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First name: Lance

Last name: Olsen

Organization:

Title:

Comments: I believe that these findings are directly relevant to the Forest's any intended management for both present and future generations.

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## RESEARCH ARTICLE

Investigating the implications of shifting baseline syndrome on conservation

Lizzie P. Jones Samuel T. Turvey Dario Massimino Sarah K. Papworth

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### Abstract

1. Shifting baseline syndrome (SBS) describes a persistent downgrading of perceived 'normal' environmental conditions with every sequential generation, leading to under-estimation of the true magnitude of long-term environmental change on a global scale. The presence of SBS should be considered when local ecological knowledge and participatory techniques are involved in conservation target-setting. However, despite increasing recognition of the phenomenon, there is little empirical evidence for SBS. Here we provide evidence of SBS, and the first empirical investigation of the impacts of SBS on public perceptions of conservation need.

2. Large-scale online questionnaires were used to collect public perceptions of long-term biological change regarding 10 UK bird species, as well as demographic information and measures of knowledge and experience of the local environment ( $n = 330$ ). A paired data approach compared social perceptions to a large-scale longitudinal biological dataset. Using information theoretic and model selection techniques, we estimate the relative importance of multiple demographic, social and psychological predictors of SBS. We provide a framework for investigating evidence of SBS and its impacts on perceptions of conservation need for species in decline.

3. Evidence of generational amnesia was found as an age-related difference in perceptions of past ecological conditions. The perceptions of older participants had significantly higher agreement with biological data than the perceptions of younger participants. Our results therefore support the expectation that younger, less experienced people are less aware of historical ecological conditions and show greater evidence of SBS. We also present evidence of a negative impact of SBS on future conservation, as older people were more likely than younger people to perceive a greater need for conservation action for three declining species.

4. Our research supports the need to encourage greater intergenerational communication and increase experience of local nature. Discovering evidence of SBS in public perceptions of species experienced within everyday life demonstrates SBS as a pervasive social issue with the potential to impact public perceptions of local nature.

A free Plain Language Summary can be found within the Supporting Information of this article.

## 1 INTRODUCTION

Knowledge of past environments is critical to evaluate current conditions, comprehend change and set effective conservation targets for the future (Soga & Gaston, 2018). There is a wealth of empirical evidence recording our long-term impacts on the natural environment, from species extinctions and habitat loss (Dirzo et al., 2014) to climate change (Steffen et al., 2015). Despite this, conservation baselines are often formed using only recent information (Rodrigues et al., 2018). By focusing on more recent timescales, we may lose perspective on the true

magnitude of long-term environmental change (Rost, 2018). This is known as shifting baseline syndrome (hereafter SBS), a socio-psychological phenomenon in which historical environmental information is lost over time and people do not notice changes in biological systems. Without intergenerational communication, it is thought that people tend to compare current ecological conditions to reference points set within their own autobiographical experience, forgetting or ignoring valuable historical information (Papworth, Rist, Coad, & Milner-Gulland, 2009; Pauly, 1995). However, relatively few studies provide empirical evidence for SBS (Papworth et al., 2009; Turvey et al., 2010), often due to a lack of access to longitudinal biological datasets against which to compare perceptions of biological change (Guerrero-Gatica, Aliste, & Simonett, 2019).

According to Papworth et al. (2009), two criteria must be met in order to demonstrate SBS empirically:

1. There must be biological change in the system and,
2. Any perceived change must be consistent with biological data.

The interpretation of these criteria depends on the mechanism by which SBS is occurring: either generational or personal amnesia. Generational amnesia, so called for the unperceived loss of knowledge between generations, occurs when the baseline for 'normal' ecological conditions shifts with each successive generation due to a lack of intergenerational communication, preventing accurate perception of long-term change (Kahn & Friedman, 1995). Therefore, under generational amnesia, individuals must have an accurate perception of current conditions, and there must be age- or experience-related differences in perceptions of change (see Figure 1 for theoretical example).

Papworth et al. (2009) also described a second mechanism, personal amnesia, in which age- or experience-related differences are not found; instead, people have an accurate perception of current conditions but believe past conditions to be the same as current conditions. This second mechanism is comparable to the cognitive bias named the 'recency effect' in which people tend to recall more recent information most effectively (Baddeley & Hitch, 1993). By comparison, 'change blindness' or 'anchoring' describes a tendency to remember the past better than recent conditions (Simons & Rensink, 2005).