MAINTENANCE BEHAVIOR OF THE COMMON RHEA

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THE many detailed studies of avian behavior which have appeared during the last few decades have concentrated on the carinates, and relatively little attention has been paid to the more primitive ratites. Schneider (1949) studied the Ostrich (*Struthio*) in captivity, and Meise (1963) summarized and evaluated the behavior of the ratites with reference to their phylogeny. One of the least studied ratites is the Common Rhea (*Rhea americana*) of South America. Field studies of this species, such as those of Darwin (1955), Adams (1908), Hudson (1920), and Wetmore (1926) are short, and largely anecdotal. Studies of captive birds are also few in number. Portielje (1925) briefly described some reproductive activities, Brito (1949) provided data on nesting and egg production, and Faust (1960) described the brooding biology of captive rheas.

The present study, undertaken to provide more detailed information about the behavior patterns of the Common Rhea, was carried out during 1962–63 at the Detroit Zoological Park. The subjects were a group of about twelve Common Rheas, half of them of breeding age and half subadult. They were maintained in an outdoor enclosure of approximately two acres, most of it flat except for the edges which sloped downward to prevent escape. The soil was bare in places but most of the area was covered with grass and a few patches of large trees. The area contained a drinking trough and a small, shallow pool of water. Other animals in the enclosure included llamas and Jabirus (*Jabiru mycteria*).

A few observations were also made at the San Diego Zoo. The first part of this study is concerned with the maintenance behavior of the rhea. A subsequent paper will deal with agonistic and sexual behavior.

POSTURES

Standing.—When standing the rhea generally holds one foot about twelve inches behind the other. One leg is directed backward at a slight angle and apparently supports less weight than the other, which is held vertically. Probably the bird is more stable with the feet placed at two points along the longitudinal body axis than at one point (Fig. 1).

Crouching.—In this position the rhea rests its weight on its heels and, to a lesser extent, on its toes. The tibiae are almost vertical and converge downward so that the heels are in contact, or nearly so. The toes are generally held together and pointed downward, resting on the ground, so that the distal ends of the tarsi are lifted an inch or two off the ground (Fig. 2).

Sitting.—Both the knee and heel joints are completely flexed, with the

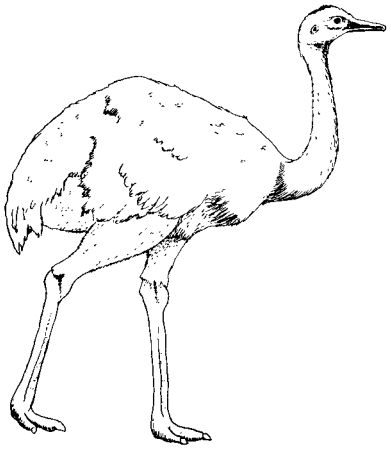

FIGURE 1

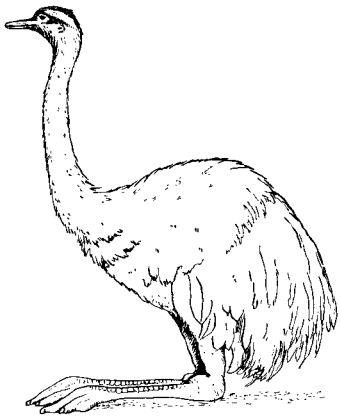

FIGURE 2

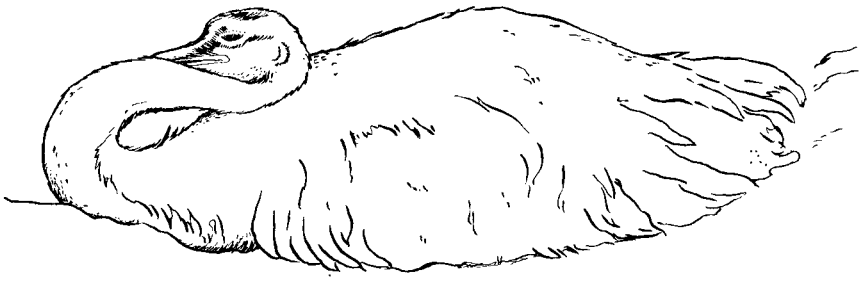

FIGURE 3

FIG. 1. Standing position of the Common Rhea.
FIG. 2. Crouching position of the Common Rhea.
FIG. 3. The common sleeping position of the rhea.

tibiae and tarsi being approximately parallel to each other and to the ground. This is the common resting and brooding posture. The neck may be held vertically, folded in an S-curve, or extended straight out on the ground. The crouching position is an intermediate stage in the process of sitting down or standing up, and usually lasts only a few seconds. Occasionally it is maintained for several minutes or more, during which the rhea may preen or dust-bathe.

Sleeping Postures.—Most commonly the rhea sits with its wings folded over its back, its neck folded in a tight S-curve, with the nape resting on the back or on the base of the neck, and its head held horizontally with the bill resting on the throat (Fig. 3). Occasionally the rhea extends its neck, places its bill against the ground, and slides its head forward so that

the neck is stretched straight out in front of the body with its entire ventral surface on the ground.

Immelman (1959) noted that the Ostrich (*Struthio*) utilizes the latter position during deep sleep at night. It is possible that the rhea also uses some such position at night, as distinct from that used in light sleep during the day. However, this is uncertain, as rheas were not observed at night during this study.

During light, intermittent sleep, the neck is held up vertically and the eyes are opened and closed every few seconds. This may precede a period of deeper sleep as described above.

LOCOMOTION

With their long, powerful legs rheas are well adapted to roam about on the plains in search of food. Darwin (1955) states that rheas are capable swimmers. In the zoo there is a pool about two and one-half feet deep, in which they might wade, but they were never observed to enter the water.

As the rhea walks there are slight back-and-forth movements of the head in the sagittal plane. Such movements are common among birds and probably give mechanical assistance to the walking movements; they may also aid in visual fixation of the surroundings (Daanje, 1950).

The posture assumed in running varies with the rhea's motivation. In non-social situations, as when a bird runs to be fed by spectators, the neck is held vertically, the wings are raised only slightly above the back, and the plumage is not conspicuously ruffled. In contrast, the running postures assumed during sexual or agonistic activities involve crouching, wing and neck movements, and ruffling of the plumage. These postures will be described in another paper.

FEEDING BEHAVIOR

Feeding Movements.—The rhea spends much of its time wandering about in search of food. The neck is bent downward at the shoulders and curves up again to the head, giving a U-shaped curve. The rhea moves slowly, raising and lowering its head slightly, or looking from side to side. When food is located the bird extends its neck and picks up the object in the tip of its bill, then jerks its head back a few inches, releases the food, and thrusts its head forward again with its bill open so as to catch the food in the back of its mouth. After taking a few bits of food the rhea raises its neck vertically and holds it up for a few seconds, looking from side to side. This probably facilitates swallowing while the bird keeps an eye out for possible danger.

Types of Food.—Rheas in the wild feed primarily on vegetable material

such as grasses, seeds, and berries (Stejneger, 1885), as well as insects (Adams, 1908) and snakes and rodents (Peterson, 1963:179). In captivity they feed mainly on a mixture of corn, lettuce, and other items provided by the keepers.

On two occasions rheas were seen feeding on fecal material deposited a few minutes earlier by other rheas. One pecked at the feces, then walked away to wipe its bill in the grass. Bill-wiping is a common activity of passerines, but this was the only time it was observed in a rhea.

Occasionally a rhea will peck at flies on another's folded wings while following it about for several minutes. The other bird ignores this activity.

On two occasions the rheas attempted to catch small birds. Once an adult captured, killed, and ate a Common Grackle (*Quiscalus quiscula*). The capture was not observed. The rhea was first seen holding a struggling grackle in its bill. It then ran about the enclosure, stopping often to rub the grackle vigorously in the dust, sometimes dropping it and picking it up again. This continued even after the grackle had ceased to move. Another rhea tried to pick up the dead bird several times when the first dropped it, but the captor quickly ran off with its prey. During this time the rhea was extremely excited, and glanced about alertly. After about fifteen minutes it swallowed several pieces of meat which it had torn from the grackle by pecking at it and shaking it in the air. Then it picked up the remainder of the grackle's body, and by vigorously shaking its head back and forth, managed to swallow it. When it had finished the rhea walked about slowly, occasionally searching the ground, but did not resume feeding for about five minutes. The entire incident took about 20 minutes.

DRINKING BEHAVIOR

A rhea usually stands while drinking. Gaping slightly, it extends its neck and vigorously dips its bill into the water, pulls it out about six inches, and snaps its head forward again so that the water pulled into the air by the backward movement is caught in the mouth by the forward movement. This "pecking" of water is rapid, and similar in appearance to pecking at food. It is rather different from the more passive dipping movements by which most birds drink, though the rhea may also do this at times.

Quick drinks may be taken at any time but prolonged drinking periods of five to ten minutes most often occur after the rhea has been actively feeding, or soon after it awakens and before a period of prolonged feeding. After drinking the rhea will commonly wander about for a few minutes, often dipping its head as though to feed, but stopping with its bill a few inches above the ground. Apparently the presence of water in the digestive tract inhibits feeding for a few minutes.

TABLE 1
PERCENTAGE OF PREENING IN VARIOUS BODY AREAS IN *RHEA AMERICANA* (276 MOVEMENTS) AND THE AMERICAN GOLDFINCH. (1457 MOVEMENTS)[1]

Area	Rhea	Goldfinch
Wing	43.9	28.0
Head and Neck	14.8	28.0
Breast and Abdomen	10.5	17.0
Sides and Flanks	7.2	4.0
Back and Shoulder	6.9	13.0
Rump and Tail region	2.2	7.0
Feet and Legs	14.5	3.0
Total	100.0	100.0

[1] From Coutlee, 1963.

PREENING BEHAVIOR

Preening Movements.—A rhea may pause briefly to preen while feeding, resting, etc., but prolonged preening bouts are most common when the bird is settling down for a nap or arising from one. The wing is extended laterally to be preened, and although only one can be preened at a time, both wings may be spread simultaneously. The wing is held differently than by most birds. The humerus is extended laterally and the radio-ulna directed downward, so that the elbow points upward and the dorsal wing surface is directed anteriorly. This is also seen in the Wing Display of the male, which is apparently derived from this preening posture. In most other birds the elbow is pointed downward so that the ventral wing surface is directed anteriorly. In preening, the neck is bent back over the humerus and the bill is inserted among the bases of the plumes from the undersurface of the wing, presumably because this surface is bare, while the dorsal wing surface is covered with small feathers which might make it difficult to reach the bases of the larger plumes.

Preening Frequencies.—The rhea preens its wings more frequently than any other part of the body (Table 1). The number of feathers here is large, and many of these are primaries and secondaries whose long shafts are easily disarranged by the wind or by contact with the body. Also, the wings are moved about vigorously during running and display, and also during the preening of body areas which the wings cover when folded. All of these movements lead to disarrangement of the feathers. Wing preening also occurs as a displacement activity during courtship and aggressive behavior.

The neck is the second most frequently preened area, and again, is a

region which is apt to be disturbed by frequent movements. The same is true for the tibiae, which are preened almost as often as the neck (13.4 per cent or 92 per cent of all preening movements on the legs). The remaining areas of the body surface, such as the back, rump, and flanks are moved relatively little, or are only sparsely feathered, and therefore require only occasional preening. The rhea occasionally nibbles at its unfeathered tarsus (1.1 per cent), and is probably picking at loose pieces of scaly skin.

Coutlee (1963) has described the preening behavior of the American Goldfinch (*Spinus tristis*), and her data provide an opportunity to compare the preening frequencies of the rhea with those of an advanced, flying species. In both forms the wings and neck received the most preening, but in the rhea the wings were preened three times as often as the neck (Table 1) while in the goldfinch the rate was the same for both areas. Perhaps this can be explained by the relatively loose arrangement of feathers in the rhea, or by the disturbing effect of movement on the loose-vaned ratite feathers as compared to the goldfinch whose feathers, being equipped with barbules, have stiffer, more tightly arranged vanes.

The breast and abdomen received the next highest rate of preening in the goldfinch (17 per cent), while the corresponding area in the rhea was fourth. The rhea preens its tibiae with the third highest frequency, while in the goldfinch the feet and legs receive only three per cent of the preening movements. This difference is probably due to the fact that in the rhea the relatively large tibiae are exposed, while in the goldfinch they are more hidden in the body plumage. Also, the rhea moves its legs much more than the goldfinch during locomotion. In both forms the general body surface was preened relatively infrequently as compared to the neck and limbs.

Thus there is a close similarity in the frequencies with which the various parts of the plumage are preened in birds at opposite ends of the phylogenetic scale. The major difference is correlated with a major difference in morphology and behavior associated with the primary method of locomotion in each form.

DUST-BATHING

Dust-bathing most often occurs at the beginning of a rest period. It may begin while the bird is crouching and continue while it is sitting. The rhea extends its neck and picks up some dust or dirt with its bill from directly in front of it, draws its neck back into an S-curve, and swings its head around to one side to throw the dust onto its wings, which are folded over its back. Sometimes, under what is apparently a less intense drive, the dust is merely dropped beside the rhea instead of onto it. After several minutes of intermittent dust-bathing and preening, the rhea settles down to sleep. It may awaken a few times in the next several minutes to perform

a few listless and incomplete movements in which the dust is picked up and then dropped in place, before finally falling asleep.

Dust-bathing is usually regarded as a means of removing external parasites. In many birds, including Ostriches and many passerines, the activity involves extremely vigorous thrashing of dust between and through the feathers, compared to which the rather quiet movements of the rhea appear to be of little value. It may at times function as a displacement activity in relieving restlessness caused by broodiness or mild aggressiveness. It is performed mostly by males, which tend to rest in nest-like concavities in the ground, apparently nests dug by males who subsequently fail to brood. Once a male was observed sitting in this way when another approached and poked about curiously. Ordinarily this would elicit head-forward threat movements from the sitting rhea. This time, however, it merely dust-bathed listlessly, ceasing as soon as the other rhea departed. Such incidents were not uncommon. From the context these ineffective dust-bathing movements appeared as displacement movements, occurring in place of an insufficiently activated agonistic response.

MISCELLANEOUS MAINTENANCE ACTIVITIES

Defecation most often occurs during feeding, and sometimes during drinking.

To scratch its head while standing, the rhea stretches its neck straight forward and downward so that its head is just a few inches above the ground, then extends one leg forward and scratches vertically eight or ten times with its foot.

A standing or walking rhea often jerks its wings slightly, several times in succession. Occasionally it stretches the wing on one side laterally and slightly downward, while simultaneously stretching the other leg straight backward. In addition, there are innumerable slight twitches or jerks of the head, wings, body, and skin, which may occur at any time without interfering with the activity of the moment.

SUMMARY

The behavior of *Rhea americana* was studied at the Detroit Zoological Park. The usual form of locomotion is walking, with running generally restricted to social activities. The common sleeping posture is with the neck in an S-shaped loop, with the bill resting on the throat. The rhea is largely herbivorous, but occasionally captures small birds or other animals. It may sip water in the manner common to most birds, but usually pecks at it. Prolonged drinking inhibits feeding for a few minutes. The frequency with which various body areas are preened is similar to that in a passerine, *Spinus tristis*. Dust-bathing frequently precedes a period of sleep and may be used as a displacement activity.

ACKNOWLEDGMENTS

I wish to thank Dr. William L. Thompson of the Department of Biology, Wayne State University, for his guidance and encouragement during this study. Much valuable help was provided by Keith Kreag and James Drake of the Detroit Zoological Park, and by Kenton C. Lint of the San Diego Zoo.

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