

OBSERVATIONS ON THE BEHAVIOR OF THE ANDEAN CONDOR (*VULTUR GRYPHUS*)

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Although the Andean Condor (*Vultur gryphus*) is exhibited in many of the larger zoos of the world, very few observations on the behavior of these birds have been recorded. As far as the authors know, there are no systematic studies of their behavior in the wild but, during recent years, a few observations have been made in zoos. Lint (1959) reported on a pair of birds in San Diego Zoo which, over a period of several years, had successfully raised a number of young. Poulsen (1962) described the behavior of a pair of birds kept in the Copenhagen Zoo, and Whitson and Whitson (1969) gave an account of the breeding behavior of a pair of birds in Oklahoma City Zoo; the same birds we later used for the following study.

METHODS AND MATERIALS

The condors we observed were housed in a large aviary approximately 18 × 20 × 20 ft. At one end of the aviary was a two-story rock shelter, the upper compartment of which had a concrete floor, the lower one had an earthen floor. Along one side of the aviary was a bathing pool.

Apart from the male's adornment with a head crest, the two birds looked much alike. The male was slightly larger than the female, stood about 3 ft tall and had a wingspan of 9 ft 5 inches. According to Grossman and Hamlet (1964), their wingspan may reach well over 10 ft.

The age of the birds was unknown. The male had been in the Zoo since 1958, the female, since 1962. The major part of our study was carried out during 1968 and 1969. However, their behavior had been studied since 1967 by one of the authors (Gailey).

Our method consisted of daily observations in the period from early February to mid-July. During the rest of the year, the observations were more intermittent due to the birds disinterest in one another. The time each day one or both of us spent with the birds during the breeding season varied from a few hours to the whole day. An effort was made to vary the time of observation from early morning to late in the evening; late morning and early afternoon were the most common periods. Notes were taken and cine and tape recordings of all aspects of behavior were made. The mechanical recordings proved particularly valuable for detailed analysis.

RESULTS

PRELIMINARY BREEDING BEHAVIOR

As long as the weather remained cold, the condors showed no interest in each other and remained almost motionless in one spot for hours, with their ruffs pulled up to the head. However, as early as February on isolated warm days, some interaction and courting was observed. As the days became warmer, the birds were more often seen with their ruffs down, exposing their bare necks and naked breast patch. Occasionally the male inflated his neck (fig. 1b) which then changed color from the normal pinkish-gray to a distinct pale rose and sulfur yellow. If the observer approached the female or the shelter at this time, the male showed signs of aggression by ruffling his scapular feathers (fig. 2). Frequently, the male rubbed his head and neck against the ground or against stones and upright objects. If it was an upright pole, he hooked his neck around it in a peculiar snake-like manner (fig. 3). A related behavior was directed toward such oblong objects as straws, sticks, and feathers resting on the ground (fig. 4a). With his bill he shoveled the objects up under his lifted wing in a manner which gave the impression that he tried to tuck them in between the feathers (fig. 4b). His movements were always slow and deliberate and much time was spent on balancing the object on the bill while he pushed it up among the feathers. On no occasion did we see the objects remain there; they always fell to the ground, and the shoveling process was repeated until the bird tired. We can offer no explanation for this behavior, and the movements performed seem unrelated to any other behavior observed. Portielje (1949) and Poulsen (1962) both mention that the male condor rubs his "head and neck against stones or other obstacles, sometimes while sitting," and Poulsen also seems to think it is

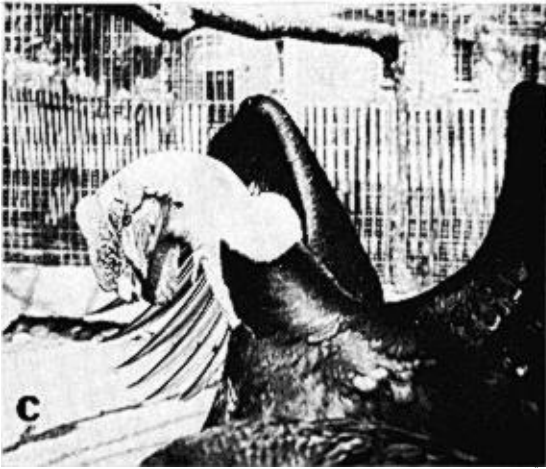


FIGURE 1. The behavior of the Andean Condor: *a* the male sunning; *b* the male with the neck inflated; *c* hooked neck posture of the courting male; *d* courtship behavior of the female; *e* courting male approaching subdued female; *f* mounted male achieves cloacal contact.



FIGURE 2. The aggressive male Andean Condor.

the same behavior the male later directs toward the female. We find it difficult to agree with this. Poulsen also mentioned that the female picks up small sticks and puts them aside. We noticed a similar behavior. She dragged longer sticks about, usually in the direction of the shelter, but there were no attempts to bring the sticks inside and arrange them in any way comparable to a nest. After half an hour's shifting and manipulating of the materials, she usually lost interest and abandoned them. Newly introduced sticks and straws were manipulated more than those left in the aviary from the previous day.

COURTSHIP

Typically, courtship began with the male approaching the female with long strides and with uncovered inflated neck, exposed chest patch, and giving a loud hissing sound. When he was close to her, he began to display. His body was held erect while he stretched his neck and bent it so that his head was vertical with the bill pointing downward or even slightly inward (fig. 1c). At the same time, he began

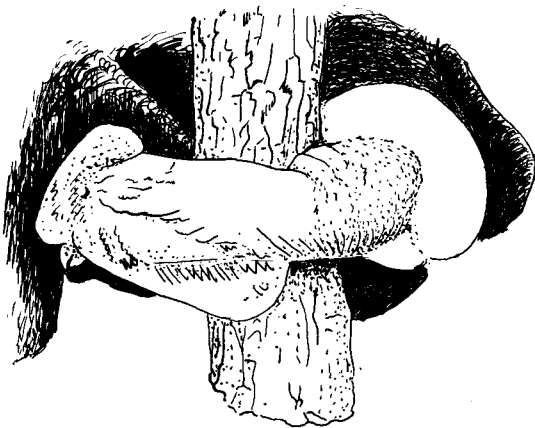
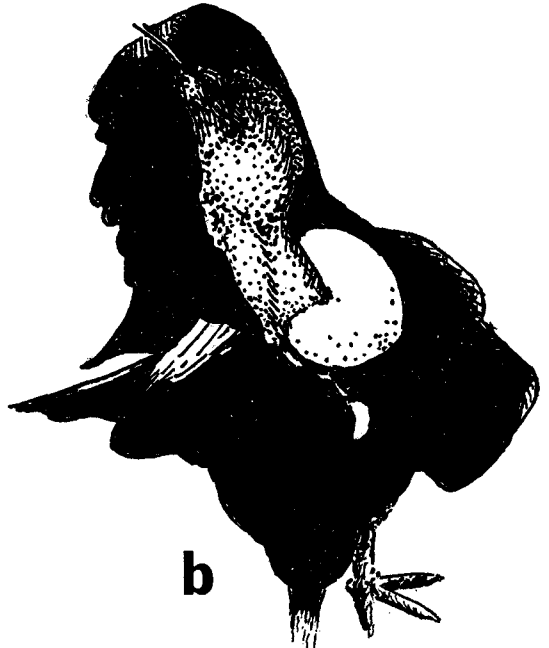
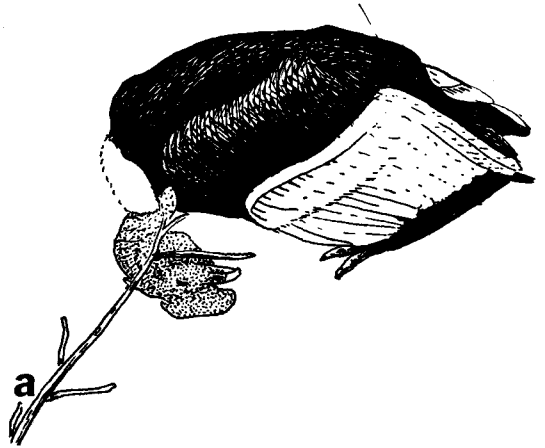


FIGURE 3. The male Andean Condor rubbing his neck around a pole.

FIGURE 4. Behavior of the male Andean Condor: *a* shovelling up a stick; *b* pushing a straw under the wing.

to ruffle his abdominal feathers, fan his tail slightly, and raise his wings over his back (fig. 5). Facing the female in an upright posture with wings now spread to their full extent, he waddled slowly toward her, making small turns to the right and left (fig. 1e). Upon assuming this display position, he began to utter a low, guttural clucking sound, the production of which became visible in the cheek region. The birds preferred to mate on level ground free from obstacles which might interfere with the male's movements. An estimated 80% of the matings we observed took place in the barren southeastern corner of the aviary. If the female was ready, she stood with body inclined while she held her head about level with her shoulders. After about a minute of display, the male



FIGURE 5. Courtship behavior of the male Andean Condor.

mounted her from the side. He had great difficulty in finding a foothold and keeping his balance while on her back. Usually he steadied himself with a wing tip on the ground or against the wire. During this process his head came close to hers (fig. 6a). Noticing this, she often pointed her beak upward, billing him gently in a manner reminiscent of a chick begging for food (fig. 6b), but at this time he never reciprocated. Instead, he would continue his display for a brief period while attempting to obtain safe foothold on her back. While this happened, the female lowered her chest almost to the ground and raised her wings, without extending them (fig. 1f). Still flapping his wings for balance, the male would finally bend his tail forward and slightly to the side bringing his cloaca in position for the ejaculation. Prior to and during ejaculation the male's clucking became more throaty and much louder. As long as the copulation lasted, the female kept her chest lowered, and either extended her neck along the ground or retained it in the same position. She uttered a loud, continuous groaning sound which ceased with the end of copulation. Cloacal contact was usually obtained three or four times. The total duration was approximately 20 sec. Copulation completed, he half stepped, half slid to the ground while slightly ruffling his scapular feathers and hissing. The female then assumed the normal standing position and joined in the hissing. Many times this hissing was almost simultaneous. The hiss of the female was

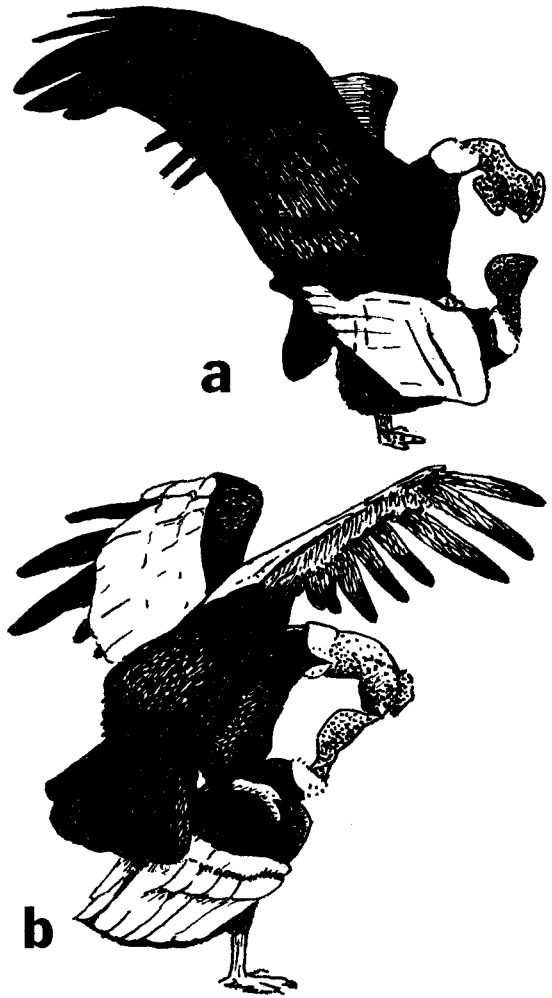


FIGURE 6. Copulation behavior of the Andean Condor: *a* the male mounted on the female; *b* the female billing the mounted male.

very soft and quiet and many times almost inaudible. Mutual billing and nibbling about the head and neck region followed for the next few seconds. Many times the male hissed as he approached the female with lifted or outstretched wings, but he did not display. On such occasions mutual nibbling and billing invariably followed.

The courtship display of the male was on most occasions induced by the female. She would face him and display to him in a posture identical to his and give the same vocalizations while he remained silent (fig. 1d). Usually, however, she seemed to omit the initial hiss, but this was difficult to determine because her soft hiss was difficult to detect. When the female came close to the male, he usually started his display, while she stopped and assumed the lowered position of a subordinate holding her wings folded. If he failed to display, she could mount him in male fashion. In

1968, this happened in all observed cases except two. In 1969, we observed it only twice. Both birds were seen on several occasions displaying face to face, without either assuming the subordinate posture. At those times there was neither mating nor any billing immediately after. In 1969, the female often displayed after the male had begun courting her. A similar behavior could frequently be induced by one of us when he approached the female while copying the courting "dance." Moreover, it could happen that when the male did not respond to the female's display, she would approach and direct her efforts toward us. Sometimes this lasted as long as several minutes.

The frequency with which courtship and copulation took place varied with weather and the time. On sunny days in May the intervals might be as brief as 45 min. There was a tendency for the frequency to fall off in the afternoons, or when the temperature was oppressive or felt chilly, or when it was very windy.

BEHAVIOR AT THE NESTING SITE

The condor's interest in the shelter increased gradually during the spring, and more and more time was spent in the lower nest chamber where both birds sat for long periods at a time, mostly inactive or billing and nibbling each other. Now and again the female scratched the ground with her feet, and while resting on her wrists, shaped the loose soil into a shallow nest-bowl by making sideways movements with her chest. At other times the birds picked up and manipulated small stones or dug the ground with their bills. This was done by biting at the earth and shoveling it with the mandible. Usually they made no more than a shallow groove the width of their bill, but at other times they dug larger holes. On four occasions they were seen digging holes several inches deep in the floor of the nest chamber. The deepest hole observed was approximately 9 inches deep and 12 inches in diameter. Both birds worked on it and after they had reached the ultimate depth, they extracted straws, a few feathers, and an oak leaf. These objects must have been placed there by the birds on a previous occasion and covered up, since no keeper had worked on the floor for a long time. Having removed everything as far as we could see, the birds began scraping the soil back with their beaks in a very random way; sometimes the soil which had just been scraped in was taken out and then a moment later it was shoveled back in again. When the hole was half filled, most of the materials were replaced and covered up. By then the male lost interest

and left, while the female continued filling in the hole until no more than a slight depression was left. How long the birds were at work we could not determine because the hole was already several inches deep when one of us arrived, but they were observed at work for more than an hour and a half.

To ascertain if they buried surplus food at the nest site, we overfed them three times their daily ration. The food provided on that occasion was not all horse meat but also included a large rabbit and a number of rats. However, after they had their fill, they left the remains scattered on the ground and showed no further interest.

We are still unable to explain the significance of the digging behavior, but since it was observed several times and was done with great tenacity on the nesting site and never very persistently in any other place, we may offer the suggestion that it might serve to keep the soil loose, soft, and dry. Systematic field studies may be necessary before an explanation can be given.

AFFECTION

Toward one another, the condors seemed "peaceful and affectionate," although the male held the dominant position. Billing and nibbling around each other's head and neck seemed to indicate "tenderness." This was always observed associated with copulation and was frequently observed while the birds were on the nest; not quite so often in other places. On very rare occasions, the female directed the same sign of "friendship" toward us.

AGGRESSION

There was very little aggression between the birds, although it has been observed. Toward their keepers, the birds were mostly "peaceful," but occasionally the male became aggressive and attacked. Such attacks were most frequent during the breeding season. One of us experienced an attack three times while filming in the aviary and once had a narrow escape. In the threat and attack, the bird ruffled his scapular feathers (fig. 2) and if on the ground, he walked swiftly toward the opponent with long deliberate strides, beak pointing straight ahead, and wings slightly raised. At close range, he lowered his shoulders and suddenly uncoiled his long neck, lashing forward with great force while trying to bite and tear the target of aggression. On rare occasions, the male actively attacked a keeper. His attack was done by "jumping" the person in a manner reminding one of a rooster fight. The wings were then slammed against the per-

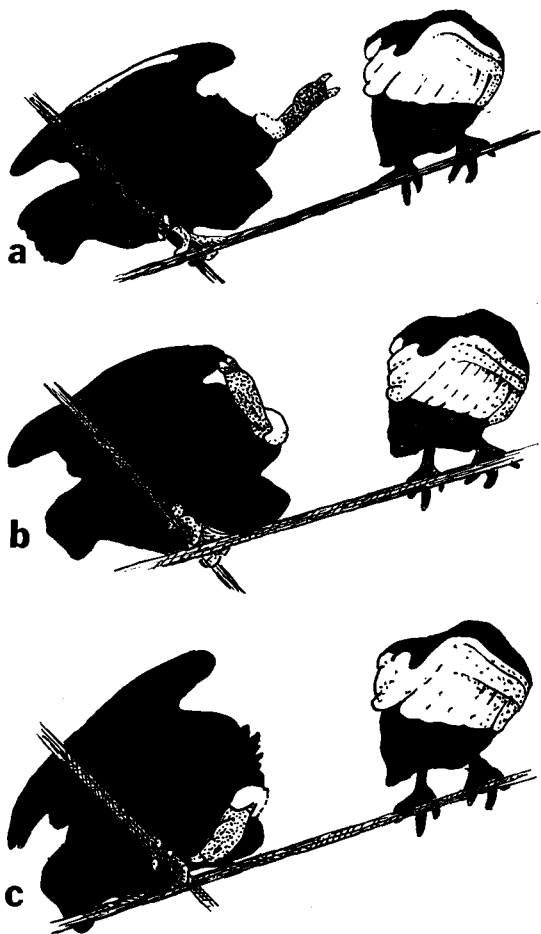


FIGURE 7. Behavior of the female Andean Condor: *a* inhibited female threatens male; *b* head swinging interruption of female threat; *c* bending posture interruption of female threat.

son while he struck out with open beak and both feet. This has been reported by several keepers and was observed once by one of us (Gailey). It was necessary for the keeper under attack to throw up his arms to shield his face. Such attacks occurred only in the middle of the breeding season and when the keeper approached the nesting site.

On one occasion, when a disagreement occurred near a perch, the male lashed out at the female without touching her. A moment later, she threatened him in the same manner, lashing her open beak toward him (fig. 7a), but each time interrupting her attack by either swinging her head sideways alternately toward her lifted right or left wing (fig. 7b) or by bending her head down to her feet (fig. 7c). The actions took place in very swift succession, and each time the position of the head shifted between the two extreme positions, one at which the open bill pointed toward the male, and one at which it pointed away. Probably

the behavior should be regarded as a fluctuation between a checked attack and a "cutoff" of an overwhelming fear-inducing stimulus.

Once, shortly after they had mated, the birds were given a rabbit. The male at once took possession of the carcass and did not allow the female to come near. She made repeated attempts to sneak up from behind to snatch a bite and was driven away each time. During the 20 or more minutes this lasted, the appearance of the male changed remarkably. Having just mated before the beginning of the meal, he threatened and lashed at the female with a thin, reddish-gray neck; but as time passed on, his sexual motivation gradually returned, and with that his neck became more and more inflated and colorful each time he drove her away. In the end he left the few remnants of the meal and courted her. One constant feature each time he drove her away was his ruffled scapular feathers. Later examination of our materials shows that a swollen neck is seen only during the breeding season and is more pronounced in the male than in the female. It is not invariably followed by attack, but it is a constant feature before courting and mating, and more so on hot than on cool days. However, on no occasion has a bird attacked without raising the scapular feathers. The extent to which this happens seems to be proportional to the motivation to attack. The swollen neck should therefore be regarded as a sign of sexual motivation and not as a threat. A lowering of the threshold for attack seems to accompany sexual arousal, and aggression can more easily be provoked in a bird with an inflated neck. Koford (1953) mentions a similar inflation in the California Condor (*Gymnogyps californianus*). He indicates that there are individual variations saying that, "an adult at one nest seemed always to be in the distended condition. One adult that I watched at the National Zoological Park maintained strong inflation for many minutes."

HUNTING AND EATING BEHAVIOR

The condors are alleged to hunt and kill their own prey (Lint 1959; Koford 1953). Not only are they said to kill birds and marmots but may also attack llamas, alpacas, and sheep. To see whether the birds have any special technique for hunting and killing, a live rabbit was set free in the aviary. Both birds gave immediate chase, grabbed, and tore at their prey with their bills. Before the author could come to the rescue of the rabbit and kill it with a blow over the head, both birds had already started eating it. These birds apparently have not developed any special hunting technique.

When eating, the condors held their prey by standing on it. They began eating this rabbit by tearing the skin around its neck and then ate their way down into the chest. In most other cases they began with the skin around the anus. From there they pulled the skin off while turning it inside out. As they progressed with the skinning, they ate the exposed tissues and organs. One of the first organs to be eaten was the liver, followed by other viscera and muscles. The entrails were left untouched. We had expected that they would go for the brain, but we saw no attempts made to break open the skull. Ribs and some skin also were eaten and the following day 1.5 to 2 inch hairy pellets were regurgitated.

BATHING AND DRINKING

Long periods were spent in bathing, accompanied by much splashing. Frequently in the baths the birds completely submerged and rolled over. Each session usually lasted for half an hour or more and during this time they hopped in and out of the water while the male attempted to assert his dominance by monopolizing the bath. After the bath, they spent 2-3 hr preening and sunning until their feathers were completely dry (fig. 1a). The feathers were obviously not water repellent, as they became well soaked.

Poulsen (1962) mentioned seeing the birds drinking by placing the bill on the surface of the water, nibble a couple of times, and raise the head quickly swallowing water. We observed the same.

DISCUSSION

The hooked and the inflated neck. Koford (1953) mentions that nestling and juvenile Californian Condors when alarmed, posture with their neck bent into a hook (fig. 8). "When strongly alarmed by a sudden loud sound or by the close approach of a man, a young condor holds its head low in front of the body, opens its bills and protrudes the tongue, erects the interscapulars and raises the ruff (when these feathers are present) and gives the hiss-grunt. . . . If too closely approached, the bird attacks from this position. . . . In strong alarm the nestling opens its wings a few inches and thus increases its apparent size and prepares to strike with its wings."

This account brings to mind the posture of the courting Andean Condor which also bends its neck into a hook and hisses. Young Turkey Vultures (*Cathartes aura*), observed by one of us (Bolwig), took up a similar posture when alarmed (fig. 9a). They stood with wings spread and necks craned, but although spitting



FIGURE 8. The chick of the California Condor in alarm posture (redrawn from Koford, 1953).

and hissing like angry cats, they never attempted to peck. When their bills were touched, they adopted a more standing position, relaxed their wings, and poked their bills upward between the observer's fingers, nibbling as if begging for food (fig. 9b). The posture was very similar to that of the frightened chick except that it was standing higher on its legs and it performed a "dance" similar to that of the courting Andean Condor.

It is noteworthy that the alarm posture of the chick is very similar to that of the courting

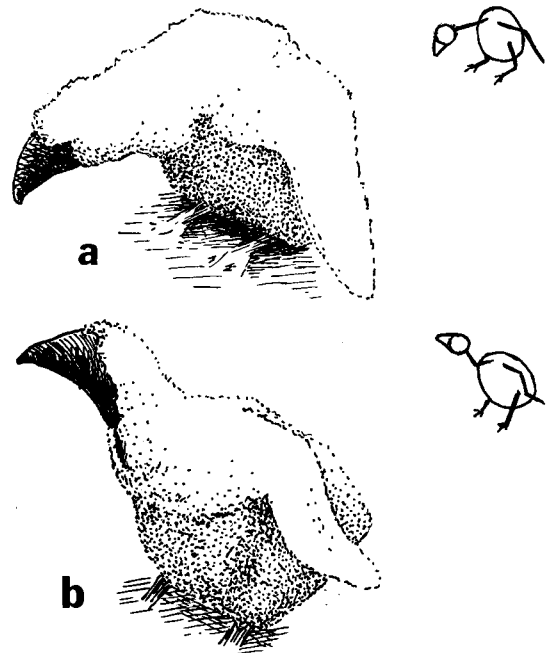


FIGURE 9. Postures of the chick of the Turkey Vulture: a alarm; b begging.

adult male. Koford (1953) points out that "The display attitude of the 'male' condor bears more resemblance to the threat attitude of the chick than to any other posture. In some birds the male employs the same action in display as in threat." But he adds: "Threat differs from display in that the ruff covers the neck, the bird does not turn from side to side, and the wings are but slightly extended."

We can agree with Koford that there is a striking similarity between the alarm posture of the chick and that of the courting male. In the turkey vulture, they seem to be almost identical. It is, however, peculiar that the adult never seems to take up this posture when alarmed. Moreover, Koford seems to think that, in the California Condor, the courting male hisses when he approaches the female with crooked neck. This we have never observed in the Andean Condor. The hissing we recorded took place earlier when he approached the female in normal upright posture prior to assuming the display posture. Immediately the neck was hooked, he produced the guttural clucking sound. It is plausible that the courting posture has originated from the alarm posture of the chicks. Infantile behavior frequently forms part of adult courtship. Probably it should be regarded as an expression for a state of general tension rather than for aggression or alarm. However, the impression could not escape us that the erect posture with a hooked neck signified dominance and no doubt contained an element of aggression. Although the feathers, bar those on the abdomen, were depressed while the male courted with the neck hooked, the presence or some aggression was indicated by slightly raised interscapular feathers immediately after mating had taken place.

The inflated neck which the authors earlier regarded as a sign of aggression was, as already mentioned, found to be a sign of high sexual motivation in the male. It probably serves as a physiological cooling mechanism, a suggestion which gains support from the observation that it is more pronounced on hot than on cold days.

Billing. The billing seen during mating was always initiated by the male holding his head closely above the head of the female or touching it with his bill in order to steady himself on her back. The posture of the billing female much resembled that of the food-begging young Turkey Vulture. In the case of the California Condor, Koford reports that "The chick does not attempt to feed until the adult lowers its head and holds its bill approximately verti-

cal a few inches above the floor. Then the chick thrusts its bill into the gape of the adult and the two heads lock in a feeding contact."

The role of aggression and submission in the courtship. The previous attempt to analyze the courting behavior of the Andean Condor indicates that, as in so many other birds, aggression and submission are important elements of the courtship, and that copulation cannot take place until a certain balance has been achieved between the aggressive and submissive tendency of the partners (Morris 1954, 1955; Cade 1960). The courtship display serves to establish this balance. A strong sexual drive apparently induces the typical courtship "dance" in *both* sexes, characterized by the upright posture, hooked neck, and spread wings. What follows depends on the motivation of both birds. Should the male happen to be devoid of sexual motivation at a time when the female has a strong drive to mate, she will display to him and may even attempt to mount him. His response may be to walk away, ignore her, allow her to mount, or to bill her. If, however, he has some motivation to mate, he too may display. The outcome depends on the vigor with which he displays. A stalemate may ensue, or the male may succeed in intimidating the female and thereby suppress her display. Her reaction will be to take up a submissive stance by which she indicates her preparedness to let him mount. Expressed in other words: her domineering tendencies must be suppressed by his, and she must accept his dominance and indicate it by submissive gestures. The fact that one of us was able to instigate courtship "dancing" in the female fits into the picture. The postures and the movements of the observer were sufficiently similar to the bird's dance to stir the necessary drives in the female but not complete enough to overpower her domineering tendency.

Other behavior related to courtship and nesting. There are several behaviors for which we cannot find any explanation. We do not understand why, in the breeding season, the male may be seen rubbing his somewhat inflated neck against the ground, hooking it around objects or balancing sticks on the mandible while pushing them up under the lifted wings. Perhaps the manipulation of straws and sticks is an atavistic behavior left over from times when ancestral condors were nest builders. A more detailed study of New World vultures will probably be required before we can offer an explanation.

We can offer no explanation for the origin

of the digging except that it may be an atavistic hoarding behavior. The only function, as far as we see, is that it may serve to loosen the soil so that the egg when laid is less likely to break. Ostriches too have been observed pecking the soil and picking it up at the nesting site, although not digging (Bolwig, unpubl.).

SUMMARY

It was noted that the sexual drive induced the same courtship in both sexes, and that successful mating was dependent on the ability of the male to dominate the female and induce her to assume a submissive posture. Attempts have been made to explain the origin of the various postures during the courtship.

The only clear sign of aggression was ruffling of the scapular feathers, whereas the inflation of the neck was a sign of sexual motivation.

Digging and manipulation of sticks is described, but no satisfactory explanation for this behavior can be offered until further studies are made.

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