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Do apprehended saffron finches know how to survive predators? A careful look at reintroduction candidates

Luisa Mascarenhas Ladeia Dutra[a], Robert John Young[b], Conrado Aleksander Barbosa Galdino[a], Angélica da Silva Vasconcellos[a,*]

[a] Programa de Pós-graduação em Biologia de Vertebrados, Pontifícia Universidade Católica de Minas Gerais, Av. Dom José Gaspar, 500, Prédio 41, Coração Eucarístico, Belo Horizonte, Minas Gerais CEP 30535-901, Brazil
[b] School of Environment and Life Sciences, University of Salford Manchester—The Crescent, Salford M5 4WT, United Kingdom

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ABSTRACT

Wildlife trafficking is a major factor contributing to the reduction of biological diversity. In Brazil, trafficked animals are apprehended by environmental agencies and released in the wild. The maintenance of wild animals in captivity may jeopardize their survival in the wild, for example, by reducing their ability to recognize a predator. Saffron finches (*Sicalis flaveola*) are among the most trafficked Brazilian birds. Twenty-eight apprehended saffron finches were submitted to Temperament and Predator-recognition tests, with presentation of predator and non-predator models: a live and a taxidermised hawk, a taxidermised armadillo and a Lego cube. The captive saffron finches have retained general anti-predator responses, such as increasing alertness, avoiding back-facing and keeping distance when presented with potential predators. The birds responded more strongly to the live hawk than to the cube. Although some responses to the other stimuli were not statistically different from each other, a decrease in intensity of response with the decrease in threat level was remarkable. We found no relationship between temperament traits and responses to predators: a possible consequence of husbandry practices in captivity. Our results indicate saffron finches may retain basic anti-predator responses in captivity, which favours release and reintroduction programmes: information relevant for conservation management.

1. Introduction

Wildlife trafficking is considered the third largest illegal activity in the world (Destro et al., 2012). The extensive removal of animals from their natural habitats for trafficking or illegal breeding creates enormous challenges for governmental wildlife protection agencies as it contributes to biodiversity loss and, ultimately, to species extinction (Licarião et al., 2013; Primack and Rodrigues, 2001). Passerines are the most caged birds in the world and at least 2 million of them are involved in the global market annually (RENCTAS, 2001).

In Brazil having birds as pets is common; however, these animals are mostly captured in the wild (Sick, 1997) or illegally bred and sold. Birds are the most confiscated animals by Brazilian environmental agencies, corresponding to 82% of the rescues from animal trafficking and illegal captive breeding (Pagano, 2009). These animals, after apprehension, are released in the wild, however, for most species there is no data on how successful these procedures are.

One factor that compromises the success of release and reintroduction programs is the loss of individuals due to predation (Teixeira et al., 2007; van Heezik et al., 1999). Captivity-reared birds were reported as showing fewer adequate responses to predators than their wild counterparts (Ratanen et al., 2010; Robertson and Dowell, 1990), and for this reason, conservation biologists have included anti-predator training among the pre-release procedures (Griffin et al., 2000; van Heezik et al., 1999). According to the Normative Instruction no. 23 from the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA), before being released, traffic-rescued animals must undergo behavioural analysis to evaluate their capacity to survive in the wild, including their responses to predators. Such tests would indicate whether an individual could be immediately released into its natural environment or, otherwise, whether it has to be assigned to a training program (Brasil, 2008). However, up to now, there is a lack of guidelines for testing and training these animals as required.

* Corresponding author. Fax: +55 3133194269.
E-mail addresses: angelicavasconcellos@gmail.com, angelv@usp.br (A.d.S. Vasconcellos).

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Relaxed predation pressures may lead to epigenetic processes—which facilitate the rapid fixation of environmentally adaptive phenotypes and favour fitness in the wild (Ledón-Rettig et al., 2012), but in captivity these may affect the animals' predator-recognition abilities. If the wild population of a certain species contains the necessary genetic variation for rapid adaptation to captivity, in one or a few generations, we will observe a rapid, epigenetically based fitness reduction (Christie et al., 2012). Robins (*Petroica australis*) translocated to an island without predators had their predator-recognition abilities weakened within one generation (Jamieson and Ludwig, 2012). Wild primates that were constantly observed by humans suffered fewer leopard predatory attacks and consequently reduced their vigilance behaviour (Isbell and Young, 1993), and released grey partridges (*Perdix perdix*) spend more time feeding than wild ones (Rantanen et al., 2010), probably a result of the constant availability of food in the rearing pens, which compromises individual alertness to predators. This makes pre-release behavioural evaluation vital for animals that have been living in captivity.

The temperament of wild animals has been shown to have an influence on their ability to survive in the wild (McDougall et al., 2006). Personality (i.e. temperament, individuality) is defined as a behavioural pattern of an individual that is consistent over time and across situations (Gosling, 1998).

A behavioural pattern covers numerous aspects, such as aggressiveness (being an individual's agonistic reaction), sociability (the individual's reaction to the presence or absence of conspecifics), exploration-avoidance of novelty and shyness–boldness (Réale et al., 2007). The shyness–boldness aspect has been defined as the tendency of an animal approaching an unfamiliar object or situation and, thereby, taking risks. It has been measured in wild captive animals using indexes such as the Boldness Score (Azevedo and Young, 2006; Bremner-Harrison et al., 2004). Regardless of how they are maintained, personality differences have significant evolutionary and ecological consequences (Dall et al., 2004). In birds, some anti-predator responses have been shown as correlated to personality traits, such as activity level and exploration (Jones and Godin, 2010). Bremner-Harrison et al. (2004) found that bold swift foxes (*Vulpes velox*) had higher mortality rates than shy individuals upon reintroduction, indicating the personality of captive animals can be decisive for their survival after release into the wild. Although several studies have shown that temperament is associated to anti-predator, foraging and exploratory behaviours (e.g., Gosling, 1998; Jones and Godin, 2010; McDougall et al., 2006), many of these associations remain unexplored in release settings.

Saffron finches (*Sicalis flaveola*) are the most confiscated animals by Brazilian environmental agencies (Souza et al., 2014). The species is widely distributed throughout Brazil, and is usually found in open grassland areas with scattered trees (Sick, 1997). Herein we addressed the predator recognition abilities of *S. flaveola* and the effects of individual temperament upon their behavioural responses to predators. We hypothesized that, as the study animals were living in captivity, under relaxed predation pressures, they would not recognize their predators, fail to perform differential behavioural responses to predator and non-predator stimuli, and the personality of individuals would affect their behavioural responses to the models.

2. Methods

2.1. Animals, housing, and maintenance

This study was conducted in accordance with the Animal Ethics Committee of the Pontifical Catholic University of Minas Gerais, process no. 0041/2013, and with the ethical guidelines published by the International Society for Applied Ethology (ISAE, 2002). Data were collected between September and November 2013 in Belo Horizonte, Minas Gerais, Brazil. Our sample comprised 28 saffron finches obtained from IBAMA/Wild Animal Triage Center—CETAS of Belo Horizonte, kept in captivity and managed according to CETAS instructions. Although IBAMA/CETAS do not have precise data on the origins and captivity time of the animals, because these animals were apprehended from trafficking, their estimates for the saffron finches' time in captivity are about two years. The saffron finches were kept and tested as mixed-sex pairs in 120 × 30 × 40 cm cages containing six perches, set in three different horizontal positions, 20 cm distant from each other, as instructed by CETAS. The animals were fed daily with grain mixture for birds containing birdseed, millet, barley, fruits and vegetables. Food and water were offered ad libitum. After the experiments, the animals were returned to CETAS as per legal requirements.

2.2. Experimental procedures

Based on ad libitum pilot observations, an ethogram was constructed (Martin and Bateson, 2007). Following Bremner-Harrison et al. (2004), the observed behaviours were classified as "Cautious" or "Bold" (Table 1). To test our hypotheses we conducted two sets of experiments, Temperament tests and Predator-recognition tests.

2.2.1. Temperament tests

For the Temperament tests, we presented the animals with four novel objects of the same dimensions (approximately 20 cm) and colour, thus the difference remained basically on the objects shape: a ball, a box, a toy and a plastic jar were used. Temperament tests were run twice: phase I—before, and phase II—after the predator-recognition tests, with the use of the same objects and conditions, to check for the consistency of the finches' personality over time. A two-month interval separated phase I from phase II.

The objects remained covered until the beginning of each test, which was recorded with a Samsung HMX-F900 camcorder. Each object was displayed individually, and only once for each pair per trial. The objects were placed outside the animal's cage, 100 cm distant from it. We calculated the use of cage by the birds regarding their distance from the objects: D1 = <120 cm, D2 = 120 cm, D3 = 140 cm, D4 = 160 cm and D5 = >160 cm. The tests were run between 07:00 and 17:00 h and lasted 30 min per pair; the order of pairs for testing as well as the order of stimuli presentation were defined following the Latin Square design. Each of the two test phases lasted 32 h, totalling 64 h of observation. We evaluated the effect of object type on boldness scores by using the ANOVA test followed by the Tukey post hoc test. We also checked whether sex, day period (morning or afternoon), and treatment phase (phase I versus phase II) had any influence on Boldness scores by using a paired *t*-test.

2.2.2. Predator-recognition tests

Throughout these tests, we evaluated the behaviour of the finches upon presentation of predator and non-predator models (Azevedo et al., 2012). The tests were grouped into three sequential phases: Baseline, Models and Post-models, to control for temporal effects. To avoid any carryover effects between the phases, four-day intervals separated them. During the Models phase, the stimuli were presented following the Latin Square design; during the Baseline and the Post-models phases, no stimulus was presented. The behaviour of the animals was videotaped during all phases for analysis. A live roadside hawk (*Rupornis magnirostris*—Live Hawk) and a taxidermised yellow-headed caracara (*Milvago chimachima*—Taxidermised Hawk) were used as predator stimuli. Hawks were chosen to represent the predator because they occur in the same biome as the study species and feed