

## Locale-specific sugar packet opening by Lesser Antillean Bullfinches in Barbados

Simon M. Reader,<sup>1,3,4</sup> Daniel Nover,<sup>2</sup> and Louis Lefebvre<sup>2</sup>

<sup>1</sup> Bellairs Institute of McGill University, Barbados, West Indies

<sup>2</sup> McGill University, Montréal, Canada

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**ABSTRACT.** Lesser Antillean Bullfinches *Loxigilla noctis* were observed opening packets of sugar on the grounds of a hotel on the west coast of Barbados. We presented closed sugar packets at 40 sites in 10 areas on the west coast, near the site where opening was originally observed, to determine whether the foraging behavior was locale-specific. Bullfinches only touched, opened, and fed from sugar packets at the original opening site, suggesting that the behavior pattern was specific to that location.

**SINOPSIS.** Individuos de *Loxigilla noctis* abren paquetes de azúcar en una área localizada de Barbados

Se observaron individuos de *Loxigilla noctis* abriendo paquetes de azúcar en un hotel de la costa oeste de Barbados. Para determinar si este patrón de forrajeo era específico de esta zona, colocamos paquetes de azúcar en 40 sitios repartidos entre 10 localidades de la costa cercanas al lugar donde observamos la conducta. Las aves de la zona del hotel fueron las únicas que abrieron los paquetes y se alimentaron del azúcar, lo que sugiere que el patrón de conducta es específico de la zona.

*Key words:* behavioral flexibility, foraging techniques, innovation, opportunism, social learning

Lesser Antillean Bullfinches are omnivorous, feeding on fruits, seeds, insects, and routinely visiting scraps of food left by humans (Pinchon 1964; Evans 1990; Dolman et al. 1996). Bullfinches will readily feed on dissolved sugar and fruit juice (Pinchon 1964; Webster and Lefebvre 2000), including leftover cocktails and syrup bottles, and have also been observed feeding from open sugar bowls (S.M. Reader, pers. obs.). In 2000, bullfinches on Barbados were observed opening an unusual food source, sealed paper packets of sugar. We describe here our observations of the behavior pattern, and experiments to determine whether the behavior pattern is locale-specific. Field observations of opening behavior in birds are of particular interest because they add ecological validity to the many captive tests that utilize opening of an apparatus.

The feeding behavior was first observed in the mid afternoon (14:45–15:45) on 16 May 2000 in the grounds of the Colony Club hotel

<sup>3</sup> Current address: Department of Biology, McGill University, 1205 avenue Docteur Penfield, Montréal, Québec, H3A 1B1, Canada.

<sup>4</sup> Corresponding author. Email: <simon.reader@mcgill.ca>

(grid reference 5547 5922), in the parish of St. James, Barbados. A bullfinch fed from a small hole in the flat side of a single-serving packet of white sugar (5.5 × 3.7 cm), removing the packet into a nearby bush after feeding for ca. 60 s. It was not possible to determine the sex of the individual involved, since male bullfinches on Barbados have a similar plumage to females, in contrast to the rest of the eastern Caribbean (Bond 1985; Evans 1990). To determine whether bullfinches were responsible for packet opening, a single packet (obtained from the hotel) was placed approximately 1 m from two observers. A bullfinch approached the packet within 30 s, and began pecking at the flat packet surface. After ca. 20 s, the finch had made a hole and began feeding on the sugar, occasionally widening the hole by pushing in the beak. The packet was removed for examination, and a second packet placed 0.3 m from the observers. The packet was moved by a bullfinch to a distance of 1 m after a period of 5–10 min, where the finch repeatedly turned the packet over, but did not make pecking attempts and eventually abandoned the packet. A second bullfinch, distinguishable from the previously observed birds by virtue of its smaller size, approached and opened the packet by pecking at

the flat surface. A larger bullfinch subsequently fed from this hole. Examination of the opened packets revealed a hole in each of ca.  $5 \times 2$  mm, of similar appearance to holes made by bullfinches in ripe fruit such as banana.

In total, four observations were made of bullfinches feeding from sugar packets on 16 May, with at least two different individuals observed opening the packets. One observation was made of an individual feeding from a packet opened by another. To our knowledge, this is the first recorded observation of this behavior pattern. Lefebvre et al. (1997, 1998) collected over 1800 reports of foraging innovation in birds from the published literature, and the only remotely similar cases we found in this database were Passeriformes and Piciformes exploiting hummingbird nectar feeders (Taylor 1972; Fisk 1973; Leck 1974; Fisher 1975; Martin 1977; Stokes and Stokes 1984, 1985; Beach 1988). On 24 May 2000 further observations of packet opening were made at the Colony Club hotel. Initially, brown colored packets of raw sugar were placed at the site, but after 35 min of observation only one finch had approached the packets and made a failed attempt to open them. We then placed the white packets of white sugar used by the hotel on the ground. Bullfinches were observed picking up, opening, and carrying the packets away. Bananaquits (*Coereba flaveola*) picked up the packets and fed on sugar which had fallen out of an opened packet, and a Zenaida Dove (*Zenaida aurita*) pecked at the same packet that a finch had recently contacted, as well as feeding on sugar it knocked out of an already opened packet.

To determine whether the sugar packet opening behavior was locale-specific or part of the usual bullfinch behavioral repertoire, we conducted a simple field experiment. We placed packets of sugar at a total of 40 sites, in 10 different areas in St. James, Barbados, and watched for any bird activity. We obtained sugar packets of a similar design and color to those used at the Colony Club hotel from Barbados Hotel Foods, St. Michael. We placed five packets in a row ca. 35 cm long at a variety of sites where finches had been recently observed. We observed each site for 20 min, from at least 5 m. We conducted half the observations in the morning and half in the afternoon to control for time of day. The study areas were, in the

morning, the grounds of the Colony Club hotel, the north of the Coral Reef Club hotel (grid reference 5551 5913), the south of the Coral Reef Club (5547 5910), the west of Bellairs Research Institute (5555 5905), and to the north of St. James' Church (5570 5888). In the afternoon of the following day, we tested at the following sites: the south of St. James' Church (5571 5881), the east of Bellairs (5567 5906), the east of the Coral Reef Club (5555 5911), the Colony Club, and the west edge of the Balmford estate to the north of the Colony Club (5542 5932). Grid references are the standard metric system for plotting precise locations in Barbados and many other nations (including Canada, Great Britain, and Australia). Grid references are typically split into three parts: the 100 km square in which they lie, the easting (a measure of longitude, read from the horizontal map edge), and the northing (a measure of latitude). Barbados is covered by one 100 km map square, so the first part of the grid reference is not required. The furthest study area was 500 m from the Colony Club sites.

At each of these 10 areas, two observers with synchronized stopwatches conducted tests at four sites simultaneously, so that if opening was observed at more than one site we could determine how many birds were involved. Conducting the four tests consecutively in the same area would risk attracting the same bird to each site in turn, producing a false picture of the opening activity in each area. It was unlikely that the same finches were observed in different study areas, since finches show very high site fidelity (Webster and Lefebvre 2001), and on each day the study areas were at least 50 m apart and visually isolated from one another. All the test sites were open to the public, but were chosen to be as free from disturbance and human traffic as possible.

In the experiments, finches only contacted and opened sugar packets at the Colony Club sites. In the morning session, rapid opening was observed at one site at the Colony Club. A finch picked up a packet after 148 s, carried it ca. 3 m, and opened and fed from the packet 156 s after the beginning of the trial. After 295 s a second finch chased away the opener and fed from the hole, and several other displacement incidents were observed. At another Colony Club site a finch touched, but did not open, a packet. In the afternoon testing ses-

sions, finches were observed contacting the packets at one site at the Colony Club study area, but no opening events were observed within 20 min (though a finch did open a packet 56 s after the end of one trial). At all other study areas, in both the morning and the afternoon, finches were observed near the sugar packets, passing within 5 cm, 15 cm and 75 cm at three sites, for example, but on no occasion did a finch approach, touch, or open the packets. Despite the small number of opening events observed, our finding that birds only touched and opened packets at the Colony Club site suggests that the behavior is highly locale-specific. A survey of hotels and restaurants in the local Hometown area determined that the Colony Club was the only open-air establishment serving sugar in packets. Two similar field experiments presented opened dishes of dissolved sugar (Webster and Lefebvre 2000) and closed boxes of seed (Webster and Lefebvre 2001) in two areas (Bellairs and St. James' Church) where we did not observe packet opening. Bullfinches readily approached both tasks, and opened the box at three of the 10 sites tested, suggesting that between-site differences in the willingness to approach novel objects or to avoid humans are unlikely explanations for our results.

The fact that birds did not open, or even contact, sugar packets in other sites suggests that birds at the Colony Club site have learned both to recognize the packets as a source of food and to open them. This localized behavioral variation may be the result of social learning from conspecifics, with birds perhaps learning as a result of feeding from previously opened packets or by observing other bullfinches opening packets. Alternatively, individuals may have learned through a process of "natural shaping" (Galef 1992) at the Colony Club site, perhaps feeding from abandoned human-opened sugar packets before learning how to open them for themselves. In Black-capped Chickadees (*Poecile atricapilla*), the rate of learning to open tubs of food or milk-bottles was increased in birds which encountered open food sources (Sherry and Galef 1984, 1990), and this is thought to be one of the processes responsible for the spread across mainland Britain of milk-bottle opening in tits (Fisher and Hinde 1949; Lefebvre 1995). This raises the possibility that the opening of sugar packets by

bullfinches may be socially learned by individuals taking advantage of the innovation of other birds. In Blue Tits (*Parus caeruleus*) a novel foraging behavior, nectar robbing from the flowers of the Crown Imperial, was restricted to two areas, even though flowers were available in nearby areas (Thompson et al. 1996). Thompson et al. (1996) argued that the fact that flowering coincides with nesting, when Blue Tits defend territories, might restrict the spread of nectar robbing to within a mating pair. Territoriality may also restrict the spread of the novel opening behavior in bullfinches. In our study, other bird species fed from the packets opened by bullfinches, which might suggest that social learning could facilitate spread of the use of a novel food source between species.

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