

is nowise distinguishable from my long series of *semitorques* and is, in my opinion, a bird of Japanese provenience.

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ADDITIONAL OBSERVATIONS AND COMMENTS ON
"ANTING" BY BIRDS

BY HORACE GROSKIN

ORNITHOLOGISTS in America and in several other countries have recently become greatly interested in the strange behavior of birds known as "anting." When a bird "ants," it seizes an ant and usually rubs it under the wings and often at the base of the tail or, as some observers have reported, holds the ant somewhere in its feathers for some unknown purpose. Many theories have been advanced as to why birds do this, but up to the present time no one has discovered the reason, and "anting" still remains a mystery.

W. L. McAtee (1938) summarized nearly all the recorded observations and inferences to that date, and since then many additional observations of "anting" have been recorded in various countries throughout the world. Some ornithologists were rather sceptical about the reports of this peculiar bird behavior and they remained doubtful until they actually observed it for themselves. "Anting" by birds is thought to be a rather rare occurrence but, in the opinion of the writer, it is not as rare as it appears to be and is quite often mistaken for preening; it is, therefore, overlooked until the observer becomes aware of the fact that the bird is behaving in an unusual manner, different from ordinary preening, and is picking up something from the ground and applying it to the feathers.

Some of the theories advanced as to the reasons for birds "anting" are as follows: (1) birds place ants in their feathers to get rid of ectoparasites; (2) birds use the ants to annoint themselves with the formic acid excretions of the ant to give tone to the muscles and also for the general agreeable effect; (3) birds rub ants on their feathers to wipe off the formic acid before eating them, as a means of ridding themselves of endoparasites; (4) birds place ants under their wings as a reserve food supply during migrations. This inference seems rather far-fetched, but an observation recorded by Charles T. Ramsden (1914) of birds carrying snails under their wings during migration requires that we give this theory further consideration and investigation.

I made my first observation of "anting" on October 2, 1941, at

Ardmore, Pennsylvania. At that time, I observed two Scarlet Tanagers, *Piranga olivacea*, "anting" with virgin queens of the ant, *Lasius (Acanthomyops) claviger* (Roger), recorded in 'The Auk' (60: 55-59, 1943). Since then I have made 11 additional observations at Ardmore of "anting" by five species of birds with four different species of ants.

On September 14, 1943, two Scarlet Tanagers were again observed "anting" at Ardmore at exactly the same location and with the same colony of ants that was observed two years before. The "anting" behavior of these was decidedly different. In 1941, the tanagers "anted" very deliberately, while the tanagers in 1943 appeared very nervous and excited, "anting" rapidly at intervals, which probably was due to the fact that, unintentionally, I came upon them suddenly, stopping within three feet of them. They, however, continued to "ant" for a period of 15 minutes before flying away. The incentive for the birds to continue "anting," under the circumstances, must have been powerful.

On June 1 and again on June 27, 1944, two Catbirds, *Dumetella carolinensis*, "anted" with the workers of the ant, *Formica fusca subsericea* (Say). The catbird of June 1 crouched very low over the nest entrances of the ants, appearing to allow the ants to crawl over it; from time to time it would seize an ant and rub it under the primaries and at the base of the tail. While banding Catbirds, I have often noted that when Catbirds first arrive in Ardmore during the spring migration, they usually have many bird lice, *Mallophaga*, that come running out of their feathers over my hand; this may be the reason they permit the ants to crawl over and into their feathers. On August 29, 1945, another Catbird "anted" with virgin queens and males of the ant, *Lasius niger* var. *neoniger* (Emery).

On October 5, 1944, an Eastern Robin, *Turdus migratorius*, "anted" with the virgin queens of the ant, *Lasius (Acanthomyops) claviger* (Roger). This bird tumbled completely over several times while attempting to rub the ant on the under tail-coverts. On May 14, 1947, a Wood Thrush, *Hylocichla mustelina*, soon after its arrival from its winter quarters, "anted" with the workers of the ant, *Formica fusca* var. *subsericea* (Say). A Catbird made several attempts to drive the Wood Thrush away from the ants, but it returned each time and finally held its ground and "anted" slowly, deliberately and without excitement.

On August 30, 1945, an Eastern Song Sparrow, *Melospiza melodia*, "anted" with virgin queens of *Lasius niger* var. *neoniger* (Emery). On July 20 and August 7, 14, 18, and 19, 1948, five additional observa-

tions were made of Song Sparrows "anting" with the workers of *Formica sanguinea subintegra* (Emery). It is probable that in the five "anting" observations of Song Sparrows, only two Song Sparrows were involved, and since these two were banded birds and no other Song Sparrows without bands were observed "anting," it is almost certain that it was the same two banded Song Sparrows that performed in each of the five observations. It is interesting to note that these Song Sparrows continued to "ant" repeatedly on five days between July 20 and August 19, often several times on the same day, and perhaps many more times when the observer was not present. It was not possible to determine how many times throughout the entire period each individual bird "anted," since the birds could not be trapped immediately after "anting" to read the band numbers. On August 14, 1948, both banded Song Sparrows "anted" at the same time within 35 feet of each other, seizing ants from the same file of ants travelling on an expedition.

The "anting" behavior pattern of the Song Sparrows in 1948 was entirely different from the "anting" behavior pattern of the Song Sparrow in 1945. The bird in 1945 "anted" in the usual manner by rubbing the ant under the primaries and under tail-coverts very deliberately without excitement, whereas in 1948 the Song Sparrows' performance was so peculiar that it probably would be of interest to describe it in detail.

From about the middle of July to the latter part of August, the workers of the ant, *Formica sanguinea subintegra*, known as the "Blood-red Slave-makers," make raids on other species of ants, particularly the common black ant, *Formica fusca* var. *subsericea*, and carry off the young to their own nests where the young are raised to become slaves. When the slave-makers go forth to make a raid, they usually travel in a file along a narrow route from 12 to 18 inches wide, extending in length anywhere from 50 to 300 feet from their own nest to the nest to be raided. When these ants are on a raiding expedition there are often as many as 300 to 500 slave-makers in the file. During the past several years, I have had an unusual opportunity to observe and study these raids and have become fairly well acquainted with this ant's behavior.

We have two large colonies of these slave-makers on our property at Ardmore, as well as five large colonies of the ant, *Formica fusca* var. *subsericea*, which is the species usually enslaved by the slave-makers. On July 20, 1948, I observed a long file of the "Blood-red Slave-makers" in the short grass, close to the house, on their way to make a raid. While observing the ants, a banded Song Sparrow arrived and sta-

tioned itself alongside the file of ants, and immediately started "anting" with the slave-makers by seizing one of the ants from the file; it rapidly rubbed the ant under the primaries of the right wing and then changed over to the left wing, where it rubbed the ant between the primary feathers with a few strokes; it then straightened up. In a few seconds, the Song Sparrow seized another slave-maker from the file and started rubbing it under the tail-coverts, but apparently it was not reaching the desired spot, so it brought its tail forward under the body and actually sat down on its tail and proceeded to rub the ant on the underside of the tail which was then upside down. Suddenly, the bird sprang to its feet and began shaking itself vigorously, dancing around in a half circle, and also jumping up and down; from time to time it picked at its legs and breast feathers. The entire performance continued for about two minutes, when the bird gradually quieted down and, much to my surprise, started "anting" again and going through the same performance which lasted for about ten minutes. Then the bird flew away. The reason for this unusual "anting" behavior of the Song Sparrow was perhaps due to the fact that when the Song Sparrow started seizing these slave-making ants, the fellow workers of the slave-makers immediately attacked the bird.

It is evident from the "anting" behavior of the Song Sparrow, as described above, that there is considerable variation in "anting" behavior, depending on the particular species of ant that is used by the bird in "anting," and perhaps also on the various castes of ants belonging to the same species and even to the same colony.

The Song Sparrow in 1945 "anted" with virgin queens of *Lasius niger* var. *neoniger*, and these queens submitted to capture without difficulty, while the Song Sparrows in 1948 "anted" with the worker caste of the slave-makers, *Formica sanguinea subintegra*, and the bird was attacked, which resulted in a considerable difference in the "anting" behavior of the bird. It is also possible that the same bird may "ant" for a particular purpose at one time and for an entirely different reason at another time. On one occasion the bird may rub the ant on its feathers to rid itself of ectoparasites, and on another occasion it may not rub the ant at all but hold the ant in its feathers so that the ant may spray formic acid and thus keep the ectoparasites out of its feathers.

Up to the present time, hardly any attention has been given to the identification of the ants used in "anting," and we know almost nothing about the excretions of the ants. Many ornithologists have assumed that the birds "ant" to get the benefits of formic acid and have taken for granted that all ants excrete formic acid. For example, O. Hein-

TABLE 1

SPECIES OF BIRDS AND THE ANTS USED IN "ANTING"

Seven Eastern Robins, *Turdus m. migratorius*, "anted" with the following six species of ants.

- Tapinoma sessile* (Say)
- Lasius umbratus mixtus aphidicola* (Walsh)
- Lasius* (*Acanthomyops claviger*) (Roger)
- Formica fusca* var. *sambanescens* (Emery)
- Formica fusca* var. *subsericea* (Say)
- Formica exsectoides exsectoides* (Forel)

Five Catbirds, *Dumetella carolinensis*, "anted" with the three species of ants.

- Lasius niger* var. *neoniger* (Emery)
- Lasius umbratus mixtus aphidicola* (Walsh)
- Formica fusca* var. *subsericea* (Say)

Four Starlings, *Sturnus v. vulgaris*, "anted" with four species of ants.

- Camponotus consobrinus*
- Lasius niger* var. *neoniger* (Emery)
- Lasius* (*Acanthomyops*) *interjectus* (Mayr)
- Formica fusca* var. *subsericea* (Say)

Three Eastern Song Sparrows, *Melospiza m. melodia*, "anted" with three species of ants.

- Lasius niger* var. *neoniger* (Emery)
- Formica rufa* (Linnaeus)
- Formica sanguinea subintegra* (Emery)

Three Purple Grackles, *Quiscalus q. quiscula*, "anted" with three species of ants.

- Lasius niger* var. *neoniger* (Emery)
- Lasius umbratus mixtus aphidicola* (Walsh)
- Lasius* (*Acanthomyops*) *murphyi* (Forel)

Two Red-eyed Towhees, *Pipilo e. erythrophthalmus*, "anted" with two species of ants.

- Tapinoma sessile* (Say)
- Lasius niger* var. *americanus* (Emery)

Two Scarlet Tanagers, *Piranga olivacea*, "anted" with one species of ant.

- Lasius* (*Acanthomyops*) *claviger* (Roger)

One Cowbird, *Molothrus ater*, "anted" with two species of ants.

- Lasius niger* (Emery)
- Formica* sp.

One Western Crow, *Corvus brachyrhynchos hesperis*, "anted" with one species of ant.

- Formica rufa obscuripes* (Forel)

One Hooded Crow, *Corvus c. cornix*, "anted" with one species of ant.

- Formica rufa* (Linnaeus)

One Lewin Honeyeater, *Meliphaga*, "anted" with one species of ant.

- Camponotus* sp.

One Buff-throated Saltator, *Saltator maximus*, Sharp-billed Flycatcher, *Pipromorpha oleaginea*, and Barred Woodhewer, *Dendrocolaptes certhia*, "anted" with one species of ant.

- Camponotus senex textor*

roth (1911 a.) wrote that, "Birds probably find formic acid is useful in expelling vermin." Alfred Troschutz (1931), writing about "anting," said, "A peculiarity which certain exotic birds and the Redwing Thrush have in common is the use of living ants for anointing their legs, rump and wings. The formic acid must have an especially agreeable effect." Funke (1912) referring to a Magpie, *Pica p. pica*, and Starling, *Sturnus v. vulgaris*, "anting," stated that he "believes that the 'anting' by these birds is for the practical objective of driving out annoying vermin by means of formic acid." H. Heine (1929), who observed hooded crows, *Corvus c. cornix*, dusting themselves in a colony of *Formica rufa*, wrote, that "the Hooded Crows sprinkled themselves with formic acid to rid themselves of parasites." Salim Ali (1936) who was also very much interested in "anting" remarked that, "Formic acid is used in human medication to give tone to the muscles, increase muscular energy and abolish the sense of fatigue and may similarly be useful to birds or possibly also in expelling endo-parasites." K. Floericke (1911), reference from Gerber, 1935, said, "The birds were also seen to use the beak in placing ants under their feathers where the action of formic acid would be effective." The writer, H. Groskin (1943), suggested the possibility that "the bird held the ant at particular places among its feathers where its skin had been irritated by ecto-parasites. The ant being disturbed by being held in the bird's bill would cause it to spray formic acid on the irritated skin, which might be beneficial to the bird's skin as a counter-irritant." The use of formic acid as a counter-irritant has been well-known to the medical profession for several hundreds of years.

Many species of ants no doubt do spray formic acid. Neal A. Weber (1935), a myrmecologist, made an "anting" observation and identified the ant as *Formica rufa obscuripes* (Forel), stating that these ants spray formic acid. He described the observation as follows: "The peculiar behavior of two pet Crows indicated an unexpected factor which may, perhaps, be of some importance. These Crows, entirely normal in every respect and able to fly as well as any wild ones, several times flew to the nest while I was observing the general activity. They stood upon it, fluffed out their feathers, squatted in the manner of birds taking a dust bath, and deliberately allowed the ants to crawl over them. The workers swarmed in large numbers over and through their fluffed out feathers, spraying formic acid liberally. After a few moments, when covered with ants, they hopped off the mound and shook themselves vigorously. The ants still clinging to the feathers were picked off and thrown aside. None were eaten. It seems to me that the Crows might have acted in this

manner to disinfect themselves: the formic acid sprayed by the ants might repel ecto-parasites of the Crows."

Marion R. Smith (1947) of the United States National Museum, Division of Insect Identification, states that "the ants of the genus *Lasius* (subgenus *Lasius*) *niger alienus americanus* (Emery), *niger* var. *neoniger* (Emery), and *niger* var. *sitkaensis* (Pergande) are capable of emitting a strong formic acid odor." However, the general assumption, as indicated in the foregoing references, that almost all ants spray formic acid is certainly invalid.

William M. Wheeler (1910) wrote, "Apart from a recent paper by Melander and Brues (1906), little has been published on the chemical constitution of the poisons of ants in general. These authors find appreciable traces of formic acid, as a rule, only in *Camponotinae*." Wheeler (1910), however, referring to the genus *Formica* stated that "many species of this genus of ants spray their enemies with formic acid." Whether some of the other sub-families and genera of ants excrete formic acid is certainly open to question. The ants of the genus *Lasius* (*Acanthomyops*) have a strong pungent odor similar to lemon geranium or oil of citronella. This odor is very noticeable if one happens to be near a colony of these ants when they are swarming. The ants of the genus *Tapinoma* have a nauseating odor of rotten coconuts. Wheeler (1910) states that "In the *Doryline* ants (various species of *Eciton*) the secretion has a very strong and nauseating fecal odor like that of Lace-wings (*Chrysopa*)." Probably none of these ants excrete formic acid. Stumper (1922, 1923), who investigated the venom of some ants, reported that several species of the sub-family *Camponotinae* produce only formic acid, while several species of sub-families *Myrmicinae* and *Dolichoderinae* produce no formic acid. Instead, the venom appears to consist of proteins. We find, according to the recorded "anting" observations, several birds are recorded "anting" with ants not known to excrete formic acid. Van Tyne (1943) reported that a Robin, *Turdus m. migratorius*, and a Towhee, *Pipilo e. erythrophthalmus*, "anted" with a *Tapinoma* ant. H. R. Ivor (1943) reported numerous species of birds "anting" with *Tapinoma* species. H. Groskin (1943) and M. David (1944) reported Robins "anting" with *Lasius* (*Acanthomyops*) *claviger*, while Kalmbach (1938) stated that the Starling "anted" with *Lasius* (*Acanthomyops*) *interjectus*, and H. Brackbill (1948) observed a Purple Grackle, *Quiscalus q. quiscula*, "anting" with *Lasius* (*Acanthomyops*) *murphyi*. All of these ants belonging to the subgenus *Acanthomyops* are said to excrete citric acid and not formic acid.

It is evident that we do not have enough information about ants

TABLE 2
SOME IDENTIFIED ANTS USED BY BIRDS IN "ANTING"

ANTS	BIRDS	OBSERVERS
<i>Tapinoma sessile</i> (Say)	Robin and Towhee	Josselyn Van Tyne, 1943.
<i>Camponotus</i> sp.	Lewin Honeyeater	P. A. Bourke, 1941.
<i>Camponotus consobrinus</i>	Starling	A. H. Chisholm, 1944.
<i>Camponotus senex textor</i> (F. Smith)	Buff-throated Saltator, Barred Woodhewer, Sharp- billed Flycatcher	A. F. Skutch, 1948.
<i>Lasius niger</i> var. <i>americanus</i> (Emery)	Red-eyed Towhee	W. L. McAtee, 1944.
<i>Lasius niger</i> var. <i>neoniger</i> (Emery)	Purple Grackle, Catbird, Starling	H. Brackbill, 1948.
<i>Lasius niger</i> var. <i>neoniger</i> (Emery)	Song Sparrow, Catbird,	H. Groskin
<i>Lasius niger</i>	Cowbird	M. M. Nice, 1945.
<i>Lasius umbratus mixtus aphidicola</i> (Walsh)	Purple Grackle, Robin, Catbird	H. Brackbill, 1948.
<i>Lasius (Acanthomyops) interjectus</i> (Mayr)	Starling	McAtee, Kalmbach, 1938.
<i>Lasius (Acanthomyops) claviger</i> (Roger)	Scarlet Tanager	H. Groskin, 1943.
<i>Lasius (Acanthomyops) claviger</i> (Roger)	Scarlet Tanager, Robin	H. Groskin
<i>Lasius (Acanthomyops) claviger</i> (Roger)	Robin	M. David, 1944.
<i>Lasius (Acanthomyops) murphyi</i> (Forel)	Purple Grackle	H. Brackbill, 1948.
<i>Formica</i> sp.	Cowbird	M. M. Nice, 1945.
<i>Formica fusca</i> var. <i>subanescens</i> (Emery)	Robin	C. H. Nichols, 1943.
<i>Formica fusca</i> var. <i>subsericea</i> (Say)	Wood Thrush, Catbird	H. Groskin
<i>Formica fusca</i> var. <i>subsericea</i> (Say)	Starling, Catbird, Robin	H. Brackbill, 1948.
<i>Formica rufa</i>	Song Sparrow	Nice and Pelwyk, 1940.
<i>Formica rufa obscuripes</i> (Forel)	Western Crow	Neal A. Weber, 1935.
<i>Formica rufa</i> (Linnaeus)	Hooded Crow	H. Heine, 1929.
<i>Formica exsectoides exsectoides</i> (Forel)	Robin	A. E. Staebler, 1942.
<i>Formica sanguinea subintegra</i> (Emery)	Song Sparrow	H. Groskin
<i>Tapinoma</i> sp.		
<i>Camponotus pennsylvanicus</i> (Degeer)		
<i>Lasius niger</i> (Emery)	31 species	H. R. Ivor, 1943.
<i>Formica sanguinea</i> (Latreille)		

and their excretions to solve the problem of why birds "ant." It is suggested that observers of "anting" collect some specimens of the ants immediately after the bird finishes "anting" and have these ants identified and also, if possible, secure from a chemist an analysis of the chemical composition of the excretion of the ant and have this recorded, which no doubt would contribute greatly in solving the "anting" problem.

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