Lateral stamp-feeding behaviour in Caribbean flamingos

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Abstract

Peluso and Anderson (2014) have previously demonstrated individual-level lateral preferences for clockwise stamp-feeding in several Caribbean flamingos (*Phoenicopterus ruber*) held at the Philadelphia Zoo, USA. In the present study we employed an online webcam to partially replicate this earlier effect, obtaining evidence of a general (population-level) preference for clockwise stamp-feeding in the Caribbean flamingos held at the Maryland Zoo (Baltimore Maryland, MD, USA). This clockwise stamp-feeding preference observed in Caribbean flamingos contrasts with the counter-clockwise stamp-feeding preferences recently reported in greater flamingos (*P. roseus*) by Vidal et al. (2018). Additional research is needed to confirm this species difference and to explore its possible causes.

Resumen

Peluso y Anderson (2014) han demostrado previamente preferencias laterales a nivel del individuo en la alimentación por pisoteo en el sentido de las agujas del reloj en varios Flamencos del Caribe *(Phoenicopterus ruber)* alojados en el zoológico de Philadelphia, EE.UU. En el presente estudio empleamos una cámara web para replicar parcialmente este efecto anterior, obteniendo evidencia de una preferencia general (a nivel de población) por la alimentación por pisoteo en el sentido de las agujas del reloj en los Flamencos del Caribe alojados en el Zoológico de Maryland (Baltimore Maryland, MD, EE.UU.). Esta preferencia de alimentación por pisoteo en sentido horario observada en los Flamencos del Caribe contrasta con las preferencias de alimentación por pisoteo en sentido antihorario reportadas recientemente en Flamenco común *(P. roseus)* por Vidal et al. (2018). Se necesita investigación adicional para confirmar esta diferencia entre especies y explorar sus posibles causas.

Résumé

Peluso et Anderson (2014) ont déjà démontré des préférences latérales individuelles pour l'alimentation en piétinement circulaire chez les flamants des Caraïbes *(Phoenicopterus ruber)* détenus au zoo de Philadelphie (États-Uni). Chez cette espèce on observe que le piétinement en rotation sur soi-même se fait préférentiellement dans le sens des aiguilles d'une montre. Dans la présente étude, nous avons utilisé une webcam en ligne pour reproduire partiellement ce résultat, ce qui nous a permis de montrer par ailleurs une préférence générale (au niveau de la population) pour l'alimentation en rotation dans le sens des aiguilles d'une montre chez les flamants des Caraïbes détenus au zoo du Maryland (Baltimore Maryland, MD, États-Unis). Cette préférence d'alimentation dans le sens des aiguilles d'une montre observée chez les flamants des Caraïbes contraste avec les préférences d'alimentation dans le sens inverse des aiguilles d'une montre récemment signalées chez les flamant roses (*P. roseus*) par Vidal et al. (2018). Des recherches supplémentaires sont nécessaires pour confirmer cette différence entre les espèces et explorer ses causes possibles.

Introduction

Laterality (i.e., side preferences in brain and behaviour) has been well documented in a wide variety of species across the animal kingdom, as reviewed by Rogers, Vallortigara & Andrew, 2013). The benefits of laterality to any one individual animal are generally understood to include a reduction in neurological redundancy, enhanced multitasking, and/or improved cognitive processing (Rogers, 2006; Magat & Brown, 2009; d'Antonio-Bertagnolli & Anderson, 2018). The function of population-level lateral preferences, situations in which all/most members of a species display a lateral preference in the same direction, is less well understood, but some have hypothesized that population-level lateral preferences may develop out of a need for social cohesion and stability (Rogers & Workman, 1989) or group coordination (Bisazza, Cantalupo, Capocchiano, & Vallortigara, 2000). If such an explanation is correct, one might expect to find evidence of lateral preferences in more highly gregarious animals such as flamingos, and indeed some evidence for this has been obtained (Anderson, Williams, & O'Brien, 2009; Anderson, 2009; Vidal et al., 2018).

While they failed to obtain evidence of a lateral preference in scratching foot, Peluso and Anderson (2014) demonstrated that some individual Caribbean flamingos (*Phoenicopterus ruber*) held at the Philadelphia Zoo significantly prefer to turn in a clockwise manner when engaging in stamp-feeding. Peluso and Anderson (2014) failed to obtain evidence of a significant population-level lateral preference in stamp-feeding behaviour within the Philadelphia Zoo flock, but all statistically significant individual-level lateral preferences observed in that study were in the clockwise direction, and the results conceivably could have been impacted by relatively few observed occurrences of the stamp-feeding behaviours under examination. It thus seems warranted to further examine the possibility of population-level lateral stamp-feeding preferences in Caribbean flamingos. Additional study of this question is further warranted considering more recent evidence from Vidal and colleagues (2018) illustrating a population-level lateral preference in wild Greater flamingos (*Phoenicopterus roseus*) for counter-clockwise turning while stamp-feeding. Indeed, whether species differences may exist in flamingo lateral stamp-feeding preferences is an intriguing notion.

Thus, the present study aimed to expand upon the previous work of Peluso and Anderson (2014) to further observe and analyse lateral preferences in Caribbean flamingo stamp-feeding and scratching behaviours. Here we employed a publicly available online webcam focused on a captive Caribbean flamingo flock held at the Maryland Zoo (Baltimore, MD, USA) to examine population-level lateral preferences of the behaviours in question, thus attempting to replicate the previously observed effects in a different group of captive flamingos.

Methods

Between 09:00 and 11:00 EST/EDT one of three observers (K.R., D.H., or T.R.) logged on to Maryland Zoo's livestream flamingo webcam (https://www.marylandzoo.org/animals/live-cams-feeds/flamingo-live-cam/) to observe and record flamingo behaviour for 30 minutes, utilizing an all-occurrence sampling technique (Altmann, 1974), tallying the occurrence of any of the following behaviours displayed by any of the flamingos in the flock over the course of the observation period. Specifically, we tallied: instances of clockwise and counter-clockwise turning during stamp-feeding in which the body was the pivot point, instances of clockwise and counter-clockwise turning during stamp-feeding in which the head was the pivot point, and instances in which a flamingo scratched itself with either its right or left leg. A bout of stamp-feeding involved at least one full rotation in either a clockwise or counter-clockwise direction.

Multiple bouts of any one behaviour displayed by a single flamingo needed to be separated by at least 5-sec of "calm" during which the behaviour was not displayed in order for the behaviour to be tallied as multiple bouts. In each category, we only counted those birds that were clearly seen displaying the behaviour in question; if there was any uncertainty about the behaviour being observed, we didn't count the behaviour in that category.

Only one 30-minute observation per day was gathered between 1st October and 23rd November 2020. The 09:00-11:00 observation window was selected as a time during which flamingos were likely to be active, as they are known to rest during the middle of the day (Bildstein, Frederick, & Spalding, 1991). At the end of the study, behavioural tallies were totalled across all observations and a binomial analysis (with correction for continuity) (Siegel, 1956) was conducted on each behaviour (scratching, stamp-feeding) comparing the observed distributions of right and left foot scratching and clockwise and anticlockwise stamp-feeding (collapsing across instances in which the head or body served as pivot) to chance performance.

Results

Stamp feeding (collapsing across instances in which the head or body served as pivot) was more likely to occur in a clockwise direction (clockwise instances=80, counter-clockwise instances=56) and the observed distribution significantly differed from chance (z=1.972, p=0.049, two-tailed). There was no obvious lateral preference in scratching foot (left=43, right=45) and the observed distribution did not significantly differ from chance performance (z=0.106, p=0.912, two-tailed).

Discussion

Peluso and Anderson (2014) have previously obtained evidence of individual-level lateral preferences for clockwise stamp-feeding in several Caribbean flamingos held at the Philadelphia Zoo, and also failed to obtain evidence of lateral preferences in scratching foot. The general tendency toward clockwise stamp-feeding observed here in the Maryland Zoo Caribbean flamingo flock partially replicates this previously observed effect and suggests that Caribbean flamingos may generally prefer clockwise turning while stamp-feeding (i.e., a population-level lateral preference). The lack of scratching foot preference in Caribbean flamingos would also seem to be well established at this point and is likely explained by the symmetrical need for maintenance/comfort that scratching behaviour satisfies; it may be disadvantageous to ignore one half of the body by having a preferred scratching foot.

While Peluso and Anderson (2014) utilised a method that allowed for tracking of individual flamingo behaviour over the course of that study, the webcam-based method employed in the present investigation did not allow for identification and tracking of individual birds and was thus limited to examining group/population-level behavioural patterns (Anderson, 2009; Anderson et al., 2011; Peluso et al., 2013). Given this limitation, it is unclear whether the observed population-level lateral preference is the product of several very strong individual-level lateral preferences within the group or if it is a true general preference for clockwise stamp-feeding shared by all/most members of the flock. Additional research with both captive and wild Caribbean flamingos is necessary to further examine this issue. That being said, with multiple studies from two distinct flocks of Caribbean flamingos now evidencing some preferences for clockwise stamp-feeding, it seems reasonable to conclude that when Caribbean flamingos do display a significant lateral preference when stamp-feeding it is likely to be in the clockwise direction.

As was proposed by Vidal et al. (2018), a population-level lateral preference for stamp-feeding in flamingos could have arisen due to space constraints of the social-foraging flamingos such that they need to rotate in the

same direction to avoid collision with nearby conspecifics or possibly as a means by which to encourage food items more effectively to be stirred up from the substrate. Particularly if the species difference hinted at in the pattern of available results holds true, with greater flamingos preferring counter-clockwise stamp-feeding and Caribbean flamingos preferring to stamp-feed in a clockwise direction, these explanations seem to most parsimoniously account for the observed effects as they could conceivably leave room for the development of opposite lateral preferences in such closely related species by chance. Future research with both captive and wild flocks of both species is necessary to verify this possible species difference and to explore the reasons for its occurrence.

Conclusions

The present study demonstrated a general (population-level) preference for clockwise stamp-feeding in the Caribbean flamingos held at the Maryland Zoo, a finding that when taken together with earlier results obtained from a different captive flock seems to suggest that when Caribbean flamingos do display a significant lateral stamp-feeding preference it is likely to be in a clockwise direction. This contrasts with the counter-clockwise stamp-feeding preference that has been reported in greater flamingos. Additional research with wild and captive flocks of both species is needed to confirm this potential species difference and to explore its possible causes.

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