

NEST SANITATION AND AN ALLEGED RELEASER<sup>1</sup>

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LORENZ (Auk, 54: 245, 1937) and Tinbergen (Amer. Midland Nat., 21: 210, 1939) have stressed the importance of the releaser concept in bird life. Tinbergen has refined some of the theoretical aspects of this hypothesis, terming Lorenz's "releasers," "signals" and subdividing "signals" into "releasers" and "directers" (t. c., p. 221). Surprisingly, Lorenz writes that the entire factual basis for his paper originates almost exclusively from chance observations. Tinbergen supplies more critical data but a consideration of the data available hardly justifies him in assuming (t. c., p. 223) "as a working hypothesis, that conspicuous and highly specialized structures whose participation in non-social processes cannot be found have a social, communicative function," a criticism already voiced by Emerson (Amer. Midland Nat., 21: 234, 1939).

The following is an example of a misapplication of the 'releaser' theory, based merely upon such an assumption. Lorenz (t. c., pp. 248, 249) refers to the cirlet of feathers about the anus of passerine nestlings as a releaser stimulating the adult to remove the feces of the young. Tinbergen (t. c., p. 222) accepts this and says, "The other signal structure found in passerine nestlings is an erectile ring of conspicuously colored feathers around the anal aperture. This signal is displayed shortly before defecation and releases as well as directs the feces-taking movements of the adult." A little thought recalls the fact that young passerine birds hatch without feathers and remain so for several days at least. Yet the "feces-taking movements of the adult" are present from the first day.

There was still the possibility of some special act of the young providing the stimulus which results in the adult carrying away the feces. To test this I conducted the following experiments on a family of Song Sparrows (*Melospiza melodia*) and a family of Catbirds (*Dumetella carolinensis*) which were in my yard at Riveredge Manor, New Jersey, in July, 1940.

*Song Sparrow.*—The normal behavior of this pair of Song Sparrows was for the adult to bring food to the nest, feed one young, sometimes feed another, or, if the young first fed did not swallow at once, to remove the food to the gullet of another which did. The adult then stood on the edge of the nest, apparently watching intently the nest contents for a few moments. If the young voided, the white, black-

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tipped fecal sac was at once removed; if it did not, the adult usually waited a few moments longer than the normal time for the appearance of the feces before leaving.

The results of the following experiment are typical for the several which were conducted: I arranged on the nest rim one fecal sac (from a previous experiment), one gray clay pellet about the size of the sac, one about twice the size of the sac, and two about one-half the size of the sac. I then retired to watch the nest from about forty feet distance, where I was completely disregarded by the birds. The actions of the birds were as follows:

- 7:07 P.M. Adult to nest, fed, and at once carried off a small clay pellet.
- 7:11 P.M. Adult to nest, fed, turned around at once and carried off the other small pellet. The young fed muted quickly, but the adult was gone.
- 7:16 P.M. Adult to nest, fed, immediately reached across nest and carried away one fecal sac.
- 7:24 P.M. Adult to nest, fed, at once carried off largest clay pellet.
- 7:29 P.M. Adult to nest, fed, and immediately carried off clay pellet the size of fecal sac. The movements of the young at this feeding caused the remaining fecal sac to fall under their bodies, where it could not be seen from above.

I watched this nest for a longer period and despite the fact that the young on these occasions did not void on being fed, and the adult appeared to peer into the interior of the nest and examine the lining, this sac which had fallen under the birds was not removed. However, it had been removed by the next evening.

Three incidents from other experiments should be described here. (1) There was one clay pellet on the nest rim. The adult came to the nest, placed a green caterpillar in the mouth of one young and at once picked up the clay pellet and flew off with it. The young with the green caterpillar apparently was not very hungry, and took more than thirty seconds to swallow it. (2) Two young had left the nest, due to handling, just before the adult came to the nest, fed one young and stood on the nest rim. The young did not void. The adult moved about, then reached about three inches outside the nest rim, picked up what appeared to be a fecal sac voided by one of the young which had just left the nest, and carried it off. (3) The young were removed from the nest and two large blobs of clay were placed in the bottom of the nest. The adult came to the nest, after a moment ate the food it was carrying, but made no effort to carry out the foreign objects. One similar blob of clay had been removed from the nest when placed in the nest with the young. These data will be discussed after the data on the Catbird are presented.

*Catbird.*—The normal procedure is for the adult to come to the nest, feed, pause, and if the young void, to pick up and eat or carry off the white, black-tipped fecal sac. If the young do not void, the adult may stay on the rim of the nest for a short time, in one case for about nine minutes.

Experiment 1. Two gray clay pellets about the size of the fecal sac were placed on the rim of the nest. I retired to watch from about thirty feet, where the birds paid only slight attention to me. The results follow:

- 1:50 P.M. Adult to nest, fed, paused, picked up and carried off one clay pellet.
- 1:51 P.M. Adult to nest, fed, paused a few moments, then left without taking anything.
- 1:55 P.M. Adult to nest, fed, paused, pecked into nest near posterior of young, then picked up clay pellet and flew away with it.

Experiment 2. Placed on rim of nest three gray clay pellets and two white paper-pulp pellets all about equal in size to a fecal sac. Results:

- 1:58 P.M. Adult to nest, apparently without food; did not feed; picked up clay pellet, appeared to try to eat it, then flew off with it.
- 1:59 P.M. Same actions of the same bird with a clay pellet.
- 2:00 P.M. Same actions of the same bird with a clay pellet.
- 2:01 P.M. The other adult to nest, fed, paused, then picked up and tried to swallow a paper-pulp pellet, then carried it away.
- 2:04 P.M. Adult to nest, fed, at once picked up and carried away last paper-pulp pellet.

#### DISCUSSION

From the above it is seen that ordinarily the adult comes to the nest, feeds, and then pauses, giving time for the young to void. When the fecal sac appears, the adult picks it up and either eats it on the spot before flying away, or flies away with it. If no fecal sac is voided by the young, the adult bird may stay at the nest some time longer before leaving. The above might be interpreted in terms of releasers. But when fecal sacs or foreign objects are placed on the rim of the nest so that they are there to be carried away when the bird arrives to feed, the bird may or may not pause (depending perhaps partly on the species, partly on circumstances, and perhaps partly on the individual), picks up the object present and carries it away, sometimes only after trying to eat it. Whether it closely resembles the fecal sac in color or size is apparently immaterial. Especially with the Song Sparrow, when there was foreign material on the nest rim, there was no pause by the adult to give the young time to mute. On one occasion the young muted quickly after feeding, but the adult had already left with a clay pellet. In normal feeding, if one young

does not swallow quickly, the food is transferred to the gullet of another which does. But with one Song Sparrow feeding, when clay pellets were there to be taken away, the adult merely placed the food in the gullet of a bird that was not eager to swallow, and carried away the clay pellet before the young had swallowed.

With both species there was no attempt to remove more than one pellet at a time. With the Song Sparrows the presence of several objects to be removed did not interrupt the normal sequence of finding and bringing food with each visit, and if several objects were present to be carried away, one was taken after each feeding. With the Catbird, however, objects lying on the nest rim were ignored after one feeding, though the bird paused before leaving as if to wait for the young to void. On one other occasion a Catbird, after removing one clay pellet, apparently made two more trips to the nest, especially to remove two more pellets. This indicates that the presence of fecal matter or clay pellets on the nest rim, or even a short distance outside the nest rim, is sufficient to initiate the fecal-removing actions of the adult, and that no special actions or structure of the young are necessary to act as stimuli. However, one experiment indicated that the presence of the young is necessary for the completion of nest sanitation. It appears that the taking away of fecal matter from the nest is just as much a part of care of the young as the bringing of food to the nest. In finding and starting to carry food to the nest, the adult does not need the sight of the young begging to initiate this; and similarly when carrying away material from the nest the sight of the young voiding is not necessary to initiate the action. The two actions are complementary parts of one phase of the care of the young. The part of the behavior which deals with bringing food is apparently more specialized, as food is apparently always brought; the instinct to carry away something is more generalized. The more general removal urge, rather than a more specific feces-removal act is an advantage to the bird, as in this way extraneous material that had accidentally been deposited on the nest, such as leaves or twigs, would be removed. A strict lock-and-key relationship here would be a disadvantage to the bird.

That this removal of something from the nest is a complementary part of bringing something to the nest is shown by the action of the bird if something is already there when the bird brings food. If nothing is there and the young do not void, the adult pauses watching the interior of the nest, and may substitute a number of irrelevant acts for the one of feces removal, before it leaves with nothing. Sev-

eral times I saw a Song Sparrow pause on the nest rim after feeding, and when no fecal sac appeared, it sometimes pecked at the gape of the still-begging young; sometimes it pecked at the body (and anus?) of the young, sometimes at the nest lining, sometimes it picked up pieces of material from the nest rim and moved them about; once it preened, and once it settled on the nest to brood. A Catbird under similar circumstances fluttered its wings a number of times. These actions could all be interpreted as irrelevant acts substituted for the act of carrying away feces, the only relevant act under the circumstances. When the bird could not do the relevant act, it did something else.

Tinbergen (t. c., p. 221) has suggested that the pecking at the anus of the young by the adult in such circumstances may be a means of communication to the young. Rather it seems that it is one expression of a more generalized pattern of behavior, the substitution of one of several possible irrelevant acts, when the relevant act is impossible.

If a reason be sought for the circling of feathers around the anus, may it not be a purely physical one? There are arrangements of feathers around the other natural openings of the bird, the eye, the ear, the mouth, the nostrils. There must be some arrangement of feathers about the anus. Why not a circling of feathers? And since it is on the under side of the bird, why not light-colored? And since it is normally concealed, why not light-colored, as are the bases of the feathers in many birds, even in some birds otherwise completely black in plumage? If a further, functional use of this circling of feathers be sought, may it not be merely to help push away the surrounding body feathers shortly before defecation, to prevent their being soiled?

#### SUMMARY

It is inadvisable to consider a structure as having any special function merely because we do not know its function.

The circling of feathers about the anus of passerine birds appears only after some days of nest life, so that it cannot be the stimulus initiating nest sanitation, which starts with the first day.

Experiments with Catbirds and Song Sparrows show that the voiding of the young provides no special stimuli to the nest-sanitation behavior of the adult, but the presence of the young is necessary for nest-sanitation to be carried out.

Nest-sanitation behavior, the removal of material from the nest, appears to be complementary to the action of bringing food to the

nest. It is more generalized than the latter, an advantage to the species, and when blocked because of lack of material to be removed, the bird may substitute irrelevant acts in its place.

The exact arrangement of the cirlet of feathers about the anus may be an evolutionary accident, and its present function may be physical.

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