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Cedar Waxwings (*Bombycilla cedrorum*) Observed Feeding on Flying Insects

Jan G. Reese

P.O. Box 298, St. Michaels, Maryland 21663
reesejan@ymail.com

Abstract: The frugivorous Cedar Waxwing (*Bombycilla cedrorum*) subsists most of year on a diet of fruit nutritionally rich in sugars, but during spring, replaces fruit with a substantial amount of protein-rich plant pollen and insect prey. Studies report waxwing pursuit of flying insects in flycatcher-like sallies, but details of the behavior are lacking or poorly described. I report here waxwings observed aerial feeding on swarming ants (Hymenoptera: Formicidae) The waxwings used short, ungraceful sallies, generally without turns, and landed on nearby branches as soon as possible. Feeding on swarming insects during March–June suggests an opportunistic behavior to replace a dietary requirement during a portion of the year when sugar-rich fruit are not available; however, reasons for the dietary change may not be fully understood.

Keywords: aerial feeding, *Bombycilla cedrorum*, Cedar Waxwing, *Prenolepis imparis*, swarming Winter Ants

The Cedar Waxwing (*Bombycilla cedrorum*) is one of the most frugivorous birds in North America, with fruit comprising 70–84% of its diet (Stiles 1984, Witmer 1996). However, during March–June when fruit is scarce or absent, their diet includes substantial amounts of insects and flower parts for reasons not clearly understood (Beal 1893, Witmer 1996). Most individuals glean insects from vegetation foliage, but several studies also report aerial sallies to capture flying insects (Crouch 1936, Bartlett 1956, Harlow 1971, Pinkowski 1976, McPherson 1987, Witmer 1996, Witmer et al. 2014). These sallies are likened to those of flycatchers, but give little or no definitive descriptions of the behavior. I give here a more comprehensive description of the behavior, the prey, and potential reasons for the seasonal change in the diet.

OBSERVATION

Walking from within a willow oak-loblolly pine (*Quercus phellos* L.-*Pinus taeda* L.) association forest (Brush et al. 1980) in St. Michaels, Talbot County, Maryland on 8 March 2016 at 1430 hours, with an ambient temperature of 18.3° C (69.4° F), a flock of 28 Cedar Waxwings suddenly landed on top of a leafless

sweetgum (*Liquidambar styraciflua* L.) at the forest edge directly in front of me. I quickly halted, becoming motionless.

Upon landing, individual waxwings flew down and dispersed throughout branches of the sweetgum and the interior of an approximately 10 m (33 ft) tall adjacent southern magnolia (*Magnolia grandiflora* L.). Magnolia leaves covered only the outer portion of the branches, thus the tree's interior was open except for the bare branches emanating from the trunk. Waxwings quickly flitted from branch to branch of the gum, but mostly within the shaded interior of the magnolia. They appeared to be chasing some minute flying prey.

I eventually caught glimpses of sparkling clear-wing movement of tiny flying insects that were the object of the waxwings interest. After visual acclimation to the lighting situation, I realized there were hundreds or possibly thousands of tiny insects flitting about, perhaps staging or swarming within the magnolia branches and foliage.

The method used by waxwings to capture flying insects in the tree interior took several forms. It began from a branch posture of nearly 45° where waxwings appeared to be visually trying to locate aerial prey in front of them. Birds then simply darted forward, snatched the insects in the air, and continued nearly straight-ahead to another branch within the tree's interior. Others darted forward to snap prey in the air, and then turned abruptly to return and land near or adjacent to the departure branch. Still others, perched near openings in the exterior foliage, used a similar method, i.e., they darted outside the foliage to snatch an aerial insect then came back within the tree interior on openings lower in the foliage to land on a bare branch.

Ungraceful short sorties ranged up to approximately 3 m (10 ft) both inside and outside the tree foliage. Near midair collisions suggest limited abilities and/or unfamiliarity with this type of feeding behavior. Birds were silent during the 25-minute feeding event throughout the interior of the tree, with activity descending within 2 m (7 ft) of the ground and/or the observer.

After the feeding activity ceased and the waxwings departed, I netted 20 of the tiny (~3 mm [~0.1 in] long) flying insects for later identification. I forwarded the specimens for identification to Samuel E. Droege and Eugene J. Scarpulla at the Bee Inventory and Monitoring Laboratory (BIML) at the United States Geological Survey's Patuxent Wildlife Research Center in Beltsville, Maryland, where the insects were determined to be male alate (winged) ants, mounted, and photographed (Figure 1). The ant specimens were forwarded for species identification to Maryland ant specialist Timothy Foard at i2L Research USA, Inc. (i2L) in Baltimore, Maryland where they were identified as Winter Ants, *Prenolepis imparis* (Say) (Hymenoptera: Formicidae: Formicinae).

Figure 1. Winter Ant, *Prenolepis imparis* (Say) (Hymenoptera: Formicidae: Formicinae). Alate male. Body length: ~3.0 mm (mean, median, and mode; n = 13; measured to closest 0.5 mm, mouth hypognathous). **Top left:** frontal view; **top right:** lateral view; **bottom:** dorsal view. Specimens collected by Jan G. Reese in St. Michaels, Talbot County, Maryland on 8 March 2016 and photographed by Samuel W. Droege on 19 July and 9 September 2016.

I returned to the magnolia tree at the same time on three subsequent balmy days, but never again saw the insects or waxwings.

DISCUSSION

Observed aerial feeding in mid-afternoon on a late winter day was synonymous with the warmest period of the day when flying insects are most likely active. Aerial feeding has been reported in other studies that also took place during the warmest part of the day, 1100–1700 hours, from mid-March to September (Bartlett 1956, Baird and Meyerriecks 1965, Harlow 1971, Pinkowski 1976).

Waxwing aerial feeding has been observed most often in June–July (Bartlett 1956, Harlow 1971, Witmer 1996). Many of these events took place over ponds and streams which had emerging stoneflies (Plecoptera) or mayflies (Ephemeroptera) (Crouch 1936, Bartlett 1956, Pinkowski 1976, Witmer et al. 2014), or at other insect mating swarms and dispersal of flying ants (Baird and Meyerriecks 1965, Muller and Berger 1965, Harlow 1971). All of these occurrences suggest opportunistic feeding. Beal (1893) believed waxwings consume some quantity of insects at all times if they are easily obtained. Beal's observation suggested opportunistic aerial feeding since it was done in late winter, earlier than other studies, and a plentiful crop of American holly (*Ilex opaca* Aiton) was within view of the observed aerial feeding. Similarly, a study of waxwing winter fruit preference in Norman, Oklahoma in 1984–1985 found American holly berries of low preference when notable consumption of insects started in March (McPherson 1987).

Other waxwing studies also describe slower and less graceful movements than flycatchers or other species (Harlow 1971, Witmer et al. 2014), shorter flights (Pinkowski 1976) seldom returning to the origin branch (Bartlett 1956), and disregard for close proximity of the observer (Crouch 1936). Conversely, one study reports frequent returns to the origin branch (Harlow 1971). Waxwings have been credited with "hovering" to harvest fruit (Witmer et al. 2014) and "fluttering" while pursuing flying prey (Bartlett 1956). It appears both of these behaviors could be an adventitious strategy in aerial feeding. I observed no hovering or fluttering. On one occasion however, a waxwing appeared to miss the intended flying prey, thrust its wings into a vertical position in order to stop forward movement while simultaneously snapping or grabbing for the prey a second time. The bird then lost altitude and forward momentum, suddenly dropped, repositioned its wings, turned, and landed on a convenient branch. This behavior may be related to the fluttering observed by Bartlett (1956). The spirit, agility, and lack of finesse in Cedar Waxwing aerial feeding may be related to limb proportions, wing-loading ability, feather and bill structure, visibility, or other morphological features in comparison to flycatchers (Fitzpatrick 1985, Norberg 1986, Witmer 1996, Warrick 1998).

Winter Ants are commonly found throughout the continental United States. Nests are usually located in damp soils of habitats such as forests, forest edges, fallow fields, and around buildings (Klotz et al. 2008, Ellison et al. 2012). The species is cryophilic and commences foraging with temperatures around 0° C (32° F), thus it is one of the first ants to become active early in the year with nuptial flights commonly occurring by March–April (Klotz et al. 2008). Colonies actively forage in late-winter to mid-spring and mid-fall to early-winter while aestivating during the warmer months (Fisher and Cover 2007, Klotz et al. 2008).

Alate ants comprised seven percent of all insects found in Cedar Waxwing stomachs collected in 1885–1950 (Beal 1893, Witmer 1996). Many of those ants appeared to belong to the genus *Camponotus* Mayr (Formicidae: Formicinae). In Wisconsin during 1958–1963, prey in nine incidences of aerial-feeding waxwings during 28 August–22 September involved *Lasius alienus americanus* (Foerster) (Formicidae: Formicinae) (Muller and Berger 1965). Similarly, 13 species of birds, including Cedar Waxwings, were identified aerial-feeding on *L. alienus* on 23 August 1961 in Massachusetts (Baird and Meyerriecks 1965).

Waxwings appear to function well and maintain body mass for extended periods during the year on a ripe fruit diet nutritionally rich in various sugars; however during spring, consumption of fruit diminishes for several weeks while being replaced by a substantial amount of high protein plant pollen and insect prey (Witmer 1996, Witmer et al. 2014). A total of 212 waxwing stomachs collected in 1885–1950, mostly from eastern North America, contained insects in April through November being most frequent during May–June (Beal 1893, Witmer 1996). Flower parts (stamens and petals) comprised 44% of the waxwings diet in May and insects 41% when fruit crops were at a low or not available (Witmer 1996, Witmer et al. 2014). These observations further support the notion that a March–June slack period of fruit availability leads to supplemental feeding of plant and insect protein to replace a dietary requirement in preparation for migration, reproductive activities, or until preferred ripe fruit are again plentiful in July.

For instance, a hypothesis suggests in the temperate zone, adult frugivorous species such as waxwings have evolutionarily switched to a largely protein diet during the reproductive season lessening pressure on plants to produce fruit during the early and/or shorter growing season (Morton 1973). Additionally, frugivorous nestlings fed a largely protein diet during this time fledge in a shorter period of time than those on a fruit diet, while the shorter nestling period also reduces predation risk for nestlings.

Witmer (2001) noted nutritional sugary fruit of European cranberrybush (*Viburnum opulus* L.) in New York persisted through the winter, to be eaten

primarily by waxwings in spring when other fruits were not available. The waxwings also ate at this time nutritional, protein-rich, male catkins of eastern cottonwood (*Populus deltoides* W. Bartram ex Marshall). Further investigation found secondary compounds in the pulp of aged cranberrybush fruit made it acidic. The study suggested that in spring, waxwings consume foods rich in protein to produce bicarbonates as a buffer to the acid in the dehydrated fruit. Thus, hypotheses and waxwing studies indicate the spring dietary addition of protein-rich foods is still not fully understood.

In summary, numerous studies report March–September waxwing aerial feeding on swarming insects. The behavior is believed opportunistic and/or to meet a dietary requirement at a time of year when fruit are scarce or not available. In this observation, waxwing aerial feeding was generally a slow, straight, short, ungraceful sally followed by a landing at the nearest convenient branch rather than returning to the origin branch. The prey was from a mating swarm of alated Winter Ants.

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"A Berry Good Day" by Ellen Lawler

Ellen painted this watercolor (the original is in color) of Cedar Waxwings in March 2017. For references, she used two photographs taken along the C & O Canal in Cumberland, Maryland, in October 2015.