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# Belly-soaking as a possible thermoregulatory mechanism in nesting Purple Martins

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On 4 June 1977 at 1730, while banding Purple Martins (*Progne subis*), we captured an adult female as she brooded five half-grown nestlings near Starkville, Oktibbeha County, Mississippi. When removed from her gourd nest, the female had breast and belly feathers saturated with water (Figure 1). Her young varied in weight from 24.1 to 30.7 g, their eyes were just opening, and although feather tracts were dark, the young were naked except for two down feathers in the capital tract. When removed from the gourd, each had a wet back. A female at another gourd nest containing four eggs also had wet belly feathers. The nearest water was a farm pond approximately 400 m from the nests. Older nestlings in other gourds were panting, each with its head and neck extending from the gourd entrance. All nests were exposed to full sun, the air was nearly calm, and afternoon air temperatures peaked at 35.6° C in the shade. Subsequent measurement with a YSI model 44 TD tele-thermometer revealed temperatures of 36.3° C within a similar empty gourd and 37.5° C within a similar gourd with an empty martin nest when outside temperature in the sun was 33.5° C.

At 1300 on 27 June 1979 at the Mississippi Test Facility in Hancock County, we saw two female Purple Martins with wet breast feathers enter nests in holes along the steel upright support of a crane on an old barge. A few minutes later we observed several martins wetting their breast feathers by briefly dipping to the surface of the barge canal from low flight over the water. The encounter with the water lasted only a few seconds and the birds seemed momentarily stopped in their forward motion; they did not merely skim the surface, as is typical of birds feeding or drinking. Air temperature in the shade at the time was 25° C.

During the 1980 nesting season the useful limits of this behavior were tested by extreme drought and temperature conditions at the same colony where the behavior was first observed. We noted some breast-wetting during late May when nests contained naked young. However, for 9 consecutive days in early July when maximum temperatures recorded at nearby Mississippi State University exceeded 39° C, reaching 41° C on 15

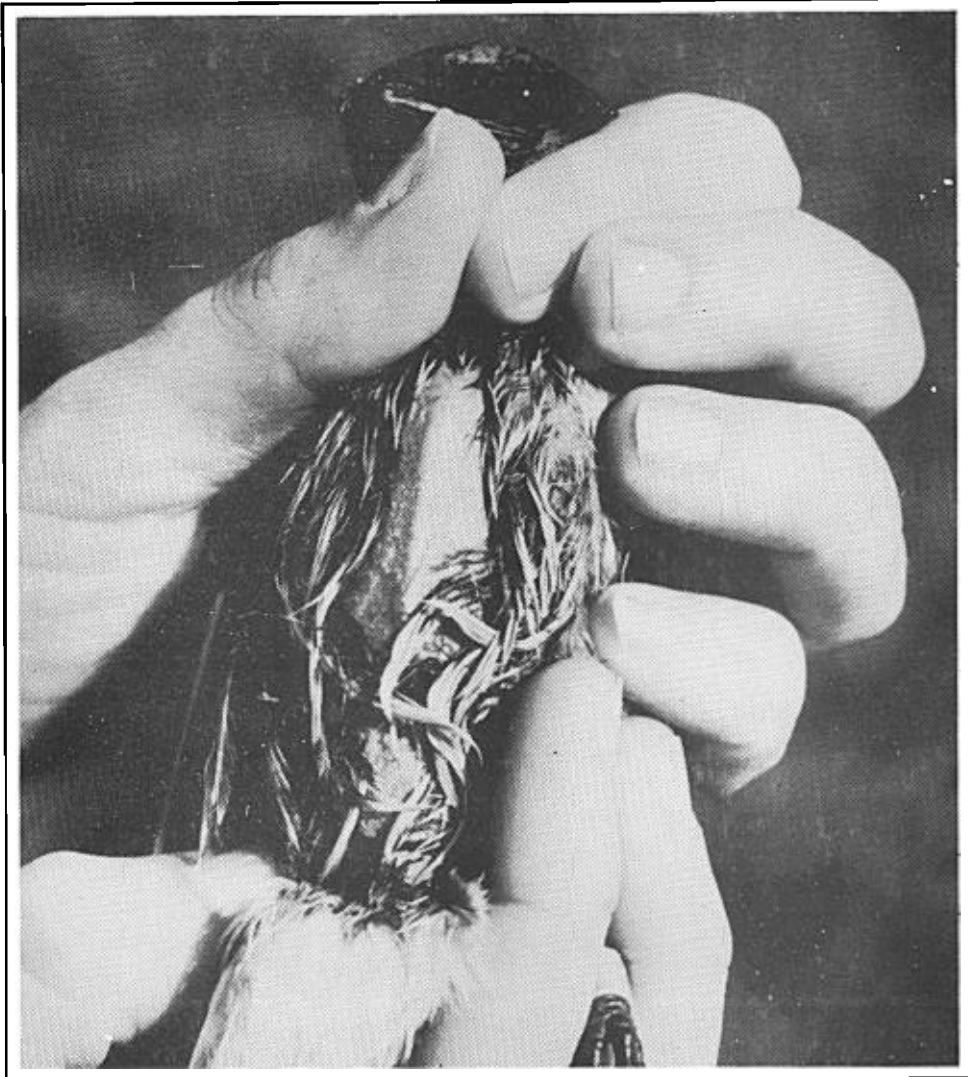
July, we saw no belly-soaking. By these dates all young in the gourds were well-feathered. Young coped with the heat by gaping at the nest entrance, but this was inadequate and by the end of the 9 days all 17 young in the colony (4 nests) had died.

Belly-soaking has been reported for a number of charadriiform birds (see review in Schardien and Jackson, *Auk* 96:604-606, 1979) and has been demonstrated as an effective mechanism to cool eggs and young during extreme heat. The presence of this behavior in martins is of interest because of the birds' common use of man-provided nest sites that are probably less well insulated than "natural" nest sites in old woodpecker cavities.

It appears that belly-soaking by Purple Martins could have survival value for eggs and young nestlings but that it may be either ineffective at extreme temperatures or not used for older nestlings. It could be ineffective because of the insulative and water repellent properties of nestling feathers. On the other hand, martins frequently forage near water and occasionally pick insects from water surfaces. It seems possible to us that the behavior had arisen incidental to the adults' foraging tactics. As the young become larger and feathered, the prey brought by adults shifts from smaller insects such as might be scooped from the surface of the water, to a diet dominated by adult dragonflies which they catch on the wing (pers. obs.; Walsh, *Wilson Bull.* 90:248-260, 1978). More importantly, adults enter the nest to feed small young, but more often perch at the entrance to feed larger chicks, thus reducing the opportunity to wet them. Any thermoregulatory advantage accruing to the eggs or young from the foraging behavior of the adults or from actions taken by the adults to cool or bathe themselves could be selected for.

We hope that other banders will look for this type of behavior in martins and other swallows so that its significance, frequency, and geographic limits can be further identified. ☛

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*Figure 1. A female Purple Martin with wet breast and belly feathers. She was captured as she brooded small young on a hot afternoon.*