Novelty Responses in a Bird Assemblage Inhabiting an Urban Area

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Abstract

Neophobia, or the hesitancy to approach a novel food item, object, or place, is an important factor influencing the foraging behavior of animals. Environmental factors (e.g. rapid anthropogenic changes, migration into new habitats) are associated with novelty in feeding ecology and may affect neophobic responses. Mechanisms that underlie the differential neophobic response may involve complex interactions with the environment: post-fledging experience in a greater diversity of habitats or in habitats that are more complex may contribute to reduced neophobia. In a previous study, it was observed that some urbanized species, in particular house sparrows (*Passer domesticus*) and shiny cowbirds (*Molothrus bonariensis*) show high levels of neophobia. This study was carried out in a suburban marsh of *Cortaderia selloana*, a relatively simple and predictable ecosystem as compared to urban areas. For this reason, in the present study, we explored novelty responses of bird species inhabiting an urban area, representing a complex environment. The results were compared to those obtained previously in the suburban marsh. We found unexpectedly high levels of neophobia in house sparrows, but shiny cowbirds showed a somewhat neophilic response. In the presence of novel objects, house sparrows tended to enter the feeders alone, while shiny cowbirds tended to forage in groups. We found no differences in latencies to forage or in visit duration between habitat types, but the proportion of individuals that visited the feeders when novel objects were present was lower in the urban area for house sparrows and eared doves (*Zenaida auriculata*). The results are discussed in the context of invasion success and feeding innovation in shiny cowbirds.

Introduction

Animals vary in the flexibility of their foraging behavior (Webster & Lefebvre 2001). Behavioral flexibility is a critical attribute as individuals that can vary their behavior will respond much more rapidly than others when confronted with a changing environment or new ecological opportunities (Reader 2003). Both colonization of new areas and exploitation of new foraging opportunities may be limited by behavioral inflexibility, because individuals with an increased behavioral flexibility would readily recognize and hence utilize unfamiliar resources (Martin & Fitzgerald 2005). Animals can be attracted to (neophilic), deterred by (neophobic), or indifferent to unfamiliar stimuli. Neophobia, the fear of novelty, is an indicator of an animal's internal state of risk perception as well as its propensity to take risks (Mettler & Shivik 2006). Greenberg (1983) suggested that variation in hesitance to approach novel objects may

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produce variation in foraging specialization, because an increase in neophobia will reduce the number of microhabitats that a bird will explore for food (the 'neophobia threshold hypothesis'). In general, behaviorally flexible species are more willing to explore novel objects or situations that neophobic species might avoid (Greenberg & Mettke-Hofmann 2001). Therefore, more specialized species will remain specialized because of a higher level of neophobia, and reduced neophobia should be a characteristic of generalists (Greenberg 2003). However, the traditional view of the adaptive value of neophobia established that the primary function of neophobia is to protect animals against unknown potential dangers from unfamiliar stimuli ('the dangerous niche hypothesis', Barnett 1958; in Greenberg 2003) rather than to maintain foraging specialization (Greenberg 2003), particularly if toxic foods or predators characterize the environment (Sabbatini et al. 2007). However, while neophobia may reduce exposure to danger, it can also limit explorative behavior and constrain exploitation of novel resources, learning and innovation (Stöwe et al. 2006a). Differential neophobic responses within and between bird species have been subject of several studies. Mettke-Hofmann et al. (2002) found that neophobic reactions in parrots were related to some ecological variables (e.g. species feeding on insects appeared to be more neophobic) and Greenberg (1983, 1984, 1990) found that differences in neophobia were related to the ecological plasticity of the species. Social environment may also facilitate the approach to novel foods or objects because the presence of group members may reduce the stress of being alone (Greenberg 1990; Cadieu et al. 1995) and under some circumstances it would be safer to exploit the experiences of other conspecifics and to learn about the palatability of novel items socially (Stöwe et al. 2006a; Voelkl et al. 2006). Furthermore, Greenberg (1989) suggested that the mechanisms that underlie the differential neophobic response involve complex interactions with the environment: having post-fledging experience in a greater diversity of habitats or in habitats that are more complex contributes to reduced neophobia. Environmental factors such as the appearance of new food types, seasonal changes in vegetative structures (e.g. fruits and flowers), rapid anthropogenic changes, and migration into new habitats are associated with novelty in feeding ecology and may affect neophobic responses (Greenberg & Mettke-Hofmann 2001). Echeverría et al. (2006) found that some urbanized species inhabiting suburban marshes of pampas grass (*Cortaderia selloana*), in particular house sparrows (*Passer domesticus*) and shiny cowbirds (*Molothrus bonariensis*), display higher levels of neophobia than more specialized species (e.g. great pampa finch, *Embernagra platensis*; warbling finch, *Poospiza nigrorufa*). This study was carried out at Mar de Cobo [population 249 (Census 2001)], a small village located 30 km north of the city of Mar del Plata (Buenos Aires province, Argentina) and in the vicinity of suburban pampas grass marshes.

The house sparrow, indigenous to Europe, Asia, and northern Africa, has been successfully introduced into South America and is now perhaps the most widely distributed avian species (Anderson 1994). Martin & Fitzgerald (2005) observed weaker neophobia in an actively invading population of house sparrows (28 yr of residency; Colon, Republic of Panama) compared to a population that had been resident for more than 150 yr (Princeton, NJ, USA). In Argentina, the introduction of house sparrows probably occurred around 1872 in the city of Buenos Aires. In 1898, they were observed 200 km south of Buenos Aires, possibly arriving at Mar del Plata around 1915 (Bernal de Pereyra 1923). It is possible that house sparrows established themselves first in Mar del Plata (founded in 1874) and only later appeared at the more recently founded Mar de Cobo (founded nearly 1960). On the other hand, the shiny cowbird is an obligate brood parasite native to South America that uses a generalist strategy in host selection (Wiley 1988; Sackmann & Reboreda 2004) and is nowadays widely distributed in Central and South America.

These opportunistic-generalist birds are usually associated with urban and suburban areas, and they use a wide range of microhabitats (Canevari et al. 1991). The village of Mar de Cobo, the site of a previous study of equal design, is a relatively pristine habitat with a predominance of natural marshes and slightly human-modified areas. This suburban area most likely represents a simpler environment as compared to urban areas. Higher levels of aversion in generalist, urbanized species to novel objects may be the outcome of their post-fledging development in a relatively simple and predictable ecosystem. For this reason, the aims of this study were to evaluate novelty responses of bird species inhabiting an urban environment and to assess the influence of habitat complexity on aversive responses. We hypothesized that avian neophobic responses are weaker in an urban setting, due to the urban environment's complexity and unpredictability, than those exhibited in a simpler and more predictable environment, like a natural marsh.

Methods

Study Area

The study was carried out at Mar del Plata city, Buenos Aires Province, Argentina [38°0′S 57°33′W, population 541 733 (Census 2001)]. We conducted experiments between Jul. and Aug. 2006. We chose six sites in four different areas (three sampling sites were located in urban gardens and three were located at Pueyrredón Park, a city park). Distances between sites were >100 m, to decrease the probability of repeated sampling of territorial birds.

Experimental Procedures

We compared the responses of individuals of different avian species during trials when one novel object was placed near a feeder (treatment) with those of individuals in control trials without the novel object near the feeder (control). The objects included yellow 12 × 12 × 10 cm boxes, a 20 × 4 cm purple tube and a small clump of metallic golden paper garlands (40 cm in length), which were identical to objects used in Echeverría et al. (2006). A control trial involved rotating the food dish and touching the food, while a novel object trial involved rotating the dish, touching the food and placing one of the three objects near the feeder. The distance between the novel object and the dish was 2 cm from the edge of the feeder. We established one feeding station per site that consisted of a PVC dish with a 20 cm diameter. The feeders were not removed during the experiment and were replenished with 1 kg of a mixture of seeds and balanced food [three parts wheat, one part cracked corn, ½ part canary seed, ½ part millet and ½ part balanced food for birds (BoosterMix Aves, Alimental S.A., Argentina)] every 2 d during the first month prior to the experiment.

Neophobia Test

We conducted three matched pairs of neophobia trials on different days at each of the sites [one trial per day for each site, during 6 d: three controls (C) and three treatments (T)]. Treatment and control trials were alternated during successive days; the first trial (C or T) was randomly selected. We presented a 1 kg patch (20 cm in diameter) of mixed food at the sampling site at the beginning of each session and recorded different behavioral variables to assess the degree of aversive response of birds to novelty for 20 min. Sessions were video-recorded for subsequent analysis in the laboratory. The video camera was positioned 5 m away from the feeder, whereas the observer, visible, was 30 m away from the feeder. The variables used were: (1) latency to feed from the dish (in seconds); (2) visit duration (in seconds); and (3) effective number of visits to the feeder (EV), which was expressed as a ratio (total number of individuals visiting the feeder/total number of individuals arriving in an area with a radius of 10 m centered on the feeder; see Echeverría et al. 2006). We also registered group size per species when coming close to the feeder (within 10 m), and number of birds of each species that were feeding at the same time. Birds were given a maximum of 20 min to enter the sampling area and feed from the dish. A failure to forage from the dish was scored as a latency of 1201 s.

For each species, the experimental results were based on the summed response of free-living individuals at the different sites. We are confident that the data for each species are not strongly influenced by the behavior of a few birds, because many different individuals made visits to the feeders. Data obtained in a previous study performed in a suburban marsh (Echeverría et al. 2006) were used to assess the influence of habitat complexity on novelty responses of birds.

Statistical Analysis

We evaluated the response to novel objects at two levels: individuals and species. For evaluation at the individual level, intraspecific differences in the latency to forage and visit duration between control and treatment trials were compared using a Mann–Whitney *U*-test and differences in the effective number of visits were compared using χ^2-tests (Zar 1999). We used the mean of the three trials to reduce effects due to object quality and due to the presence/absence of shy/bold individuals during trials. For evaluation at the species level, interspecific differences were investigated using two variables: the difference between control and experimental trials as a measure of the change in behavior that was caused by the novel objects (strength of the novelty response) and the absolute values, which reflected which species were less reluctant to enter the feeder. The variables were evaluated using a one-way ANOVA on ranks (Zar 1999). When significant differences were detected, we used an *a posteriori* Dunn's test to discriminate medians (Zar 1999). Interspecific differences between house sparrows and shiny cowbirds in visit duration were analyzed using the variable 'change in visit duration' (difference between control and experimental trials) as a measure of the effect of the presence of novel objects. Eared doves (*Zenaida auriculata*) were excluded from the visit duration comparison because this species visited the feeders only two times when novel objects were present. For this reason, we used a Mann–Whitney *U*-test. Interspecific differences in the group size around the feeders and number of birds feeding at the same time during treatment trials were explored using a one-way ANOVA and *a posteriori* tukey test.

Differences between habitat types (urban area vs. suburban marsh) in the strength of the novelty response (e.g. differences in the latency to forage between control and treatment trials) and the change in visit duration were analyzed using a Mann–Whitney *U*-test, where the grouping variable was the habitat type. Again, eared doves were excluded from the analysis, because this species only visited the feeders two times during the entire experiment. Furthermore, differences in the effective number of visits between habitats were compared using χ^2-tests.

Results

General Results

The feeders were visited by two passeriformes species: shiny cowbirds and house sparrows; and by two columbiformes species: spot-winged pigeons (*Patagioenas maculosa*) (only during control trials) and eared doves. We observed two other passeriformes species in the surrounding area, great kiskadees (*Pitangus sulphuratus*) and rufous horneros (*Furnarius rufus*), but these species showed a maximum latency to forage from the dishes (they did not approach the food dish within the 20-min duration of each trial).

The group size around the feeder per species differed among species (one-way ANOVA; $F_{2,150} = 8.05$, $p < 0.001$). House sparrows were more numerous than eared doves and shiny cowbirds ($p < 0.001$, Tukey *post hoc*) (Table 1). During some trials, we observed mixed flocks coming close to the feeders (within 10 m). These groups were highly variable in composition, and the proportion observed most often was eight house sparrows:two shiny cowbirds:one eared dove. Scrounging attempts close to the feeders were not observed. The number of birds feeding at the same time during treatment trials showed significant differences between house sparrows and shiny cowbirds (one-way ANOVA; $F_{1,11} = 7.10$, $p < 0.05$). Shiny cowbirds tended to forage in groups and house sparrows tended to enter the feeders alone (Table 1).

Table 1: Group size per species during neophobia tests

Species	Group size around the feeder (10 m)*	Feeding at the same time	
		Control	Treatment
House sparrow	5.12 *6.42* (81)	5.02 *7.17* (46)	1.25 *0.46* (8)
Shiny cowbird	2.08 *0.91* (25)	2.00 *0.58* (13)	2.20 *0.84* (5)
Eared dove	4.70 *4.84* (47)	4.33 *3.42* (20)	1

Number of individuals around the feeder in an area with a radius of 10 m centred on the feeder, and individuals feeding at the same time are showed.
Data: Mean, *standard deviation* and N (feeding events in which the number of individuals feeding at the same time was measured).
*Values from control and treatment were pooled for each species because of no significant differences ($F_{2,147} = 0.05$, $p > 0.05$).

Response to Novel Objects

Intraspecific comparisons

We assessed the novelty response of each avian species that used the feeders during control and treatment trials. The parameters considered were latency to forage from the feeder and visit duration. Overall, we found that the presence of novel objects discouraged visitation to an otherwise attractive food source. The latency to forage from the dish was significantly higher during experimental trials for eared dove ($U_{52,60} = 101.00$, $p < 0.001$), shiny cowbird ($U_{19,7} = 19.50$, $p < 0.01$) and house sparrow ($U_{118,115} = 1245.00$, $p < 0.001$) (Fig. 1a). Visit duration was significantly higher during experimental trials in shiny cowbirds ($U_{28,12} = 91.00$, $p < 0.05$), whereas house sparrow showed no statistical differences for this variable ($U_{64,15} = 462.50$, $p > 0.05$) (Fig. 1b). The objects were not manipulated or pecked by birds during treatment trials.

Interspecific comparisons

We investigated the interspecific differences in the novelty response using the strength of novelty response and the absolute values in latency to forage and visit duration as variables (see Statistical Analysis). Eared doves showed a stronger novelty response in the latency to visit the feeder than house sparrows and shiny cowbirds (one-way ANOVA on ranks, $H_2 = 140.12$, $p < 0.001$; Dunn's test, $p < 0.05$).

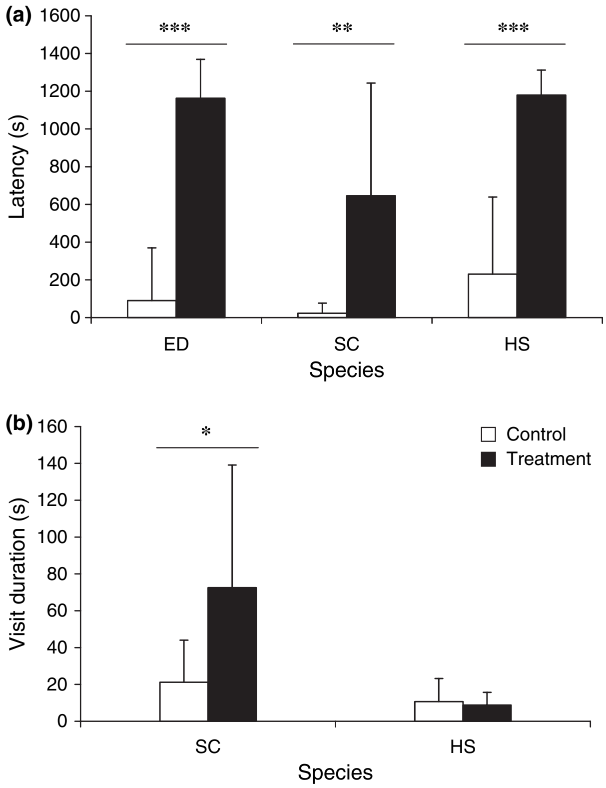

Fig. 1: (a) Latency to feed from the dish and (b) visit duration of eared dove *Zenaida auriculata* (ED), shiny cowbird *Molothrus bonariensis* (SC) and house sparrow *Passer domesticus* (HS), during control and experimental trials. p: *<0.05, **<0.01 and ***<0.001.

Shiny cowbirds were less reluctant to enter the feeders in presence of novel objects than eared doves and house sparrows (one-way ANOVA on ranks, $H_2 = 65.30$, $p < 0.001$; Dunn's test, $p < 0.05$) (Fig. 1a). Shiny cowbirds visited the feeders longer than house sparrows when novel objects were presents ($U_{12,\ 15} = 27.50$, $p < 0.001$) and the effect of the presence of novel objects on visit duration was stronger in shiny cowbirds than house sparrows ($\bar{x} \pm SD_{shiny\ cowbird} = 59.34 \pm 58.85$; $\bar{x} \pm SD_{house\ sparrow} = 5.19 \pm 4.55$; $U_{12,\ 15} = 20.00$, $p < 0.001$).

Habitat Comparison

We evaluated the effect of inhabiting a more complex habitat on the novelty response displayed by eared doves, shiny cowbirds and house sparrows using the strength of the novelty response in the latency to forage and visit duration and the effective number of visits as variables (see Statistical Analysis). We found no difference in the strength of the novelty response between habitat types for any of the species under study, neither in the latency to visit the feeder (eared dove $U_{3,60} = 64.00$; house sparrow $U_{10,115} = 460.00$ and shiny cowbird $U_{12,7} = 32.00$; all species $p > 0.05$) nor in the visit duration (house sparrow $U_{17,15} = 105.00$ and shiny cowbird $U_{6,12} = 22.00$; both species $p > 0.05$). However, the comparison between the urban area and the suburban marsh showed that the effective number of visits to the feeder (total number of individuals visiting the feeder/total number of individuals arriving in the area surrounding the feeders with a radius of 10 m) was lower in the urban area for house sparrows and eared doves (Fig. 2). Shiny cowbirds showed both a higher effective number of visits to the feeder than eared doves and house sparrows in both habitats, and no statistical differences between habitat types in the behavioral response (Fig. 2).

Discussion

This study was performed to evaluate novelty responses of bird species inhabiting an urban environment and to assess the influence of habitat complexity on aversive responses. We found that some bird species did not use the feeders (great kiskadees and rufous horneros), even though they were present in the area, and despite their partially granivorous diet (Canevari et al. 1991). This may be explained by an extreme degree of aversion toward novel situations (in this case the feeder with or without novel objects), or because they prefer a different food presentation. On the other hand, spot-winged pigeons foraged from the dishes only when novel objects were absent, and eared doves visited the feeders only two times when novel objects were present. These results, together with the consistently aversive responses of the eared doves across different types of environments, is in accordance with previous studies where, in general, columbiformes showed stronger aversive responses in the presence of novelty, lower innovation rates, and lower performance in learning and cognition compared with passeriformes (see Webster & Lefebvre 2001). Finally, eared doves, shiny cowbirds and house sparrows entered the feeders in presence as well as in the absence of novel objects. The house sparrow and the eared dove displayed neophobic reactions as indicated by longer latencies to forage from the dishes in the presence of a novel object. An urban environment such as Mar del Plata is most likely characterized by a greater diversity of novel stimuli as compared to suburban and more pristine habitats.

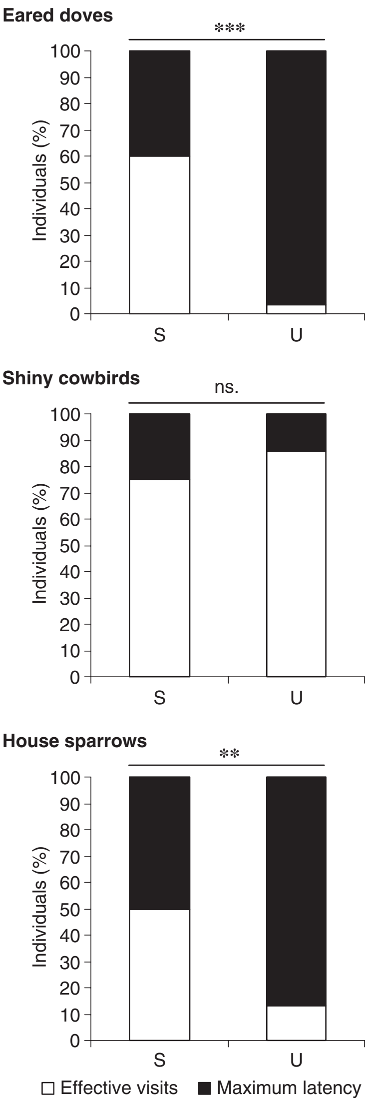

Fig. 2: Differences between habitats in the percentage of individuals visiting the feeder (effective visits) compared to the total number of individuals arriving in the surrounding area (an area with a radius of 10 m centered on the feeder). Individuals arriving in the area but not entering the feeder were assigned a maximum latency of 1201 s. S, suburban area; U, urban area; p: **<0.01 and ***<0.001; ns, non-significant.

In conjunction with the high aversive response observed in a suburban environment, the results from this urban study suggest that house sparrows and eared doves show a strong neophobic response, irrespective of whether the post-fledging experience of the individuals involves habitats with low or high levels of complexity (e.g. suburban marsh vs. urban green space). Furthermore, the lower proportion of house sparrows and eared doves visiting the feeders during treatments at the urban area suggests that these species have a stronger aversive response in more extensively human-modified areas. These results confirm the importance of studying habitat complexity. Thorpe (1956) suggested that the variation in the initial novelty response is influenced by stimulus complexity and the degree of discontinuity from the familiar background objects. In predictable environments (e.g. a natural marsh), one might expect that an artificial object (e.g. a colored box) acts as a strong novel stimulus, whereas in a complex environment, the same object should be less conspicuous or unfamiliar, because the stimuli present are more complex and unpredictable. This should occur when the response is differentially directed at new objects. However, the unfamiliar object possesses intrinsic traits that influence the novelty response, and the overall response may be stronger in more complex habitats because of the sum of effects due the fear and hesitance promoted by the stimuli present around the study site. A novel space or a novel object can hide some danger (Mettke-Hofmann et al. 2006), and the perception of risk in habitats that change rapidly might be higher than in homogeneous and predictable habitats.

On the other hand, the shiny cowbird displayed both neophilic (longer visit durations in presence of novel objects) and neophobic responses (longer latencies to forage from the feeder when novel objects were present) at the present study. This result supports the idea that the relationship between neophobia and neophilia may be more complex than has been thought (Heinrich 1995; Greenberg 2003). For example, some of the most innovative taxa (corvids and psittacines) show both neophobia and neophilia, leading to a complex but strong novelty response (Greenberg & Mettke-Hofmann 2001). Moreover, the response displayed by shiny cowbirds inhabiting a suburban marsh was different from that observed in an urban area. In the suburban marsh, there were no statistical differences between control and treatment for these variables, i.e. there was a lack of neophobic response (Echeverría et al. 2006). This result indicates that for this species, the level of environmental complexity encountered during the post-fledging experience may have an effect on novelty responses. Greenberg (1992) studied the novelty response of two sparrow species (song sparrow, *Melospiza melodia* and swamp sparrow, *Melospiza georgiana*) reared under identical conditions in aviaries, and he found that juveniles of the more specialized species (swamp sparrow) were less neophobic than the more generalist one (song sparrow), but the opposite was found in experiments performed in the wild (Greenberg 1989). He argued that juvenile swamp sparrows reared in a simpler, more predictable and consequently safer environment may not require the protection of an aversion to novelty. This contrasting response suggests that the context of the novel situation plays an important role in determining the strength and direction of aversive responses: sometimes it pays to be aversive and sometimes not. The value of information associated with food resources should be the highest in a moderately variable environment, as suggested by Winkler and Leisler (1999), and neophilia (or weak neophobia), exploration, and propensity to take risks may be advantageous in a moderately variable environment, leading to a high increase in knowledge. Therefore, environmental uncertainty is of particular concern in understanding an animal's novelty responses. Longer visit duration in shiny cowbirds might be related to longer exploration of the objects or longer vigilance events interspersing feeding bouts (Beauchamp 1998), because the information provided in more complex environments might be greater than in simpler environments. Thus, a neophilic response might be better to obtain more information related to the food resource. In the case of house sparrows, a neophobic reaction suggests a higher perception of risk in complex environments, especially in human-inhabited areas.

Another point to be considered regarding species differences is group size, a feature which may affect neophobia and exploration in birds (Coleman & Mellgren 1994; Stöwe et al. 2006a,b). On the one hand, group size around the feeder per species was different among species: house sparrows outnumbered eared doves and shiny cowbirds. It should be noted that species flock size in some instances could be greater in Mar del Plata city than the values reported in Table 1 (A. I. Echeverría and A. I. Vassallo, pers. obs.). However, the point here is that during experimental trials shiny cowbirds tended to forage in groups while house sparrows visited the feeders alone, a fact that might explain the relatively lower neophobic response observed in the former species. Stöwe et al. (2006a) found that ravens (*Corvus corax*) were quicker to approach novel objects when tested alone than when tested with conspecifics. However, they spent more time close to and manipulating the novel objects in the social conditions (dyadic and group situations) than when being alone. In red-billed weaverbirds (*Quelea quelea*), neophobia decreased in larger groups and allowed individuals quicker access to food patches (Lazarus 1979). Individuals with stronger neophobia might be less explorative and can benefit during novel foraging situations by the association with a neophilic or more explorative species, as the exploration of novel situations or resources may have associated costs (e.g. costs of time and energy, predation risk, physiological costs). Interspecific comparisons indicated longer and rather similar latencies to forage from the feeder during experimental trials for eared doves and house sparrows, as well as differences between the latter species and shiny cowbirds, which showed relatively shorter latencies during treatments (Fig. 1a). Mixed species groups composed by house sparrows, shiny cowbirds and eared doves are common in the city of Mar del Plata (Results, see also Leveau & Leveau 2005) suggesting that the difference in neophobia can play a critical role during the utilization of novel resources, because mixed-species foraging aggregations confer advantages that can be greater than those of monospecific groupings (Griffin et al. 2005). Specifically, such an advantage may be conferred if one of the species is less aversive, as is the shiny cowbird in comparison to the house sparrow and the eared dove, because high levels of fear may lead to neophobia and low levels to exploration (Halliday 1996; in Mettke-Hofmann et al. 2002). In one instance, during a treatment trial, we observed a mixed flock composed of three shiny cowbird and nearly 13 house sparrows arriving near the feeder. After few minutes, two shiny cowbirds visited the feeder and pecked the seeds. Interestingly, a few seconds later, several house sparrows visited the feeder and fed in most instances alone and occasionally in groups composed of two individuals. No agonistic interaction was observed between the birds. The existence of some type of producer–scrounger relationship (see, for example, Beauchamp 2001) in mixed groups of house sparrows and shiny cowbirds deserves further examination.

The shiny cowbird is a native species of tropical South America, and the Caribbean and Argentinean populations are expanding their ranges (Jaksic 1998), while house sparrows, a palearctic species, was first introduced into South America in Buenos Aires, Argentina, in 1872 (Jaksic 1998). The response of species commensal with humans may vary according to the time elapsed from colonization of the habitat (see Martin & Fitzgerald 2005). The shiny cowbird not only is expanding its range but also is acquiring new foraging habits. Isacch (2003) reported a feeding innovation in which the birds feed on the nectar of flax (*Phormium tenax*) flowers, a plant used frequently as an ornamental plant in Mar del Plata. A recent study (May & Reboreda

2005) showed that shiny cowbirds can learn socially novel foraging behaviors from both conspecific and heterospecific demonstrators. The authors suggested that they learn from heterospecifics with which they share roosts and foraging flocks as readily as they do from conspecifics. The acquisition of a behavioral innovation together with the expansion of the distributional range is compatible with the somewhat neophilic response observed during this study. On the other hand, the house sparrow is a widely distributed bird, with an opportunistic diet and habitat use, suggesting a high behavioral flexibility. However, it has been argued that species commensal with humans (e.g. house sparrows, shiny cowbirds and eared doves) may be both attracted to novelty and initially fearful as a way of protecting themselves in the dangerous niche they inhabit (Greenberg & Mettke-Hofmann 2001). Further tests, performed in diverse habitats and niches will be of importance to explore the paradox of neophobia in ecologically plastic species.

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