

"helping" a late-nesting pair. Nicholson's paper lays stress on their inquisitiveness, and at Fair Isle we have watched young Wheatears showing keen interest in a nestful of Twites; the fact that in his case the "helpers" were in different stages of molt to first-winter plumage, and thus almost certainly of different ages, supports this alternative.

SUMMARY

The progress of the complete post-nuptial molt in the Wheatear (*Oenanthe oenanthe*) is described from examination of over 80 specimens trapped at Fair Isle Bird Observatory.

Molt commences in late June, unless delayed by late nesting, and occupies 7-8 weeks, finishing in the third week of August.

Juveniles molt the contour feathers, median and occasionally some greater and lesser coverts when between 5-8 weeks old.

Wing and tail molt are very severe in the early stages, and the birds inactive. The few weight records from "repeat" trappings suggest a gain on normal weight at the onset and a slight loss towards the end of the period.

The severity of wing and tail molt restricts the Wheatear to a single brood at Fair Isle and farther north (Faeroe Islands, Iceland, Greenland).

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SOME TUFTED TITMOUSE LIFE HISTORY

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The Tufted Titmouse (*Parus bicolor*) is a common permanent resident in Tennessee, particularly in wooded areas. They are regular visitors at feeding stations in many residence sections of Nashville from early autumn until spring if sunflower seeds, nutmeats, peanut butter or suet are provided. Most of them go to the woods in spring to nest. They often return to my home banding station in May, June or July, bringing their nearly mature fledglings.

AGE

From 1931 to 1956, I have banding records for 327 individuals at my home and substations in the south-western section of Nashville. As this species enters banding traps rather freely, it is possible to gather

data on their life span. At the present time, 309 individuals, the number banded to the end of 1954, could have remained at the station for 2 years or more. I find that 25 Tufted Titmice did so (8 percent); 13 remained about 2 years, 7 for 3 years, one for 4½ years, 3 for 5 years, and one for 6 years, 3 months. The exact age for the latter is known. He was banded No. 42-109431 as a nestling, hatched April 21, 1948, and was last seen on July 19, 1954. Middleton (1949) in Pennsylvania reported a Tufted Titmouse banded on January 7, 1939 which remained to nest in one of his boxes each year and was captured for the last time on September 15, 1945 at 7 1/3 years of age.

HABITS

Rather rarely one of the residents will remain at my home to nest in a box and occasionally a pair has occupied one of the boxes placed in Warner Parks for Bluebirds (*Sialia sialis*) or attempted to use a tin cylinder newspaper box on the roadside. Usually a natural cavity in a tree or fence-post is preferred. Because these natural cavities are often inaccessible for watching, there is a paucity of published data on the nesting of this species. Therefore I am summarizing some general observations on behavior and nesting in the Nashville area. In addition, data were obtained from 93 hours of watching the incubation and nestling periods of an entirely successful brood of seven young, one of them being the previously mentioned No. 42-109431, called "Lefty" because he was banded on the left tarsus.

In the non-breeding season, Tufted Titmice are social, flying and feeding amicably together in twosomes, in groups and in association with the closely related Carolina Chickadee (*Parus carolinensis*). My records of distinctively marked individuals indicate that the twosomes may be a mated pair, but not always. They may be birds hatched the previous summer, probably of the same brood, or a parent and a youngster. The small groups may be a family or a brood. I have not seen large groups. One color-banded pair and their son remained together for the entire winter. At times mother and son came to the feeder together. Van Tyne (1948) had two marked young come to his feeding shelf with their parents until November 8, 1942 and after that date, one young continued to come with them until January 10, 1943.

Often when one Tufted Titmouse was trapped, a companion remained nearby, using a rasping vocal sound, while the entrapped bird was being handled, accompanying it when released. Gillespie (1930, p. 122) mentions this habit. On April 21, when nesting must have been in progress, the actions of one of a pair, in a threatening type of posture, suggested a sort of distraction display. As usual this bird used the rasping notes as I handled the mate, but instead of flying off with it, this one flew within ten feet of me, faced me on the ground and displayed by crouching with spread wings, thrusting head forward and rasping. Odum (1941, p. 531) describes a somewhat similar, but more exaggerated display by the Black-capped Chickadee (*Parus atricapillus*) when he caught their newly-fledged young.

In winter Tufted Titmice frequently store food or attempt to do so. In October, 1955, one tucked a shelled sunflower seed into a crevice of the bark of a silver maple tree; a squirrel immediately attempted to extract it. In December, 1940, one searched among the English ivy vines on a tree trunk for a place to hide the seed it was carrying. In January, 1944, one gathered bits of bread, flew to a clump of plants, hopped all around the clump, looking into it, but finally dropped the food on the frozen ground. On another occasion, I watched a Carolina Chickadee hiding hulled sunflower seeds in tree-bark crevices, but each time that the chickadee went after another seed, a Tufted Titmouse helped itself to the stored kernel. In Kentucky, Helen and Paul Owen (1956), report Tufted Titmice pushing sunflower seeds deeply into the sod on October 12, but did not see them attempting to recover them later.

BATHING

I have not seen a Tufted Titmouse bathe except in spray from the garden hose. In July, 1954, four fledglings, still being fed, but near independence, had a great frolic bathing in the spray in the garden, but were not joined by their parents.

On June 22, 1948, a hot, humid day, an immature titmouse, about two months old, sprawled on the house roof for a brief sun bath.

SONG AND FEEDING OF THE FEMALE

Immature Tufted Titmice sing lengthy formless songs as do many other juvenile birds. On September 10, 1944, I heard one singing that type which I would not have recognized except for the occasional *peto* notes interspersed within the medley. On July 19, 1954 when Lefty and his mate brought their four large young, these fledglings sang the formless song, but did not use any *peto* notes.

After a period of silence or infrequent song in winter, the voice of the Tufted Titmouse is usually heard by mid-January in loud *peto*, *peto*, *peto*, or *peo*, *peo*, *peo* or a rapidly uttered *p*, *p*, *p*, most persistently by male when calling for a mate. By February and March, a sibilant *sweet*, *sweet* or *see*, *see* or *see-bee* (similar to a Carolina Chickadee song) is used also. These sibilant notes are heard mainly when a pair is together sometimes as they feed together or when the male calls his mate to give her food that he holds in his bill. The male of the 1948 nesting pair used the loud *peto* from a distance to call his incubating mate from the nest for food. If she had not joined him, he came closer to the nest and used the soft sibilant notes to call her off. After the young hatched when he no longer fed the female, he announced his arrival in the vicinity of the nest with a harsh rasping call, occasionally with a *peto* note.

The courtship feeding behavior starts in March before incubation, but is more commonly observed in April during nest-building, egg-laying and incubation. The female assumes the begging posture of a juvenile to receive the food, crouching and quivering her wings, using soft sibilant notes. Hinde (1952, pp. 90-96) describes this "wing-shivering" display for several Paridae in Europe as a part of courtship feeding and copulatory behavior. The pair that nested near our house

quivered their wings as they met near the nest as each carried larvae for their nestlings. The female did this much oftener than the male, but on April 19, two days before the eggs began to hatch, the male quivered his wings before feeding his mate. He did this again when they met on April 21 and April 25 as they both approached the nest with food for the nestlings. On April 28 when the young were six and seven days old, the pair quivered wings as they met. Throughout the nestling period, the female was seen quivering her wings many times when she saw her mate, but he never passed any food to her after the young were hatched. Odum (1941, pp. 526-527) says that only rarely has he seen the male Black-capped Chickadee feed the female away from the nest after the young have hatched; he ignores her and feeds the young, but wing-fluttering may still take place.

Sometimes early in spring the intention of the male Tufted Titmouse to feed the female is not consummated. On March 10, 1950. Lefty and his mate were perched on a feeder, when the father of this two-year-old male arrived. The female flew. Lefty flew at his father, Blue, driving him away (I never saw Blue again). Lefty then returned to the feeding shelf, picked up a seed, calling *see, see* many times. The other bird did not reappear so he flew to another perch to eat the seed himself. Another March feeding attempt was thwarted by an interruption; the male called with a seed in his bill, but the female did not appear. On March 26, 1955, one fed his mate on the ground and while perched in trees. Brackbill (1949) observed courtship feeding in Maryland before the incubation patch had developed.

During the first part of the incubation period, female Red missed several feedings brought by her mate, Blue, to the vicinity of the nest. Sometimes she was absent; other times she did not respond to his *peto* or sibilant calls and remained on the nest. Previous to the 8th day of incubation, I did not see him go to the nest-box with food, but on April 16th, he began to deliver it to her at the entrance if she did not leave the nest to meet him on a nearby twig.

NESTING

Between 1939 and 1955, I have obtained some data on two nests in natural cavities, six in nest-boxes and one in a tin newspaper box at the roadside. Clutches consisted of 5 to 7 eggs. Many books (including Bent, 1946) state that the Tufted Titmouse lays 4 to 8 eggs; Butler (1897, p. 1134) states 5-6, sometimes as many as 9. The only cited record of 8, found in available literature, is one in the Cleveland, Ohio region. Williams (1950, p. 102) states: "June 27, family of 8 leaving the nest." For the Plain Titmouse (*Baeolophus inornatus*), Price (1936) records 3 to 9 eggs in 62 clutches laid in nest-boxes in California, with 7 egg sets predominating (17 nests). My findings in Nashville agree with those of Wayne for the Tufted Titmouse in South Carolina (1910, p. 194) who found 5 to 7 eggs in a set. In Nashville, I found 3 sets of 5 eggs; 3 sets of 6 eggs, plus one found with 6 young in a natural cavity; 3 sets of 7 eggs. One set of 5 eggs all hatched, but the young disappeared by the 13th day, the other two sets produced 3 fledglings each. One of the 6-egg sets produced 5 young, the one

in the newspaper box was deserted, and the one in a natural cavity was not followed after hatching. Of the 7-egg sets, one was taken by a predator, one set was sterile and was collected on the 18th day when the female was still incubating. The third set was entirely successful. From the 7 nests where all data are known, 18 young fledged from 43 eggs (42 percent success). Middleton (1949) reports that No. 39-126650, the old bird that nested for 7 years in a box at his home in Pennsylvania, with its mates produced 47 young. He does not state the number of eggs laid, but reports all nests successful with 3 to 7 young in a brood. This bird was mated with No. 39-126609 in 1940-41-42 and for the next three years with No. 40-137944. In 1941 there were two broods (5 and 3) and in 1945, two broods (7 and 5 young). No known second broods are on record in Nashville. Wayne (1910) states that the Tufted Titmouse is single brooded in South Carolina.

The nests built in boxes were usually about 5 feet from the ground, one was 7½ feet. Those in natural cavities were 5½ to 7 feet from the ground. H. C. Monk has given me some data on nests in natural cavities in the Nashville region; one in a gum tree was 18 inches above ground, another in a hackberry tree was 20 feet. On April 15, it held 4 fresh eggs which were cold to the touch that night about 8:00 p.m. although the bird was in the cavity and attacked his hand. Apparently the set was incomplete and incubation had not started.

In addition to green moss, grass, leaves, vegetal matter and string used in the body of the nest, I have often found snake skin or scales. Wayne (1910) mentions the presence of snake skins in the nests he found in South Carolina. He also describes a very unusual nest built in Spanish moss seen on April 23, but the following day after a storm, he found the 5 eggs on the ground. The female began to build in the same mass of moss although the male appeared to be trying to interest her in a nearby cavity by flying to it and calling to her. By May 3, she had completed the second nest and laid 3 eggs, but the following day, that nest also was blown down.

Butler (1897, p. 1136) cites a record of another unusual nest near Cincinnati, Ohio in May. Six nearly hatched eggs were found in a hole excavated in the side of an old, rough nest of a large bird in the top of a tall sapling.

During egg-laying, it is customary for the female Tufted Titmouse, like the Carolina Chickadee, to cover the incomplete set with nest lining material when she leaves the nest. Nests are usually lined with soft fibers or mammal hair, sometimes sheep wool. This habit tends to protect the eggs as it gives the impression of an incomplete nest. I have never found the eggs of either species covered after incubation has started.

In 1948, the resident pair of Tufted Titmice built in a box fastened to a tree trunk about 7½ feet from the ground, some twenty feet from our windows. Their nest was a few feet from an ivy-covered hackberry tree where a pair of Blue Jays (*Cyanocitta cristata*) had their nest. Between the two nests was a small elm tree which was used as a perch by the Blue Jays and the Tufted Titmice.

The male had been banded as an immature (first year) bird on July 29, 1947, called "Blue" from the plastic band he wore. His mate,

"Red," was banded on March 25, 1948. Nest-building was first noticed on March 24 when a layer of green moss covered the bottom of the box. Upon the thick layer of moss was a layer of dry leaf fragments. The depression was lined with $1\frac{1}{2}$ inches of soft material, including vegetal fibers, narrow strips of paper, rabbit and opossum hair. I was unable to watch closely enough to learn which of this pair carried the nest material, but among other *Paridae*, the female builds the nest (Odum, 1942, p. 524; Hinde, 1952, p. 7). The 7 eggs were laid from April 2 to 8 and were covered each day with nest material until incubation started at the completion of the set. The female alone incubated. I did not go to her nest while she was in the box, but with other incubating Tufted Titmice, I found several that would not leave the nest when I opened the top. At least three incubating birds allowed me to lift them from their eggs, band them and replace them on the eggs. Most of the Tufted Titmice that I observed nesting, hissed, sputtered and lunged forward as I looked into the nest or put my hand near the incubating bird. One of them began to peck the side of the box after hissing. I have noted this hissing and lunging behavior in the Carolina Chickadee which in my experience is even more explosive in her demonstration. Observers have found this behavior in other *Paridae*. Hinde (1952) and Sibley (1955) discuss this habit which in many ways appears imitative of the actions of a snake. Sibley observed a Plain Titmouse a number of times and says: "The entire pattern of swaying movement and hissing sound was strongly suggestive of a snake and undeniably startling." "It is not difficult to believe that potential predators would frequently be frightened by this activity."

INCUBATION

Although incubation of the 1948 nest started on April 8, I was unable to make lengthy observations until the third day, April 11. The female continued to bring bits of fiber or mammal hair to add to the nest lining at least once during each observation period until April 18, the 10th day of incubation.

As her periods on the nest were long and I was unable to watch continuously, my records show a large number of incomplete periods, most of which are omitted in the following tabulation of attentive and inattentive periods. The attentive periods (on the nest) range from 13 to 73 minutes, with the shorter periods occurring in the latter part of the incubation. The average attentive period was 39 minutes.

The periods off the nest range from 3 to 51 minutes. This one unusually long absence of 51 minutes occurred on April 12 when the day was unusually warm with a mean temperature of 78 degrees, 20 degrees above normal. The average for inattentive periods was 18 minutes.

In the following list, the periods in parenthesis represent those off the nest: April 11, (p.m.) + 61(19); April 12 (p.m.), + 66(51); April 13, (32)42(20)50(3); April 14, (7)40(12)73, 52(19)44(10); April 16, (13)66(18)55(25)32(17); April 17, 28(3)30, 17(17)-36(16); April 18, (19)27(10)26(23)29(24); April 19, (25)38-(24)18(31). For the Black-capped Chickadee, Odum (1941, p. 523)

found the average attentive period to be 24 minutes and average inattentive period 7.8 minutes.

NESTLING PERIOD

On April 21, the 13th day of incubation, young were hatching. At 5:35 a.m. C.S.T. 5 had hatched. As I looked into the nest-box, the female sat on the nest with half an egg shell in her bill. She gave a hissing note and lunged toward me, throwing the egg shell to the nest rim. She flew off the nest and soon afterward returned with a larva in her bill. I was still near the nest; she hopped about in a near-by tree as if shy of me, then swallowed the food herself.

I went indoors and the pair continued to bring food to the young. As the male had been going to the nest with food for the female, he was doubtless well aware when the young were hatching. Sometime between 10:30 a.m. and 4:00 p.m., the sixth egg hatched. The female went into the box at 5:23 p.m., 63 minutes before sunset. The seventh egg hatched sometime before the next day.

She brooded much of that morning, but after that, I failed to find her on the nest at any time during the day until toward evening when she went on for the night. After May 4, when the young were 12 and 13 days old, she ceased night brooding, leaving the young unattended for the last four nights in the nest. Table 1 shows when the female went into the nest to brood:

	Temp.	Type of day	Min. before sunset
April 21	72	Partly cloudy	63
24	81	clear	5
26	78	cloudy	27
27	83	mostly fair	28
28	67	partly cloudy	26
29	69	clear	25
May 1	78	cloudy	9
3	80	showery	15
4	67	showery	24

Three days before the young fledged, the male fed bread at least twice, and pecan bits whenever he could find them on the feeding shelf.

When the male discontinued passing food to the female after the young hatched, there was a definite change in his vocal notes. Instead of the loud *peto* from a distance or the sibilant soft note when near the nest, he used a harsh rasping note most of the time as he perched on a twig a few feet from the nest before delivering the food to the young. He became more excitable, sometimes rasping for several minutes at a time. This was particularly noticeable when he met the Blue Jays; previously he had usually watched them in silence. He had resented the presence of a pair of Cardinals (*Richmondia cardinalis*) during the incubation period, flying at them. This belligerence continued; he flew at a Myrtle Warbler (*Dendroica coronata*) that he met near the nest; he scolded squirrels, a chipmunk, a Purple Grackle (*Quiscalus quiscula*) and me. May 1, he perched near a male Cowbird (*Molothrus ater*), merely watching him. On May 5, he rasped excitedly for long intervals at a chipmunk on the ground, then he beat

the larva that he held in his bill against a branch. In the many times that I had watched him approach with food, I had never seen him do this before and thought that it might be a substitute activity in venting upon the larva the fury that he felt toward the chipmunk.

On April 25, the female Tufted Titmouse flew hissing at a Starling (*Sturnus vulgaris*), but she usually ignored other birds.

The rate of feeding showed an increase from 7 per hour on April 23 to an average of 24 per hour on May 8, the last day of nest-life. An acceleration in the rate of feeding was also noted from the mid or late morning hours into the afternoon. The slowest rates occurred in early morning and late in the day. Although it was not possible to identify each bird as it brought food because they often arrived and departed so swiftly, the male definitely assumed the greater share of providing food.

On four mornings during the nestling period, I learned when the female left the nest: April 28 at sunrise; April 30 at 5 minutes after sunrise; May 1 at 7 minutes after and May 5 at 10 minutes after sunrise. First feedings of the morning were brought on three mornings between April 26 and May 5 by the male at 6 to 9 minutes after sunrise and on May 6 by the pair at 12 minutes after sunrise, the female delivering her larva first (she had not brooded the previous night).

Final feedings for the day were noted on 12 evenings. On April 24 (young 2 and 3 days old) the male fed 9 minutes before sunset; on April 28, the female brought a meal as she went into the box to brood for the night at 28 minutes before sunset. Ten minutes later, the male arrived with food, looked into the box, then flew with the larva to a near-by tree, swallowed it, wiped his bill and flew. On six evenings thereafter (to May 4) the male brought the final meals at 30, 14, 22, 17, 32, 41 minutes before sunset. On the next four evenings, the female did not brood. She and her mate brought the late meals on alternate evenings at 30, 29, 15 and 44 minutes before sunset. During the May nestling period, there was considerable cloudiness and light showers almost daily.

Wight (1934) in Chattanooga, Tennessee, reported that after a brood was raised in one of his nest-boxes, the parents (apparently unmarked for identification) returned for a second nesting and were assisted in the feeding of this second brood by one and sometimes two others which he believed were young of the first brood.

On April 30, I banded the seven nestlings then 8-9 days old. The primaries and rectrices were unsheathed about 3 millimeters; eyes were not open to full roundness. All were quiet when handled and did not cower. On May 1, their voices could be heard at some distance. By May 5, they crouched with lowered heads as I looked into the nest. They were well feathered with tails about 7 mm. long. They had become very vociferous when the parents arrived with food. On this date, I watched the nest for 3½ hours (7:00 to 9:00 a.m., 11:30 to 12:30, 5:30 to 6:00 p.m.) when the parents brought an average of 15 meals per hour. Mrs. Nice (1931, p. 132) watched a brood of 5 well-feathered Tufted Titmice in Oklahoma on June 6, 1926 when 18 meals were fed from 2:00 to 4:00 p.m. The female brooded 3 and 8

minutes. The following day from 10:40 to 12:10, they received 7 meals in 1½ hours and she brooded 8 and 15 minutes.

During my watch periods, the male was more active in nest sanitation; he removed 14 sacs and the female 7.

On May 8, a nestling often poked its head out of the entrance, using the sibilant *su-wet* or *su-wet-tet* notes; the adults called *peto* oftener from a distance. They sometimes came to the box without food. It was evident that it was about time for the nestlings to leave, but all of that day they hesitated and the seven were still in the nest when night came. But they were off and away before 6 o'clock the following morning without my seeing them leave. They were 17 to 18 days of age.

WEIGHTS

After a 9-day absence, the family returned on May 18. On June 1, two of the fledglings entered a banding trap. One weighed 20 grams, the other 20.6 grams. On July 1, one of the brood, Lefty, entered a trap. He weighed 22.4 grams. On September 1, he and his mother were both in traps at 8:00 a.m. He weighed 23.3 grams and she weighed 19.1 grams.

Fourteen Tufted Titmice, known to be at least a year old, have been weighed at my station. They averaged 20.5 grams, ranging from 18.6 to 22.3 grams.

LEFTY, HIS MATES AND YOUNG

Lefty followed the usual pattern of the species at my station. In April, 1949, he was feeding "Orange," a newcomer banded that month. He had spent the winter with his parents, Blue and Red, but Red, his mother, had disappeared in early spring of 1949. Blue soon obtained a new mate, "Green." Both pairs left, doubtless to nest elsewhere. In September, 1949, Lefty, Blue and Green returned, but the latter disappeared soon afterward. Lefty and Blue frequented the banding station all winter, Blue disappeared in March and Lefty went away later that spring (1950) but returned July 7 with a full-grown fledgling that associated with him through that autumn and the winter of 1950-51. Lefty was often seen in spring of 1951, but his mate was never identified as any of the residents or visitors at my station. On June 21, 1951, Lefty was feeding a large fledgling which was soon banded and remained until the latter part of January 1952. After March of 1952, Lefty was not seen until November, 1952, although a brood of young appeared in June. He again spent the winter at the station (1952-53), left in spring, returning in September, 1953, for the winter. In the spring of 1954, his mate was a yearling, banded in July, 1953. As usual, they disappeared in spring, returning June 6, both entering banding traps. On July 19, 1954, they brought their four large fledglings which were still dependent. A few days afterward, all of the young were trapped and banded. Lefty was not seen again.

SUMMARY

This study includes observations on habits and nesting of the Tufted Titmouse (*Parus bicolor*), a permanent resident of Nashville, Tennessee, which usually nests in natural cavities in woods, occasionally in a nest-box. It frequents feeding stations at homes in the non-breeding season.

From 1931 to 1956, 327 individuals were banded in my home area. Of these, 13 remained for 2 years, 7 for 3 years, one for 4½ years, 3 for 5 years and one male, banded as a nestling, for 6 years and 3 months.

In winter, they are social, associating in twosomes, in small groups and with Carolina Chickadees. The twosomes may be a mated pair, a parent and young, or two immature birds. Small groups may be parents and young or young of the previous season.

In fall and winter, Tufted Titmice hide seeds or other food in crevices or in the ground.

Juveniles have a lengthy formless song unlike adult song; later in the summer season, *peto* songs are interspersed in the medley. By mid-January adult songs, *peto* and variations of it, are commonly heard. These are used in mate-calling. Courtship feeding usually starts in March previous to nest-building. The male uses a sibilant *see, see* call to the female and she assumes the begging posture similar to a dependent fledgling to solicit or receive the feeding.

In 9 nests, there were 3 sets of 5 eggs, 3 sets of 6 eggs, and 3 sets of 7 eggs. From 7 nests where all data are known, 18 young fledged from 43 eggs, 42 percent successful.

A nest in a box at my home was watched closely during incubation and nestling periods. The set of 7 eggs was laid April 2 to 8. The female alone incubated. Her mate brought food to her to the end of the incubation period, April 20, but not on or after April 21 when the young were hatching. Both parents fed the nestlings, mainly larvae, but the male assumed the greater share of feeding and nest sanitation.

The periods on the nest ranged from 18 to 73 minutes, averaging 39 minutes. The shorter periods occurred in the latter part of the 13-14-day incubation period. Inattentive periods ranged from 3 to 51 minutes, averaging 18 minutes. This single long period of 51 minutes occurred on April 12 when the mean temperature was 20 degrees above normal.

Hatching of the 7 eggs required about 24 hours (April 21-22). After the first day that all were hatched, the female did not brood until she went into the nest for the night at 5 to 63 minutes before sunset (usually about 25 minutes). She did not brood on the last 4 nights.

The 7 fledglings left very early on May 9 when they were 17 to 18 days old. After a 9-day absence, they returned with their parents to my banding station; later 3 of the brood entered banding traps, including the one called Lefty.

Lefty spent the winter with his parents at my banding station. His mother disappeared in early spring, but the following winter, Lefty, with his father, was back. Lefty disappeared each spring for nesting, usually returning in summer with one or more fledglings. Sometimes one of his fledglings spent the winter with him. Lefty spent six winters at my home banding station.

ACKNOWLEDGMENT

I am indebted to Dr. Margaret M. Nice for reading of the manuscript and for helpful suggestions.

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CHANGES IN SEX RATIO OCCURRING WITH AGE IN
YOUNG CALIFORNIA QUAIL IN CENTRAL OTAGO,
NEW ZEALAND

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Studies on population dynamics of California quail in various parts of New Zealand (where they were introduced in 1862—Williams 1952) have been proceeding for some years now. One aspect of the work that will be of interest because of a number of recent articles (Hickey 1955, Campbell and Lee 1956, Rosene and Fitch 1956, Wallmo 1956) is that of changes in the sex ratio of this species that occur with advancing age.

First of all, it is well known that the sexes can be distinguished at an age of six to seven weeks; secondly, I have found—as will appear elsewhere—that young birds may be aged with fair accuracy (to within about three to four days either way from the true date of hatching) up to an age of about 22 weeks by means of the progress of the primary wing molt