consumptions for this species, but the possibility that breeding birds with chicks drink more should not be ruled out.

We have been unable to find a published account of actual observations of any sandgrouse drinking by holding its beak in the water and sucking continually like a pigeon or dove, although Meinertzhagen (*op. cit.*) says that "as many as 44 gulps have been counted." On the other hand, three species are now known definitely not to drink in this way. Until some information on other genera or species of sandgrouse becomes available, we feel compelled to abandon the long-held notion that the family Pteroclidae can be related to the family Columbidae on the basis of a common, distinctive method of drinking.

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Drinking behavior of mousebirds in the Namib Desert, southern Africa.—Both the White-backed Mousebird (*Colius colius*) and the Red-faced Mousebird (*Colius indicus*) occur in wooded sections of the Namib Desert, usually along dry river courses. In field work carried out between 18 and 23 January 1964 and between 5 July and 11 August 1964, we had frequent opportunities to observe flocks of these two species foraging in the riparian acacia woods (*A. giraffae* and *A. albida*) associated with the dry bed of the Kuiseb River. Our observations were made around the Namib Desert Research Station located at Gobabeb, approximately 70 miles inland from Walvis Bay, in South West Africa. The riparian vegetation allows a number of avian species to extend their ranges into the desert region from the more extensively wooded highlands flanking the east side of the Namib.

In the vicinity of Gobabeb these mousebirds fed extensively on the young leaves, flowers, and green or ripe berries of the widespread, vinelike shrub, *Salvadora persica*. Since this plant appears to undergo at least two cycles of fruiting a year in this region, the mousebirds are able to exploit a more or less constant source of food. Ripe *Salvadora* berries are the preferred parts of this plant; these have a high water content. For example, a sample of 30 freshly picked ripe berries weighed 7.75 g; on oven drying to a constant weight at 80°C the weight was 2.45 g, of which the seeds, which are not digested by mousebirds, accounted for 0.38 g. Thus, the water content of these berries averages about 66 per cent of the wet weight.

Because of the high water content of their food, mousebirds are not greatly dependent on drinking in order to maintain water balance even in the desert, and except for one brief period they were never seen at the isolated water holes in the bed of the Kuiseb River where many other forms of birdlife gathered in large numbers to drink. In January, when daytime temperatures ranged above 35°C, we never saw mousebirds at water. This period corresponded with a time when the *Salvadora* bushes were in full fruit, and both species were feeding heavily on the ripe berries. Again, in July and August when temperatures were moderate to cool, we never observed White-backed Mousebirds drinking, but between 30 July and 2 August

more than 20 Red-faced Mousebirds came on several occasions to drink from the water hole at Gobabeb, usually in groups of 6 to 10 at a time.

On the afternoon of 31 July, 10 mousebirds drank at the water hole even though fog and dew had collected in droplets on the vegetation earlier in the morning, and on 1 August groups of 4 to 8 birds came to drink at 1000, 1100, 1130, 1400, 1500, and 1600 hours. A total of 21 mousebirds was netted at water during this four-day period. Although Red-faced Mousebirds were still present in the area after 2 August, we never again saw them fly down to the water hole and drink.

This episode of drinking occurred at a time when the ripe, juicy *Salvadora* berries had been depleted. The bushes supported many new inflorescences and small, green, highly acrid berries, which were not so readily eaten by mousebirds. We noted that several other birds, such as Pale-wing Starlings (*Onychognathus nabouroup*), Cape Glossy Starlings (*Lamprocolius nitens*), and Laughing Doves (*Stigmatopelia senegalensis*) which had previously been feeding heavily on ripe *Salvadora* berries now switched over for a time to the remnants of the fruit crop of the Ebbehout (*Euclea pseudobenus*). The pea-sized berries hanging on this tree were sun-dried and prunelike in consistency. Evidently these dried berries were not easily digested by the birds, for we often saw the starlings and doves regurgitating them and re-swallowing them when they came to the water holes to drink. There was also an increased incidence of drinking by starlings at this time, and the regurgitated and defecated seeds of the Ebbehout accumulated by the thousands around the water holes and under the trees where flocks of starlings perched before flying down to the water.

Possibly the mousebirds were also feeding on Ebbehout berries at this time, although we did not see them doing so, and this drier food may have necessitated their drinking some water. Possibly the peppery substance in the green *Salvadora* berries induced a drinking response. In any case, the mousebirds were soon feeding again on the maturing *Salvadora* berries in early August, and we no longer saw them flying down to water.

Our most important observations relate to the mechanism by which the Red-faced Mousebird drinks. There are at least four general methods used by birds to take in water, although the exact structures and movements involved in the four ways are by no means clearly understood and probably vary a great deal from species to species. The majority of birds drink by a method usually described as "sipping" and "tipping up," as typified by galliform and most passerine birds. Certain specialized nectar feeders like sunbirds (Nectariniidae) and hummingbirds (Trochilidae) drink by taking in water by means of protrusible, grooved, or trough-like tongues, and parrots (Psittacidae) lap up water with their tongues in a special way described by Dilger (*in* Bliss, *Roots of behavior*, New York, Harper and Brothers, 1962; see p. 36). Members of the order Columbiformes, on the other hand, are said to be characterized by a distinctive method of drinking which involves a "sucking" or "pumping" action with the beak fully immersed all the while water is being swallowed. This type of drinking is frequently cited as a classic example of a phylogenetically significant behavior pattern which supposedly reflects the close relationship of doves and pigeons, of the family Columbidae, and sandgrouse, of the family Pteroclidae (see however, *The Auk*, 83: 124–126, 1966; and see Poulsen, *Vidensk. Medd. fra Dansk naturh. Foren.*, 115: 1–131, 1953, who observed that some estrildine finches drink the same way).

We were surprised to discover that Red-faced Mousebirds imbibe water by sucking in a fashion comparable in every external detail to the method of drinking used by doves and pigeons. The behavior was obvious the first time mousebirds were seen

drinking at the Gobabeb water hole. On a subsequent day, Greenwald observed 10 mousebirds at the water hole from a blind at a distance of about 20 feet through 7 × 50 binoculars. In each case, the bird drank by immersing its beak to the base and sucking in water seemingly by a pumping action of the hyoid apparatus. At no time did a bird remove its beak from the water before it was finished drinking and tip up in the manner of a typical passerine. Later, we were able to confirm these field observations by close study of our 21 captive mousebirds. By exposing the birds to the full impact of the midday sun, we could induce hyperthermia and panting, which were soon followed by bouts of drinking. We never saw one of these mousebirds take water in any other way than described above, and we think that this method of drinking is typical for this species.

The question naturally arises whether sucking is typical of the entire order Coliiformes. An individual of *Colius striatus*, which we obtained from the Cleveland Zoo, drinks the same way as *Colius indicus*. Unfortunately, we have no data on the other four species. Such information would be of considerable theoretical importance for phylogenetic interpretations. If sucking proves to be characteristic for all species of mousebirds, then it will be necessary to decide whether their drinking behavior is homologous with that of the Columbiformes and indicates relationship between these orders or, as seems more likely to us, represents another example of a striking convergence between unrelated groups.

Our observations on mousebirds were made during field work supported by a grant from the Public Health Service (Environmental Health) ES 00008.—Tom J. Cade and Lewis I. Greenwald, *Department of Zoology, Syracuse University, Syracuse, New York.*

Observations on a hybrid between the Sharp-tailed Grouse and the Greater Prairie Chicken.—A male hybrid between a Sharp-tailed Grouse (*Pedioecetes phasianellus jamesi*) and a Greater Prairie Chicken (*Tympanuchus cupido pinnatus*) was repeatedly observed on a prairie chicken booming ground 10 miles north of Wray, Yuma County, Colorado in April, 1963.[1] No dancing grounds of the Sharp-tailed Grouse are known to exist in Yuma County, but Sharp-tails have been reported occasionally near Bonny Reservoir, 34 miles south of Wray.

The characteristics of the hybrid were divided between those of the two parental genera, and were not dominated by either. It was smaller and lighter in color than the male prairie chickens on the display ground, and had the barred breast, rounded tail, and very short pinnae characteristic of the prairie chicken. The barring on the breast faded into a spotted or checked pattern on the belly. The air sacs were purple, as they are in the male Sharp-tailed Grouse, but were much larger than those of a Sharp-tail. The two central tail feathers were slightly elongated (Figure 1).

The hybrid exhibited behavioral characteristics of both genera. During display, the wings were held out farther than is usual for prairie chickens, but were not extended as far as those of the Sharp-tailed Grouse. The hybrid seemed to stamp its feet faster and for a longer period than does a prairie chicken, but it ran less than a Sharp-tailed Grouse does during the display. This hybrid controlled a larger territory than the male prairie chickens, but the territory was not in the center of the booming

[1] These observations were made while the author was a graduate student at Colorado State University, Fort Collins, Colorado.