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Food Storing by Mexican Chickadees and Bridled Titmice

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Food storing is widespread but not universal in the Paridae. Worldwide, 14 species are known to store food (Sherry 1989). Two species, the Great Tit (*Parus major*) and the Blue Tit (*P. caeruleus*), are known not to store, or to do so only rarely. For the remaining 29 species, no information on food storing is available.

All but two of the North American chickadees and titmice are known to store food (Sherry 1989, Vander Wall 1990). For the Mexican Chickadee (*P. sclateri*) and the Bridled Titmouse (*P. wollweberi*), there are no previous records indicating whether or not they engage in food storing. We report here the first descriptions of food storing by these species.

The ranges of the Bridled Titmouse and Mexican Chickadee extend from southern Mexico to the mountains of southwestern New Mexico and southeastern Arizona. The range of the Bridled Titmouse continues slightly further north than that of the Mexican Chickadee. Between 22 January and 11 March 1991, birds were observed in the Chiricahua Mountains of southeastern Arizona, where Bridled Titmice are found primarily between 1,350 and 2,000 m in pinyon-oak-juniper forest. Mexican Chickadees are found primarily above 2,000 m in pine-oak-fir forest. The two species are occasionally found together where their habitats overlap.

Bridled Titmice were most commonly sighted in oaks (*Quercus arizonica*, *Q. emoryi*, *Q. hypoleucoides*) foraging on branch tips in flocks of two to eight individuals. Mexican Chickadees were found only where Douglas fir (*Pseudotsuga menziesii*) was prominent—most commonly in groups of two birds, but occasionally in groups of up to five—foraging on cones of Douglas fir. Ruby-crowned Kinglets (*Regulus calendula*), Brown Creepers (*Certhia americana*), and nuthatches (*Sitta carolinensis*, *S. pygmaea*) frequently were observed in close association with both species. Dark-eyed Juncos (*Junco hyemalis*) and Bushtits (*Psaltirparus minimus*) were often seen with Bridled Titmice. Neither Mexican Chickadees nor Bridled Titmice were observed storing food in the field, although storage by nuthatches associated with each species was observed on many occasions.

Between 21 February and 10 March 1991, 11 Bridled Titmice and 6 Mexican Chickadees were captured with mist nets. The birds were lured into the nets with recorded conspecific calls and calls of the Northern Pygmy-Owl (*Glaucidium gnoma*). An additional Bridled Titmouse was captured in a Potter trap baited with mealworms (*Tenebrio molitor*).

Birds were held in an outdoor aviary (7.6 m length × 4.6 m width × 2.4 m height), 1,620 m above sea level, that contained a small dead juniper (*Juniperus deppeana*) trunk, several oak branches (*Quercus emoryi*, *Q. arizonica*), Douglas fir branches with their cones, Mexican pinyon (*Pinus cembroides*) branches, and five feeding platforms. The birds were supplied with: water; insectivorous bird food; shelled sunflower seeds; mealworms; blobs of chunky peanut butter; fresh orange and apple pieces; and (sometimes) wax moth larvae (*Galleria mellonella*) and crickets (*Gryllus pennsylvanicus*). This variety of food types was provided to ensure that each species would find some offered types palatable. Since particular foods might be easier to attach to storage sites, it was important for food types to vary considerably in their consistency and size.

Observations were made by the first author, mostly in the morning between 0745 and 1000 (MST), but some observations were made later in the day (between 1430 and 1730). Fresh food was provided during observation times. The observer stood outside the aviary and recorded which food items were taken, and whether they were eaten or stored. A total of 9.5 h was spent observing birds in the aviary; the number of birds in the aviary changed from 2 to 18 over the course of these observations.

Both Mexican Chickadees and Bridled Titmice stored food in the aviary. Food items were always taken one at a time from the feeding platforms, and carried in the beak to one or more perches before they were either eaten or stored. Before storage, items were held against a perch with the foot and partially eaten or processed. In the case of wax moth larvae, the head was usually removed, and often the intestine was removed and discarded. Food was often carried for several minutes before the bird perched for a few seconds and pushed the food into a crack with the beak, or secured it to some other surface. Most items were stored in cracks on the trunk of the dead juniper, but one cricket was stored on the chicken-wire mesh of the aviary. Stored items were always partially visible. Some items were recovered promptly by the bird that cached them; the remainder were taken almost immediately by other birds. It was common for birds to attempt to steal a food item that another bird was carrying. No clear qualitative differences between the two species in caching behavior or cache pilfering were noted.

Table 1 summarizes the results of the aviary ob-

TABLE 1. Food items eaten and stored by Bridled Titmice and Mexican Chickadees (percent in parentheses).

	Meal-worms	Wax moth larvae	Peanut butter	Crickets
Mexican Chickadee				
Stored	0 (0)	7 (29)	0 (0)	2 (50)
Eaten	11 (100)	17 (71)	12 (100)	2 (50)
Bridled Titmouse				
Stored	0 (0)	2 (6)	0 (0)	0 (0)
Eaten	106 (100)	32 (94)	2 (100)	1 (100)

servations and includes a list of all of the food types taken. Wax moth larvae, mealworms, peanut butter and crickets were the only food items handled. Neither species stored mealworms or peanut butter, and only the Mexican Chickadee stored crickets. While both species stored wax moth larvae, the Mexican Chickadees stored 29% of those larvae handled, while the Bridled Titmice stored only 6%.

The Bridled Titmice took mealworms from the feeding platforms far more often than wax moth larvae, but ate mealworms rather than storing them. Storage by the titmice was not observed until wax moth larvae were supplied exclusively. Possibly the birds found the mealworms difficult to store on the substrates provided. Because both species were often observed to carry food items in their beaks for several minutes, they may have been motivated to cache, but unable to find a suitable site. While the occurrence of food storage in the aviary clearly demonstrates the capacity for this behavior, the conditions under which food storage occurs in Bridled Titmice and Mexican Chickadees in the field remain to be determined.

These results confirm that food storing is universal in the North American parids, which occur over a wide geographic range (from Alaska to southern Mexico and the Atlantic to Pacific coasts). Despite this broad geographic distribution their habitat require-

ments are very similar—principally forest and woodland (Dixon 1961). Allozyme analysis (Gill et al. 1989) of this genus has shown a substantial separation between the titmice (including the Bridled Titmouse) and the chickadees (including the Mexican Chickadee). The occurrence of food storing in all North American chickadees and titmice suggests that the behavior was present in the earliest North American representatives of these subgenera. Assuming that storing behavior evolved in the parid ancestors of both chickadees and the North American crested titmice, the maintenance of food storing in all North American parids indicates the continued selective advantage of the behavior.

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