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Behavioral Response of Birds in Stress with Emphasis on Globally Important Species Green Avadavat (*Amandava Formosa*)

Satya Prakash Mehra*[*], *Sarita Mehra**

ABSTRACT

In a context of animals, the word "stress" is used with different meanings, and so is the case of its application. In general, it is a response of animal resulting from an exposure to the adverse conditions. Birds are considered as one of the most adorable companions of the humans since long, but the pace of development has created a hostile environment for these companions. An investigation was carried out by the workers in the southern parts of Rajasthan since 2004 with the aim to observe and monitor the avian ecology. Causes of the stressful environment were observed for the species of global importance especially Green Munia or Green Avadavat (*Amandavaformosa*). The investigation is based on the field observations on the behavioural aspects of these birds at Abu Hills with the focus on limiting factors.

The result further showed that physical stress due to human encroachment on the feeding grounds of the birds was key factor to restrict the expansion of niche and movement. With the long-term strategy, the local community was involved to check encroachment resulting into the threefold increase in population of the bird since 2004. Thus, recommendation was made that with the identification of physical stress elements, and removal of the same could give space to the non-human species to maintain the ecological balance of nature and create non-stressful conditions to humans.

*Advisor, RSNH & RREDC, Rajasthan, India.
*SG & CEO, Rajputana Society of Natural History & Director, Rajputana Rural Enviropreneurship Development Centre (RREDC), Rajasthan, India.

INTRODUCTION

Wild populations get exposed to multiple, concurrent environmental changes which could act synergistically or antagonistically regarding their impacts on organisms which might be positive or negative. The resulting conditions develop the 'stress' in the organism. Assessment of the stressful environmental conditions is necessary to check the diminishing population of many species of the earth. Conservation is the priority concern for almost all the nations of the world.

India, being one of the seventeen mega diversity countries with a variety of habitats which harbour over 1,200 bird species of birds accounting 13 percent (9,600 species) of the bird species of the world. 182 species of birds in India are among the threatened list as per the records of BNHS showing increasing trends of the numbers. Enlisted as the vulnerable species, Green Avadavat or Green Munia (*Amandavaformosa*) is endemic to India (Bird Life International 2012). It was commonly distributed in central parts of India till the first half of decade 1990s before restricting to the smaller patches of habitats of India (Mehra 2011).

The aim of this paper is to review aspects of the stress in one of the mostly liked group of organisms, i.e. birds, by the humans. It further reviewed the gaps in the research on stressful conditions of species of globally importance, Green Avadavat or Green Munia (*Amandavaformosa*) leading to the decreasing population of the species.

What is Stress?

In adverse environmental conditions, the animal makes abnormal or extreme adjustments in its physiology or behaviour to cope up with challenges

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(Fraser *et al.* 1975) this is a state of "stress". As per the work of Stott (1981), "stress" is an external body forces that displaces homoeostasis whereas "strain" is the internal displacement brought about by stress. Stress could lead to the fight-flight response resulting into the faster-pumping lungs, increased heart beat, higher blood pressures, increased level of endorphins in the body. The add-on is lowering of appetite, libido and immune system for diverting energy to flight preparation. Sapolsky*et al.* (2000) explained the responses of bird towards stressor in natural environmental conditions. Acute stress is composed of adaptive physiological and behavioural responses during which the adrenal gland secretes glucocorticoids, via hypothalamic-pituitary-adrenal (HPA) axis. Stimulation of the hypothalamus inducts secretion of arginine vasotocin and corticotrophin releasing factor which stimulates pituitary to secrete adrenocorticotropin hormone (ACTH) resulting in the adrenal release of corticosterone (CORT). Negative feedback quickly suppresses CORT release once the stressor diminishes or ceases (Sapolsky*et al.* 2000, Dallman&Bhatnagar 2001). On the persistence of the stressor or if there are multiple consecutive stress responses due to a series of acute stressors, the animal becomes chronically stressed. A change in a stress-response physiology beyond a direct response to an acute stressor and beyond the adaptive time frame of stress-induced increase in CORT concentrations is referred as 'chronic stress' (Dickens *et al.* 2009) which often results in weight loss in animals.

Stress and Avifauna (Birds)

The causes and factors of stress in birds are similar to those in the humans which includes any state of danger, illness, pain, accidents, external negative influence in diet, confinement, isolation, other environmental changes, over-stimulation etc. Etim *et al.* (2013) categorized stress as physiological stress: restraint, handling or novelty or physical stress: hunger thirst, fatigue, injury or thermal extremes. The environmental stress leads to a sharp decline in population (Hoffman &Hercus 2000), such as any change in habitat characteristics, therefore, human-induced habitat modification is one of the most concerned issues in ecology (Cartwright *et al.* 2014). Mehra (2011) has observed the local changes of the bird species composition with the habitat alterations in Rajasthan. The work of Mehra&Mehra (2014) briefed the conservation issues of the bird habitat along with the characteristics of the suitability of habitats for birds (Mehra&Mehra 2013).

The amount of human-animal interaction can have a profound impact on many facets of a bird's physiology and behaviour which may be neutral, positive or negative. The physical stress encountered by the species for a shorter duration such as drought or extreme cold or the chemical stresses arising from anthropogenic activities can lead to marked reduction in population size which is followed by extinction (Andrewartha & Birch 1954) and shift the mean of a trait by imposing directional selection (Hoffman &Hercus 2000). Also, there is evidence for change in morphological traits due to periodic exposure to climatic stresses especially in the bird populations (Brown & Brown 1998). Thus, stressful conditions can in some instances lead to rapid evolution.

Stress and Conservation of Avifauna (Birds)

The importance of avifauna for the humans is well documented for the geographic area of interest of the authors (Mehra*et al.* 2014, Mehra*et al.* 2012 and Mehra*et al.* 2011). Birding is one of the important stress relieving activities undertaken by the authors through their earlier works. With the pace of development and rapid urbanisation, the habitats of the birds are under stress, thus creating the stressful conditions for many species of global significance. The habitat alteration in developing nation like India is taken as serious concern for the Important Bird Areas.

Research works on wild species involve capture, handling, and captivity to some extent whereas conservation of threatened species consist of the activities of translocation and reintroduction for encouraging the self-sustaining wild population

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(Dickens *et al.* 2009) or due to natural calamities, the bird's can lose their habitat or forced to relocate. These actions affect and/or alter the physiology of bird. For example, the preferable habitats for bird species like Green Avadavat are grass and low bushy sites, agriculture field of sugarcane, open forests and scrubs. The alterations in the habitats had affected a species to a great extent (Mehra 2011), but due to the adaptability for altered habitat (Mehra*et al.* 2005), the increase in the population of the species was observed in the pockets of Aravallis (Mehra 2011). In case of sensitive species, there is need to identify the coping behaviour of the species under the stressful conditions with the alteration of the habitat conditions.

The authors observed that the species was limited to certain pockets and the increasing human pressure has restricted the movement of the species due to encroachments on their feeding grounds or open fields. Although Green Avadavat is highly tolerant to the altering habitats but the increase in the population was found only in certain areas (Mehra 2011, Mehra*et al.* 2005) attributed to the protection and conservation of their feeding grounds. With the removal of the encroachments and protection of the available habitats, the species revived their population status. The encounter rates of visibility increased several folds at the end of decade 2010s as compared to early 2000s (Mehra 2011). Thus, with the check on the stressful conditions one could revive the population of the species of interest.

Translocation is key component of the ex-situ conservation of threatened species. Wolf *et al.* (1996) concluded that avian translocations have a high failure rate, and causes are poorly understood (Fischer & Lindenmayer 2000). There are many causal factors for the failures, but stress is often cited as an important factor (Teixeira *et al.* 2007), although few studies have demonstrated empirical evidence of physiological stress. "Success" as the outcome of translocation means creation of a self-sustaining population, survival during the period of natural or human-induced movement of birds into a novel environment. The assessment of the level of stress and the coping behaviour during artificial translocation of the species of global significance could be a major achievement for the conservationists. Also, the studies could lead to the assessment of the coping strategy due impact of the natural translocation of the species with the change in habitat characteristics. Often trapping and capturing results in the death of the animals. The reintroduction programs and release of captive-bred animals tend to have lower survival rate than their wild counterparts (e.g. Dowell 1990, Putaala*et al.* 2001).

Translocation has a high potential for causing chronic stress as it consists of multiple acute stressors initiating multiple consecutive responses. Such stressors include capture (Lynn & Porter 2008), handling (Oers&Carere 2007), transport (Groombridge*et al.* 2004, Nilsson *et al.* 2008), captivity (Franceschini*et al.* 2008) and release into a novel territory. In a chronically stressed animal, beneficial aspects of the acute response become detrimental and cause translocation failures; as examples, chronic stress causes immune system suppression (Dhabhar& McEwen 1997), reproductive axis disruption (Berga 2008) result in decreased reproductive capacity, and diminishment of the fighter- flight response to a startle stressor (Dickens & Romero 2009) increasing vulnerability to predation. Chronic stress, therefore, is a potential proximate mechanism causing failure during the establishment phase of translocation.

Recently it was observed in the habitats of the Southern Rajasthan that the reintroduced population of Green Avadavat is thriving well even though the original habitat conditions are altered to a great extent. This may be due to the higher degree of adaptability of the species towards altered habitats and wide range of limiting factors. This needs a long-term research.

CONCLUSIONS

Stress is defined at different levels, which is simply any change in conditions (internal or external)

affecting a behavioural and physiological response of the bird. The inability of a bird to cope with its environment depicts stress and results in failure to produce and reproduce optimally leading to the local extinction of the species. Therefore, identifying and understanding stressors will effectively guide conservation practitioners in raising the population of the species through employing proper management practices for *ex-situ* or *in-situ* conservation. The stressors should be minimised wherever possible through extensive research.

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