REPORT FROM A BOU-FUNDED PROJECT

Rogerson, K., Atkinson, P., Catry, I., Gill, J. & Franco, A. 2018. Comparisons of post-fledging behaviour between family members in a partially migratory long lived species.

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Comparisons of post-fledging behaviour between family members in a partially migratory long lived species

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INTRODUCTION

There are differences between avian juvenile and adult behaviour due to the costs of different life stages. Similarities might be expected if juveniles learn behaviours from more experienced individuals; adults and chicks have a high level of interaction when chicks are in the nest and parental care can occur after fledging and independence (Clutton-Brock 1991). Siblings could be expected to have similar behaviours if they are inherited or learnt from parents. Black stork (*Ciconia nigra*) siblings are known to have different migratory movements after fledging and do not stay together (Larue *et al.* 2016) similar to the dissolution of family units in white-crowned sparrows (*Zanotrichia leucophrys*; Morton *et al.* 1991). In this study GPS transmitters have been used to understand the post-fledging behaviour of family members of a long-lived species, white storks (*Ciconia ciconia*) from a partially migratory population. It is important to understand if behaviours relating to movement behaviour, such as migratory strategy, are transmitted from parents to offspring (genetically or socially), also this can be inferred by comparing siblings to random pairs of juveniles.

METHODS

GPS Transmitters were deployed on four adults and 22 juveniles as described in Gilbert et al. (2016) between April and July 2016. Transmitters collected GPS location and ground speed every 20 minutes. Proportion of time at locations is calculated as the proportion of day fixes (07:00 to 22:00) at locations excluding those with speed > 5 km/hour. Distances moved and displaced were calculated using all day fixes with package geosphere in Rstudio 3.2.3 (Hijmans *et al.*, 2016).

The sample size of parent and offspring pairs was too small for statistical tests to be conducted as no conclusions can be expanded to the rest of the population. The sibling pair's average behavioural metrics were compared to average values for randomly created pairs. The pairs of randomly selected individuals were created within colonies to control for possible differences between locations. In addition the first sibling to fledge and last to fledge were compared.

Post-fledging behaviour was split into two time periods: fledging (first flight from the nest) to penultimate day of nest use (to remove any movement behaviour away from the nest) or death and last day of nest use to day of crossing Strait of Gibraltar or death. Individuals with < five days of movement information for the first time period and those with < two days after leaving the nest were excluded from the analysis (shortest time between leaving nest and crossing to Africa was two days). Statistical tests have been performed in RStudio 3.2.3.

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MAIN FINDINGS

Out of the four breeding adults the only adult that failed to breed successfully flew to northern Africa and returned to its nest by the end of November 2016. The three other adults had fledglings that were tracked (two had one, the third had three and two were tracked); these adults all remained in Portugal over the winter. One of the tracked offspring survived to cross the Strait of Gibraltar. The movement behaviour of the adults and offspring were dissimilar; there was a large variation of nest use after the juveniles fledged within and between families. For example, adults stayed at the nest 17 and 35 days after the chick fledged and the offspring remained on the nest 23 and 14 days respectively. There is a large difference in the proportion of time spent on landfill sites for adults and their offspring, an average of 24% of time for adults and 5% of time for their offspring. Also the amount of time the adults and offspring spent within 250m of each other was less than 11%.

Table 1 Description of logged adults and their logged offspring; including information on nest use and migratory strategy. * denotes juveniles that died while it was still using its natal nest.

	Agatha	David C	Darwin	Sirius
No. of fledglings	0	1	1	3
No. of logged fledglings	-	1	1	2
Adult migrated to Africa (Y/N)	Y	N	N	N
Fledglings migrated to Africa (Y/N)	-	Y	N	N
Date of last nest use (Adult)	-	12/07/2017	03/09/2016	04/08/2016
Days using nest after juvenile fledged (Adult)	-	17	77	35
Date of last nest use (Juvenile)	-	18/07/2016	*	14/07/2016
Days using nest after juvenile fledged (Juvenile)	-	23	*	14
Days alive after fledging (Juvenile)	-	236	20	61

Initial results of comparisons of siblings and randomly created pairs show no difference in timing and behaviour metrics such as distance moved per day and proportion of fixes on landfill sites. In addition, there are no differences between the first to fledge and last to fledge of the sibling pairs.

DISCUSSION

The results show that adult and offspring behaviour is independent once the juveniles have fledged even though both use the nest after the juvenile's fledged. Juveniles did not follow their parents to foraging areas and the observations suggest there would be no social influence of parental behaviour on juvenile migratory decisions.

The results of the sibling comparison, no difference between first and last to fledge, could indicate the tendency for movement behaviour to be inherited. However this is unlikely as there were no differences between sibling pairs and randomly created pairs in nest use, visits to landfill sites, or the metrics used to describe movement behaviour. This implies that all juveniles utilise the environment in the same way after fledging. In addition from the observations of adults and their offspring, it is unlikely juveniles are responding to social cues from adults in the colony while they still use the nest. This could be a "flight-learning" phase (Larue *et al.*, 2016) and it would be expected that use of cues alters after this period.

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