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Corrigendum: Editorial: Neuroethology of the colonial mind: ecological and evolutionary context of social brains

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A Corrigendum on:

Editorial: Neuroethology of the colonial mind: ecological and evolutionary context of social brains

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After publication, three additional papers were submitted and published in the Research Topic "Neuroethology of the colonial mind: Ecological and evolutionary context of social brains": Mörchen et al., Villmoare and Grabowski, DeSilva et al. We also received insightful feedback from the Editor, Mark Elgar, about ways to frame our paper collection in the context of emerging themes. An amendment has therefore been made to the editorial to include these papers and incorporate this feedback in our discussion.

Paragraph 1 edited in light of Editor's comments:

"Collective behavior relies on interactions among individuals who have neural substrates supporting the exchange and processing of social information (Gordon, 2021). The collective acquisition and processing of information in animal groups suggest that individuals form a "colonial mind." Over the past decades, studies of individual and collective cognition have received a lot of attention (Couzin, 2009; Simons and Tibbetts, 2019). However, little is known about how the two systems interact. For instance, while collective cognition necessarily emerges from individual cognition, individual cognitive abilities are not correlated to collective cognitive abilities (Feinerman and Korman, 2017). Studying cognitive processes across levels of biological organization thus requires a better understanding of the mechanisms of cognition at each level and within an evolutionary context. This necessitates analyzing how animals use social information in different contexts or understanding the neural adaptations associated with group living and ecological challenges. For this research topic, we brought together researchers in

neuroscience and collective animal behavior to further examine these aspects of the colonial mind."

New paper added to discussion in Paragraph 2:

"Social information transfer can yield fitness benefits to individuals (Krause et al., 2010). For instance, grouped animals often respond faster and more accurately to changes in environmental or social circumstances than isolated conspecifics (Sumpter, 2010). While these cognitive advantages were long considered exclusive to the most socially advanced animals, recent studies show collective cognition can be beneficial across the animal kingdom, even in loosely social species. For instance, Mörchen et al. demonstrate that organgutans, which are less social than other apes, learn about new environments through social information gathered from local individuals when migrating. Ferreira et al. showed how social information influences individual reactions in gregarious fruit flies under threatening situations."

Citation for Poissonnier et al. updated in Paragraph 4:

"For instance, many socio-cognitive behaviors once thought to be specific to social species, such as the recognition of individual identity or social learning, have recently been described in nonsocial animals and may be primarily related to foraging and mating (Poissonnier et al.)"

Citation added in Paragraph 8:

"Using observations from comparative studies of ant neuroanatomy, these authors propose that the trend they observed may be associated with characteristics of collective behavior such as increased sociality, sharing of information, and group decision-making (but see comment by Villmoare and Grabowski and response by DeSilva et al. about potential issues of using rare fossil records for such analyses)."

Discussion in Paragraphs 9 and 10 edited to encompass Editor's comments:

"The studies in this collection seek to understand how behavioral and neural characteristics enable individuals to engage in social behaviors and how social organization, or collective behavior, may alter individual cognition. They take advantage of the approaches previously mentioned to nicely illustrate how research on the evolution of brains and cognition has recently moved from broad correlations between brain sizes and social organization (Dujardin, 1850; Dunbar, 1998) to more detailed considerations of the neuroethology of specific socio-cognitive behaviors (Lihoreau et al., 2012; Godfrey and Gronenberg, 2019). Future research will have to account for variation in cognition across group members (Naug and Tait, 2021) and life history strategies that characterize the group.

Recent studies, including those in this collection, have progressed our understanding of the neural underpinnings of collective cognition, but more can still be done. While the diversity of animal models used in collective cognition is increasing (i.e. social insects, *Drosophila*, primates), an important effort should be made to broaden the scope further with species comparisons across the spectrum of social organization. The application and tuning of tools such as statistical brain atlases (Arganda et al.) will make these large-scale comparative studies feasible and accurate. Ultimately, a better understanding of the neurobiology of collective minds across the animal kingdom, including humans, may be useful for developing more efficient collective decisions, more robust artificial systems (e.g. Ebert et al., 2020), and more informed interactions with wildlife."

The original article has been updated. The authors state that this does not change the scientific conclusions of the article in any way.

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