GENERAL NOTES

Tool-using by a Double-crested Cormorant.—In a recent review of tool-using in vertebrates, van Lawick-Goodall (Tool-using in primates and other vertebrates, *In* Adv. Study Behavior, Lehrman et al., eds., vol. 3, 1970) defines a tool-using performance ". . . as the use of an external object as a functional extension of mouth or beak, hand or claw, in the attainment of an immediate goal." She adds that "This goal may be related to the obtaining of food, care of the body, or repulsion of a predator, intruder, etc." Later, van Lawick-Goodall describes tool-using performances by a variety of birds, but she does not give examples of birds using tools in relation to care of the body.

My purpose here is to describe an act of tool-using by a Double-crested Cormorant (*Phalacrocorax auritus*) in relation to care of the body. Additionally, the observation is unusual in that the bird made use of one of its own bodily products as a tool.

On 13 February 1970, I was seated on the edge of Florida Bay in the town of Layton, Long Key, in the Florida Keys. About 50 feet from my position a long finger of debris, stones, and sand extended out into the bay. This man-made finger was a regular resting place for numerous cormorants, pelicans, gulls, and herons. On this particular day I was watching the behavior of foraging herons as they waded in the shallows between my position and the finger of solid fill. After the herons left I turned my attention to a group of five adult cormorants resting on the fill. Two of the cormorants were dozing while the remainder were preening and head-scratching.

As I watched one of the preening adults it would stretch its head and bill, in what seemed like an awkward manner to me, back towards its uropygial gland, squeeze the gland then apply the secretion to its wing feathers with broad sweeps or dabs of the anointed bill. Suddenly, as the cormorant postured with its wings widespread, one of its secondary feathers, loosened by the molting process, blew away from the extended wing and landed about a foot in front of the cormorant. The bird turned and stared at the feather for several moments, then it picked up the feather and held it crosswise in its bill. It held this pose for several moments, then adjusted its grip on the feather's shaft so that the object was held almost parallel with the bill. The cormorant then deftly applied the tip of the feather to the preen gland by simply turning its head and extending the feather towards the gland. Next, the cormorant used the feather as a brush by applying the preen gland secretion to its extended right wing, doing so by making side to side sweeps with its head, the bill still holding the shaft of the feather. The sweeping brush-like motions were made smoothly and unhurriedly.

The bird continued this behavior, making three sets of such sweeping motions over its extended wings, once on the right wing, twice on the left, each sweep preceded by an application of the secondary feather tip to the preen gland. The gland was not manipulated by the bill after the feather had been grasped the first time. At no time did the cormorant modify the tool so as to render the "brush" a more efficient tool.

A passing motorboat startled the cormorants and the tool-using bird opened its bill slightly; a light easterly breeze wafted the secondary feather from the bird's bill to a place about a foot to the cormorant's left. The bird stared at the feather for a few moments, reached out and picked it up and manipulated it for a few moments more. Then the bird released the feather and the breeze carried it out over the bay to a point about 20 feet from the tool-user. The bird made no effort to retrieve its tool, and further observation of the tool-user and the other cormorants failed to reveal any further tool-using.

This example of tool-using is not only unusual in the startling nature of such an act by a non-mammalian vertebrate, but it is of further interest in that the bird made use of one of its own bodily products, a feather, to attain a goal in what seemed to me to be an easier performance than its typical preening and oiling behavior. Furthermore, this observation adds another facet to the use of tools by birds and other vertebrates—use of a tool to care for the surface of the body by means of a brush.—ANDREW J. MEYERRIECKS, *Department of Biology, University of South Florida, Tampa, Florida 33620, 11 February 1972.*

Cold hardiness and the development of homeothermy in young Black-bellied Tree Ducks.—The Black-bellied Tree Duck (*Dendrocygna autumnalis*) is a southern species and dump nesting is extensive in Texas (Bolen, 1962 and 1967). Dump nests are the results of several females laying eggs in the same nest. Large broods with as many as 43 ducklings have been recorded and are a direct result of these dump nests (Cain, 1970).

Koskimies and Lahti (1964) have shown that surface ducks (Mallard, *Anas platyrhynchos*, and Common Teal, *A. crecca*) could not maintain combined broods because the ducklings were not cold hardy. Combined broods are common however in most genera of diving ducks, such as *Aythya* and *Melanitta* (Hochbaum, 1944) and *Bucephala* and *Mergus* (Mendall, 1958).

This study was conducted to determine the cold-hardiness and ontogeny of thermoregulation in the Black-bellied Tree Duck young and relate this to possible success of large brood that result from dump nests.

METHODS

Forty ducklings hatched in forced-air incubators were kept for 3 days at 42° C and then placed at 32° C. Another 40 ducklings were placed in outdoor pens at one day of age without a brooder.

The fate of 22 ducklings found abandoned in nests were recorded for comparative purposes.

During the temperature regulating experiment ducklings were placed in a perforated paper box in a dark cabinet held at 0° C. At 5-minute intervals a quick-registering thermister was inserted into the duckling's mouth to a depth of 40 mm. This core temperature was then recorded on a Yellow Springs Inc. telethermometer. Cotton gloves were worn to reduce heat transfer to the ducklings.

The ducklings were removed from the cold when they were unable to stand up, or after 30 minutes, and returned to their initial room temperature. Maintenance of the ducklings followed the procedure used by Cain (op. cit.).

RESULTS AND DISCUSSION

Temperature regulation.—Ducklings of this species apparently are unable to maintain a constant body temperature for several days after hatching (Fig. 1) when exposed to a low ambient temperature. The body temperature dropped rapidly (1.26° C per minute) for ducklings 1 day old and slowed as the age increased (0.50° C per minute for 6 day old ducklings). At 12 days of age the rate of cooling was 0.35° C per minute for 20 minutes and then the ducklings maintained a steady temperature of 32° C.

The slower rate of cooling for older ducklings may be due partly to an increase in metabolism (Cain, in prep.), a decreased surface to volume ratio as the duckling increased in weight, and the increased insulation afforded by the development of the juvenal down between 10–12 days of age (Cain, 1970). A similar cooling trend for nestling House Wrens