portunity to ant would do so; not all species of any one family performed; but all individuals of a species which anted also performed. The only variation in actions shown was by juvenile Wood Thrushes. Enthusiasm for anting was much more evident during late April to the end of July than it was in early spring and in the fall. Some ants were eaten and some discarded. The experiments gave no indication as to the biological significance of anting.

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Erindale, Ontario

SCARLET TANAGERS 'ANTING'

BY HORACE GROSKIN

THE peculiar behavior of birds known as 'anting,' whereby birds seize ants and place them in their feathers under their wings or elsewhere, crush the ants with their bills and rub the juices on their feathers, or dust themselves in ant hills, has been noted and recorded by a number of ornithologists both in this and other countries. Various theories have been advanced for this rather unusual behavior: that ants are placed among the feathers to drive out ectoparasites; that the bird anoints its feathers with the formic acid secretions of the ant to repel ectoparasites; that the bird eats the ant for the formic acid which may be beneficial as a medication to increase muscular energy, and the like, or to expel endoparasites; that the bird places the ant in the feathers to have a reserve food supply during migration; and other suggestions.

McAtee (1938) reviews the literature on the subject and gives in condensed form the observations, comments and some conclusions as to its biological significance drawn by twenty-six ornithologists in various countries. He also describes in full an observation made by E. R. Kalmbach in 1935 of Starlings anting in Washington, D. C.

In view of the fact that the accounts of anting in this country are

limited, it appears worth while to record a new species, the Scarlet Tanager (*Piranga erythromelas*).

On September 23, 1941, in late afternoon, I was watching a large banding trap through a window at my home in Ardmore, Pennsylvania. The trap is located on the lawn twenty feet from the window and about five feet below it. As I was watching this trap, an adult male Flicker (*Colaptes auratus luteus*) arrived and started feeding on the ground immediately adjacent to the side of the trap. I noted with field glasses through the window that he was seizing and eating winged, dark-colored ants of which there was a swarm emerging from the ground. He fed for about fifteen minutes and left. Shortly afterwards, another adult male Flicker arrived, and he also fed in the same place and in the same manner as the other one, for about ten minutes. Neither of these Flickers rubbed the acid secretions of the ants on their feathers or attempted any form of anting.

On October 2, 1941, at about 4 P. M., I was again at the window watching the banding trap when I noticed a swarm of winged, dark-colored ants on the ground alongside the trap at exactly the same place where the Flickers had fed a few days before. The swarming ants covered an area of about two square feet, and many of them were flying in the air and through the wire mesh of the trap. A few minutes later, I saw another swarm of the ants in the grass almost directly below the window. This swarm was much larger than the other one, covering an area of about five square feet, and not only were the ants emerging from the ground in large numbers, but the air was literally filled with them and several even landed on the window panes through which I was looking. During this time, there were a number of birds feeding on the ground or at the bird feeders within five to fifty feet of both swarms of ants. These birds showed no interest whatever in the ants. The species present at the time were one Northern Downy Woodpecker (*Dryobates pubescens medianus*), two Tufted Titmice (*Baeolophus bicolor*), one Catbird (*Dumetella carolinensis*), three Eastern Robins (*Turdus m. migratorius*), and two Purple Grackles (*Quiscalus q. quiscula*).

While I was watching the birds and the swarming ants, two Scarlet Tanagers (*Piranga erythromelas*) suddenly flew in and alighted on the ground in the center of the larger swarm of ants located directly under the window, and immediately started anting. Tanager 'a' continued to ant persistently for more than one hour with short interruptions from time to time, while tanager 'b' alternated between the two swarms, flying from one to the other every few minutes. The

distance between the two swarms was about fifteen feet and both could be seen easily from the window. Tanager 'a', which remained with the larger swarm of ants for the entire period, would seize an ant from the ground in its bill, spread and raise its wing slightly, and put its head with the ant in its bill under its wing where it remained for a period of a minute to a minute and a half. Then the head would come out from under the wing with the ant gone from the bill. The bird would then straighten up, look around for a few seconds, seize another ant from the ground and repeat the performance, changing from time to time from one wing to the other. The entire action was most deliberate, without any indication of hurry or excitement whatsoever. While the bird's head was under its wing, I could detect no movement either of the body or the wing. This led me to infer that the bird did not rub the ant on its feathers to benefit from its secretions of formic acid; it appeared, rather, as if the bird were holding the ant in some particular place so that it might attach itself to the feathers. McAtee (1918) calls attention to the tendency of ants, when disturbed, to seize the nearest available object with the jaws in a grip so persistent that they often die without relaxing it. It was also noted by Réaumur (1734–1744) that the great strength of ants is in their mandibles.

Since tanager 'a' apparently did not rub the ant on its feathers, and since it is hardly likely that it conveyed the ant under its wing for the purpose of eating it there, it appears possible that it intended the ant to attach itself to the feathers, perhaps to provide food during the bird's migration. It is also possible that the bird placed the ant among its feathers to rid itself of ectoparasites. The ant, disturbed by being held in the bird's bill, would exude formic acid, which, according to Wheeler (1926), is a poison used by ants in attacking their enemies or defending themselves. Wheeler (1910) also writes that in the western states and in Mexico garments are sometimes freed of vermin by being placed on large ant hills of *Formica* and *Pogonomyrmex occidentalis.* It is also suggested that possibly the bird held the ant at a special place among its feathers until the ant would exude formic acid onto the bird's skin, which had been irritated by ectoparasites. The formic acid may possibly be beneficial to the bird as a medication to soothe or cure the irritation of the skin caused by these parasites. According to the 'Merck Index,' 4th edition, a medical encyclopedia, formic acid is used externally in human medication, chiefly as a counter-irritant in painful local affections.

Tanager 'b's' anting behavior was similar to that of tanager 'a' so long as it was with tanager 'a' at the larger swarm of ants, but when it flew to the smaller swarm, instead of seizing the ants and putting them among the feathers under the wing, it would seize the ants rapidly, one after the other, and eat them, and this it continued to do every time it flew over to the smaller swarm. However, in one instance, tanager 'b', while anting with tanager 'a' at the larger swarm, seized an ant and rubbed it under the upper tail-coverts for a moment and then resumed anting in the same manner as tanager 'a'. When it finished rubbing the ant under the upper tail-coverts, I was unable to see whether it ate the ant or dropped it. Nice and Pelkwyk point out that Steiniger (1937) and Palmgren (1937), after a number of feeding experiments with birds, reached the conclusion that ants, on the whole, are protected by their taste, with which conclusion Nice and Pelkwyk agreed. However, tanager 'b' not only did not show any aversion to ants, but ate a considerable number of them with apparent satisfaction. Formic acid, in very small quantities is used internally in human medication, as a diffusible stimulant ('Merck Index'), and perhaps tanager 'b' was eating the ants for that purpose. Forbush (1929) writes that the Scarlet Tanager takes ants. Roberts (1936) writes that the food of the Scarlet Tanager is mainly animal matter including ants.

Both tanagers left the premises shortly after 5 P. M., having anted for over one hour. After the birds were gone, I examined the ground near both swarms of ants and found a large number of ants still present. I did not find any dead ants. Upon my examination of the ground the following morning, the ants had disappeared but late in the afternoon they reappeared. The tanagers, however, did not return and the other birds present at the time did not attempt to ant.

Two of the winged, dark-colored ants were later collected at the location of the swarms, both females (queens), which were identified tentatively by Ezra T. Cresson, Jr., Associate Curator of Insects, Academy of Natural Sciences of Philadelphia, as *Lasius (Acanthomyops) claviger* (Roger). This identification was later definitely confirmed by M. R. Smith, Associate Entomologist, Bureau of Entomology, U. S. Department of Agriculture, Washington, D. C. I wish to express my thanks to both of these gentlemen for their assistance.

The chemical composition of the excretion of *Lasius claviger* is formic acid. This acid is produced in considerable quantity only by the species of certain Formicine genera such as *Lasius, Formica, Camponotus,* etc.

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210 Glenn Road
Ardmore, Pa.

'ANTING' BY ROBINS

BY CHARLES K. NICHOLS

SEVERAL notes have appeared recently in ornithological literature regarding the subject of 'anting' by birds. In connection with this matter the following observations may prove of some interest.

On August 3, 1941, at about eight o'clock in the morning, I noticed a male Robin (*Turdus migratorius migratorius*), on my lawn at Ridgewood, New Jersey, which was very obviously engaged in anting himself. He would pick an object from the ground and quickly place it under one of his partly opened wings, as has been frequently described, and sometimes on the under side of the tail. In his efforts to accomplish the latter he would assume most grotesque postures, similar to those illustrated in an article by Nice and ter Pelkwyk (Auk, 57: 520–522, 1940) and frequently would lose balance and fall on his back as noted by Ivor (Auk 58: 416, 1941). At other times he would press his breast to the grass and partly rotate his body with this contact as a pivot.