



Personality, body condition and breeding experience drive sociality in a facultatively social bird



Markus Öst ^{a, b, *}, Martin W. Seltmann ^b, Kim Jaatinen ^a

^a Aronia Coastal Zone Research Team, Åbo Akademi University and Novia University of Applied Sciences, Ekenäs, Finland

^b Department of Biosciences, Åbo Akademi University, Turku, Finland

ARTICLE INFO

Article history:

Received 1 July 2014

Initial acceptance 29 July 2014

Final acceptance 13 November 2014

Published online

MS. number: 14-00540R

Keywords:

body condition

boldness

flight initiation distance

group size

maternal experience

parental care

predation

risk taking

social partner choice

Somateria mollissima

Adopting different behavioural strategies may reduce within-group conflict, selecting for behavioural consistency ('personality'). Personality may also affect grouping tendencies. The relationship between the personality dimensions sociability and boldness nevertheless remains unclear. This knowledge gap may reflect a failure to consider potential trade-offs between avoiding conspecifics, potentially alleviating social stress, and avoiding predation. Furthermore, the effects of personality and state (e.g. body condition or age affecting the costs and benefits of behavioural actions) on cooperativeness should be considered together. This is because state may explain predation vulnerability, which may affect boldness under predation risk, and thus antipredator grouping tendencies. To address the problem, we determined how group size preference and group-forming time depended on boldness (flight initiation distance, FID, in response to an approaching human), body condition and breeding experience in facultatively social eiders, *Somateria mollissima*, where females form coalitions or care for the young solitarily. Breeding adults and young are subject to high predation pressure, providing a strong incentive for brood-tending females to cooperate. Because hormonal differences may also explain differences in sociability, we included baseline and handling-induced serum corticosterone concentrations of incubating females as potential predictors of sociability. We also statistically controlled for availability of potential partners. The relationship between boldness (FID) and the number of coalition partners ranged from negative (females in poor body condition) to positive (females in good body condition), arguing against a uniform relationship between boldness and sociability. The number of coalition partners decreased with female breeding experience. The time taken to form a coalition was shortest close to the hatching peak in the population. Shyness (long FID) delayed group formation. Despite a need for safety in numbers by shy females in poor body condition, their entry into groups may be constrained by their personality, suggesting a possible trade-off between predator and conspecific avoidance.

© 2014 The Association for the Study of Animal Behaviour. Published by Elsevier Ltd. All rights reserved.

Social animals may adopt different behavioural strategies to reduce competition with group members. These alternative social options can be key factors in the evolution and development of consistent individual differences in behaviour, also known as personality (Bergmüller & Taborsky, 2010; Montiglio, Ferrari, & Réale, 2013). Despite the presumed importance of social context, understanding how personality relates to cooperation is an understudied issue (Sih, 2013). The reactive–proactive personality axis is common in many vertebrates, contrasting shy, cautious and slow-exploring individuals with bold, aggressive and fast-exploring ones (Koolhaas et al., 1999; Réale, Reader, Sol, McDougall, &

Dingemans, 2007). Boldness, the reaction of an individual towards a threatening situation, often measured as its flight initiation distance (Blumstein, 2006; Carrete & Tella, 2010; Carter, Goldizen, & Tromp, 2010; Seltmann et al., 2012), is a major component of the reactive–proactive personality axis (Réale et al., 2007). This fundamental difference in behavioural profile correlates with responses to social stimuli (Webster & Ward, 2011) and may therefore modify the cost/benefit ratio of group living. Thus, it has been proposed that the shyness/boldness dimension may underpin multiple aspects of social organization, including social position (Sibbald, Erhard, McLeod, & Hooper, 2009) and group dynamics and stability (Aplin et al., 2013). On the one hand, shy individuals are expected to prioritize survival over productivity (e.g. Biro & Stamps, 2008), and so they may be more gregarious and form larger groups, in order to reduce their predation risk (through confusion/dilution/vigilance effects of grouping; Krause & Ruxton, 2002). Shy

* Correspondence: M. Öst, Department of Biosciences, Åbo Akademi University, FI-20520 Turku, Finland.

E-mail address: markus.ost@abo.fi (M. Öst).

individuals may also be faster at forming groups with conspecifics under threat of predation, as increased predation risk can increase the speed at which prey aggregations form (Jaatinen & Öst, 2013). On the other hand, access to cooperation among individuals cannot be obtained without a certain tolerance for conspecifics; sensitivity to social challenges may deter individuals from aggregating into groups (e.g. Schoepf & Schradin, 2013).

Social groups impose costs on their members, including competition (e.g. for food, safety and reproductive shares), increased disease transmission and predator attraction (e.g. Rowcliffe, Pettifor, & Carbone, 2004; Sansom, Cresswell, Minderman, & Lind, 2008). Shy individuals may be more sensitive to social stress arising from group living (Carere, Groothuis, Möstl, Daan, & Koolhaas, 2003; Cote & Clobert, 2007) and avoiding conspecifics may be one way of reducing social conflict and its attendant stress. An individual's position along the bold–shy axis may therefore explain consistent individual differences in sociability, i.e. the extent to which an individual associates with conspecifics (Pike, Samanta, Lindström, & Royle, 2008). Taking into account the social constraints of group living, one may hypothesize that shy individuals may actually prefer smaller groups and/or it may take a longer time for them to establish partnerships, which runs contrary to what one would expect if grouping decisions were driven purely by predation avoidance. Perhaps not surprisingly, then, empirical studies report mixed evidence on the relationship between social tendency and boldness. Some studies have found that shy individuals associate with larger numbers of conspecifics (Croft et al., 2009; Michelena, Sibbald, Erhard, & McLeod, 2009; Ward, Thomas, Hart, & Krause, 2004), others have found the opposite effect (Aplin et al., 2013; Cote, Fogarty, & Sih, 2012; Pike et al., 2008), and still other studies have found no connection between group size preference and boldness (Hellström, 2012).

How can we reconcile these apparently discrepant views? Incorporating individual differences in state could potentially explain the divergent findings regarding the relationship between personality and sociability. The state of an animal refers to all those features (e.g. morphological, physiological, neurobiological or environmental) that affect the costs and benefits of its behavioural actions (McNamara & Houston, 1996); this broad definition also includes age and breeding experience (e.g. Wolf & Weissing, 2010). Particularly pertinent in this respect is the state-dependent safety model for the evolution of personality (Luttbeg & Sih, 2010), which suggests that individuals that have higher state, for example better condition or more experience, may be better equipped to escape predation and/or defend themselves (or their offspring) against predators. The model therefore predicts that, for a given level of boldness, high-asset individuals should invest less in antipredator behaviour, for example by having a weaker incentive to join groups, and respond less strongly to changes in predation danger, than individuals with intrinsically greater vulnerability to predation (Luttbeg & Sih, 2010). Consequently, personality (boldness) and internally or externally explained states may underpin individual differences in sociability in an interactive manner (Bergmüller, Schürch, & Hamilton, 2010). However, few empirical studies have so far attempted to integrate the effects of personality traits and state-dependent factors on the propensity to cooperate.

We conducted a 3-year study to determine how group size preference and group-forming time depend on boldness, body condition and breeding experience (a proxy for age) in female eider ducks, *Somateria mollissima*, cooperating to rear young. Behavioural strategies for coping with predation risk have important fitness consequences owing to high predation pressure on both breeding adults (Ekroos, Öst, Karell, Jaatinen, & Kilpi, 2012; Jaatinen, Öst, & Lehikoinen, 2011) and young (e.g. Öst, Smith, & Kilpi, 2008). Female eiders exhibit facultative sociality during brood rearing,

arriving at sea with their broods, and engaging in intense social interactions during the first week after hatching to decide whether and with whom to form brood-rearing coalitions. Females may either form coalitions, which, once stabilized, typically consist of two to five females and their broods and persist for the full brood-rearing period, or care for the young alone (Öst, Ydenberg, Kilpi, & Lindström, 2003). These coalitions can be classified as 'restricted-entry' groups, in which members exhibit high group fidelity and dominance relationships, and from which group members actively repel and exclude would-be joiners (Öst, Ydenberg, Lindström, & Kilpi, 2003). This study system fits the assumptions of the state-dependent safety model (Luttbeg & Sih, 2010). Thus, solitary brood care necessitates increased investment in antipredator vigilance (Öst, Clark, Kilpi, & Ydenberg, 2007) at the expense of foraging time (Öst, Mantila, & Kilpi, 2002). Mothers in good body condition and those having more breeding experience may better withstand these challenges of solitary life, as evidenced by the fact that brood-tending females in good body condition and more breeding experience associate with fewer coalition partners (Jaatinen & Öst, 2011; Öst, Ydenberg, Lindström, et al., 2003).

We assayed females for boldness under threat of an approaching human, by determining the flight initiation distance (FID) of incubating females. FID is highly repeatable both within and between years (e.g. $R = 0.8$ within 2009 and $R = 0.69$ between 2009 and 2010; Selmann et al., 2012). FID is also linked to stress coping: longer FID (shyness) is associated with a greater handling-induced corticosterone (CORT; the primary avian glucocorticoid) response (Selmann et al., 2012). Because individuals vary in their sensitivity to social stress and hormonal differences may therefore explain differences in social tendency (Schoepf & Schradin, 2013; Soares et al., 2010), we included as potential predictors baseline and handling-induced (serum) CORT concentrations determined at female capture. We also statistically controlled for the availability of prospective coalition partners when females made their grouping decisions, since ducklings in brood-rearing coalitions are usually of similar age (Öst, Ydenberg, Kilpi, et al., 2003). We tested whether the relationship between boldness and sociability (number of preferred coalition partners, time to establish social partnerships) was modified by individual differences in body condition or breeding experience, because these variables should influence the vulnerability to predation, thereby affecting aggregation tendencies under threat of predation.

METHODS

Field Methods

The study was done at Tvärminne (59°50'N, 23°15'E), western Gulf of Finland, in 2009–2011. We captured female eiders during nesting by using hand nets. At capture, females were weighed to the nearest 10 g, measured for structural size (length of the radius–ulna), and ringed with a standard steel ring. As a (minimum) estimate of years of maternal experience we recorded the number of years since the bird was first ringed (Öst, Smith, et al., 2008; Öst & Steele, 2010). This variable reliably reflects breeding experience because we annually capture more than half of the successfully breeding females on our study islands (Jaatinen & Öst, 2011), females show strong fidelity to their breeding island (Öst, Lehikoinen, Jaatinen, & Kilpi, 2011) and annual trapping effort has been relatively constant since 1996. This variable is also highly correlated with age; we were unable to determine age directly because females are not ringed as ducklings in our study population. None the less, we acknowledge bias in the variable minimum years of maternal experience, as it scores all unringed females as inexperienced. We also equipped females with a unique combination of one

Download English Version:

<https://daneshyari.com/en/article/8490232>

Download Persian Version:

<https://daneshyari.com/article/8490232>

[Daneshyari.com](https://daneshyari.com)