

BREEDING SUCCESS OF WHITE STORKS (CICONIA CICONIA) IN NORTHERN ITALY (LOMBARDY)

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INTRODUCTION

The gaps in our understanding of White Stork ethology in Europe are quite evident. Certain aspects, such as the breeding behavior of the Italian population, remain unexplained, particularly when it comes to data about clutch size and brood size in the first two weeks after hatching. The difficulties of observing nesting activities within the nests have contributed to this lack of knowledge. Given that White Storks are altricial species and the majority of chick mortality occurs during these initial two weeks, the existing survival data (whether fledged or hatched) are often approximate and occasionally inaccurate.

AIMS

The research aims to gather **data on breeding biology** for comparison with other European countries and to provide insights into currently unknown reproductive phases.



Nest with eggs



Chicks: 1 week



Young storks: 2 weeks



Stork copulation



Fledglings: > 50 days

METHODS

Data used are based on successfully pairs. Since deposition is asynchronous, nests were examined more times in the spawning period and in the first few days of incubation. We consider “hatched” the chicks of 1-7 days. This is important to calculate correctly the reproductive success because, during these first days, many young storks die. We consider fledged the young present in the nest older than 50 days.

Data come from:

- 100 HPa (nesting pairs) (57 in 2021; 43 in 2022)
- 278 eggs examined
- 70 field observation days (560 h)
- 350 drone inspections (DJI mini 2)

Fieldwork was carried out:

- 2021/2022 (March-September)
- Lombardy districts (**BG, CR, LO, PV**)
- different types of habitat structure/supports

RESULTS

REPRODUCTIVE SUCCESS	OCCURRENCE %		
	2021	2022	Totale
Hatched eggs/eggs	70,63%	73,50%	71,92%
Young at 1 month/eggs	52,94%	57,60%	55,17%
Fledged/eggs	40,54%	55,37%	48,28%
Young 1 m/hatched eggs	74,40%	83,08%	78,82%
Fledged/hatched eggs	58,33%	80,95%	71,90%
Fledged/young at 1 month	83,33%	98,15%	92,53%

Rate	Nests	Mean	DS	Nests	Mean	DS	Nests	Mean	DS
	2021			2022			2021 + 2022		
Eggs/nest	36	4,25	1,04	29	4,31	0,65	65	4,28	0,89
Hatched/nest	43	3,09	1,31	40	3,25	0,97	83	3,17	1,16
Young at 1 month/nest	46	2,37	1,40	43	2,60	1,06	89	2,48	1,26
Fledged/nest	32	1,81	1,42	42	2,52	1,05	74	2,22	1,28

CONCLUSION

Data differs from other studies, highlighting the need for standardized data collection to understand the link between reproduction and the environment. White storks indicate habitat health in Central Europe, tied to food, nests, and weather. Italy's reproductive factors need more study. Burnhauser (1963) suggested 2.0 fledglings per pair for stability; Bairlain & Zink (1979) proposed 2.8. Despite Lombardy's population rise, if 2.2 breeding success maintains stability remains uncertain.

In other countries:

Poland applies a similar data collection methodology recording hatched eggs/laid: 76% (Kosicksi, 2010). Mean clutch size (eggs/nest): Poland 3.81 (Kosicksi, 2010), German 3.94 (Kaat & Stachowiak, 1987), Hungary 4.20 (Sasvari & Hegyi 2001), Switzerland 5.2 (Bloesch 1982) Mean hatched size (hatched/nest): Poland 3.17 (Kosicksi, 2010) Mean fledged size (fledged/nest): Turkey 2.71, Poland 2.08 (Kosicksi, 2010), Germany 1.5 (Struwe & Thomsen), Switzerland 1.7 (Moritz, 2001); Croatia 2.8 (Schneider, 1988), Greece 3.01 (Gauthier, 1995)



PARENTAL CARE IN WHITE STORK (*Ciconia ciconia*)

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INTRODUCTION

Lack (1969) estimates that 92% of birds forms pair bonds, but emphasizes that pair bond and biparental care are not synonymous. Cockburn (2006) estimates that 81% of species makes biparental care. White Storks form strong pair bond but the breeding behavior is poorly known.

AIMS

The research focused on **biparental care** and reproductive behavior. Both males and females incubate eggs and care for the brood, but:

how much each of them collaborates?

METHODS

- Site Selection: Lodi – Pavia – Bergamo
- 18 pairs
- 5 pairs with sex identified before incubation (rings or natural markings).
- February-July 2022
- Focal animal sampling: 9:00 AM – 5:00 PM
- 7 behavior categories identified for ethogram
- 270 observation hours
- Division of the study period into 4 phases.

RESULTS

- Time spent by each individual:
 - Incubating
 - Standing at the nest
 - Off the nest
- N° of times each parent turned the eggs
- N° and frequency of feeding acts for chicks
- N° of times adults exchange at the nest
- Frequency of nest maintenance acts

Brooding phase

Between deposition and hatching of the first egg



Phase 1

Two weeks after the chicks' birth



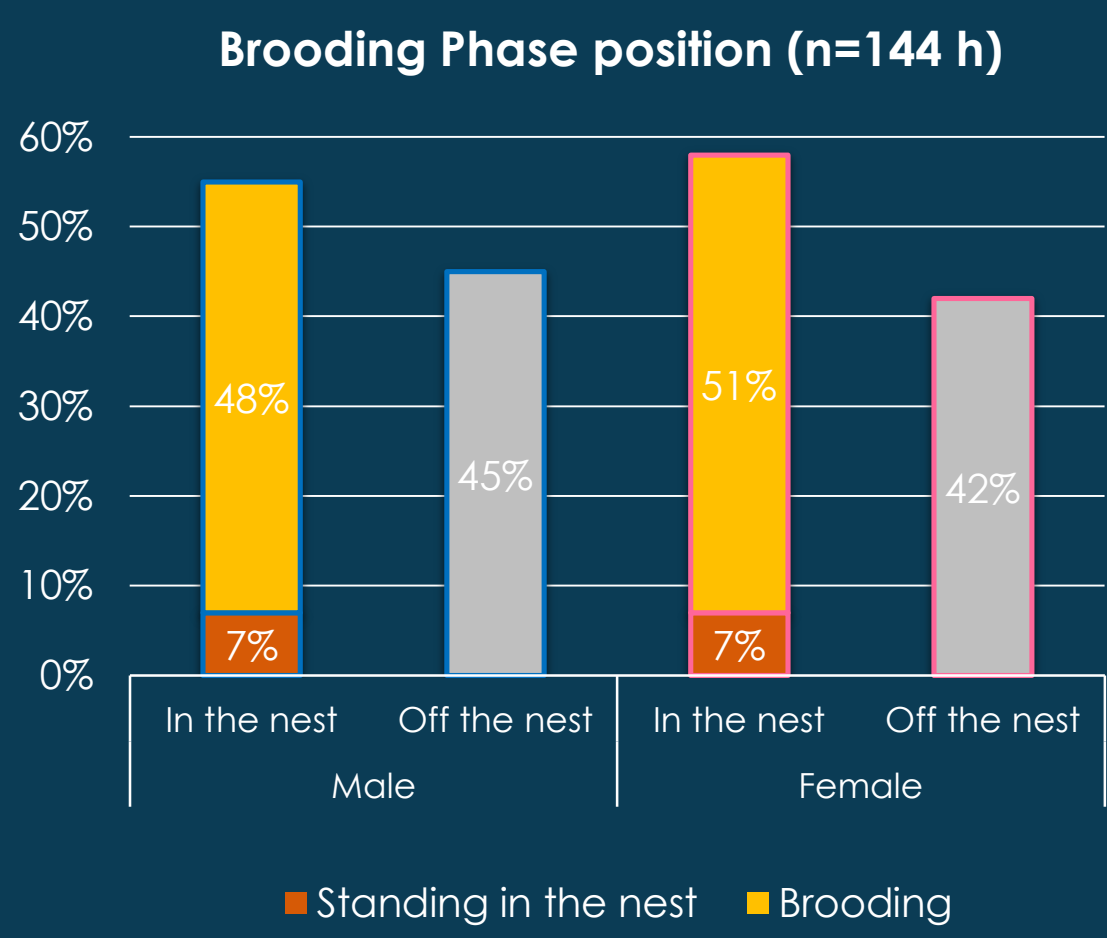
Phase 2

Central weaning weeks



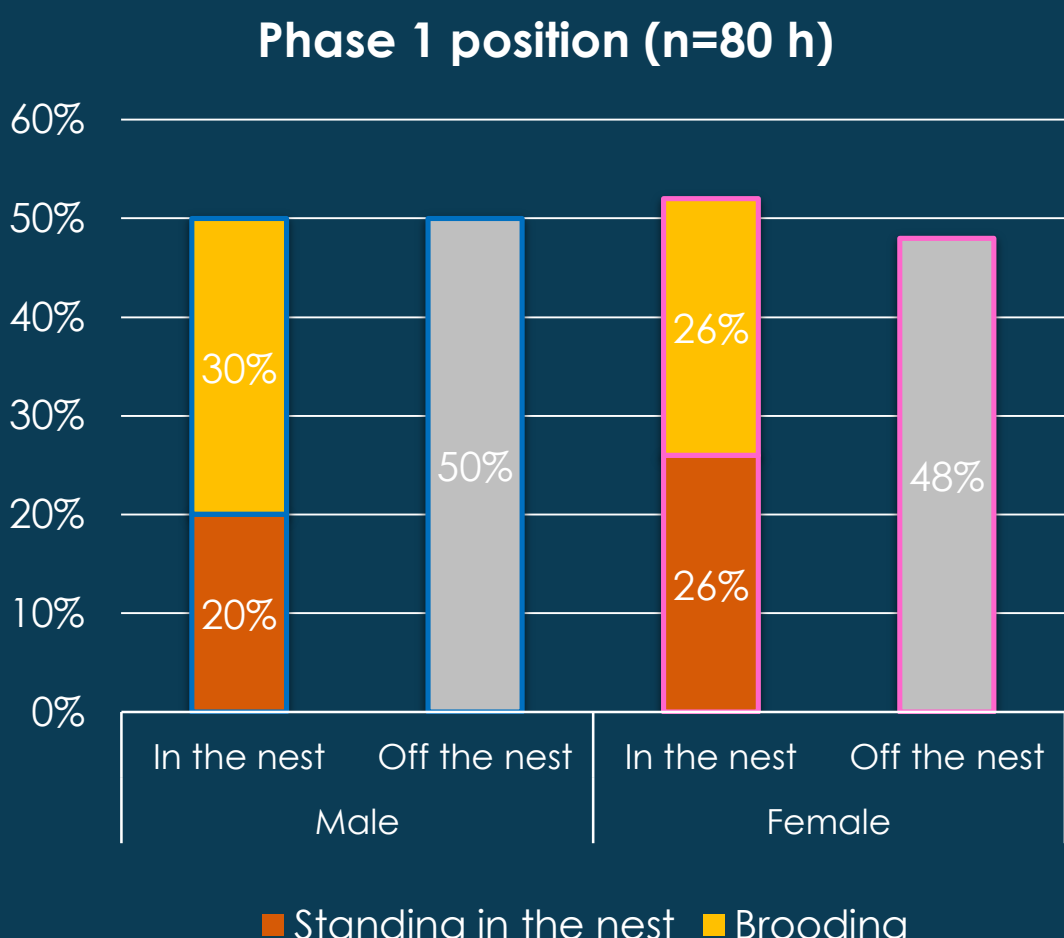
Phase 3

Two weeks before fledging

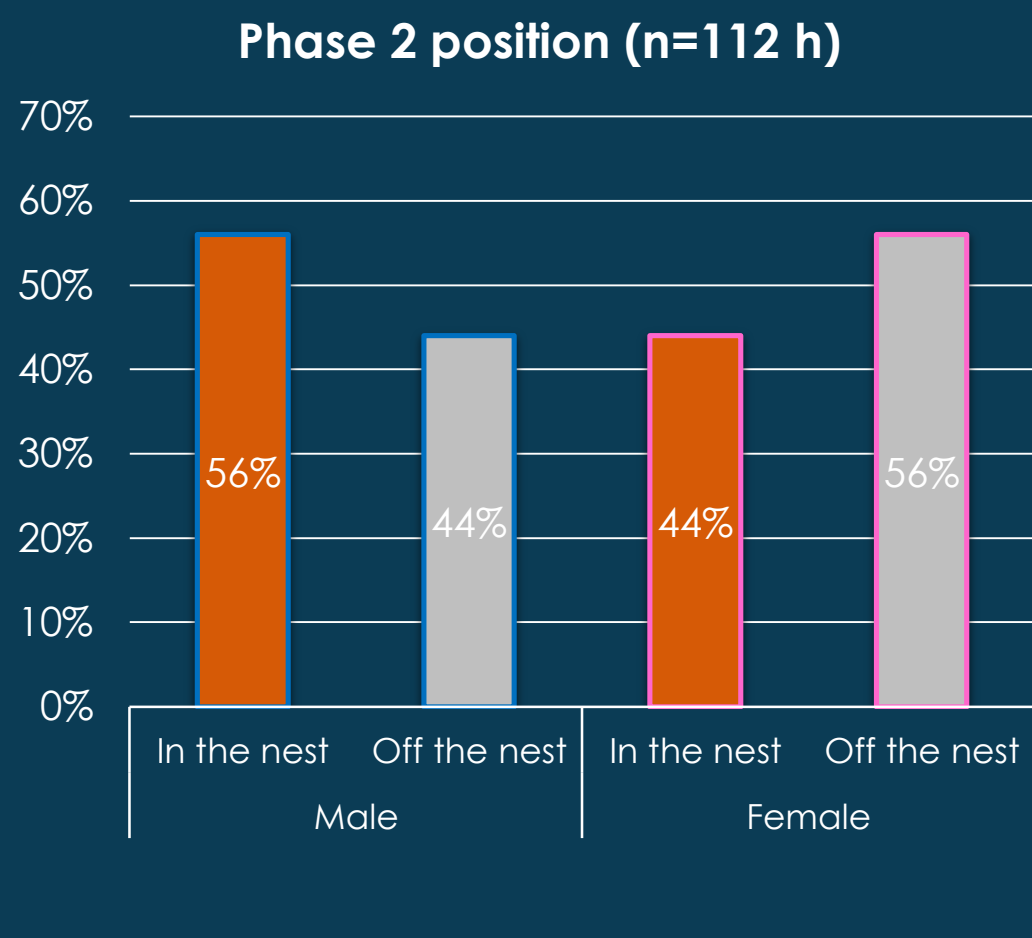


*P-value** Brooding = 0,83
Standing in the nest = 0,87
Off the nest = 0,89

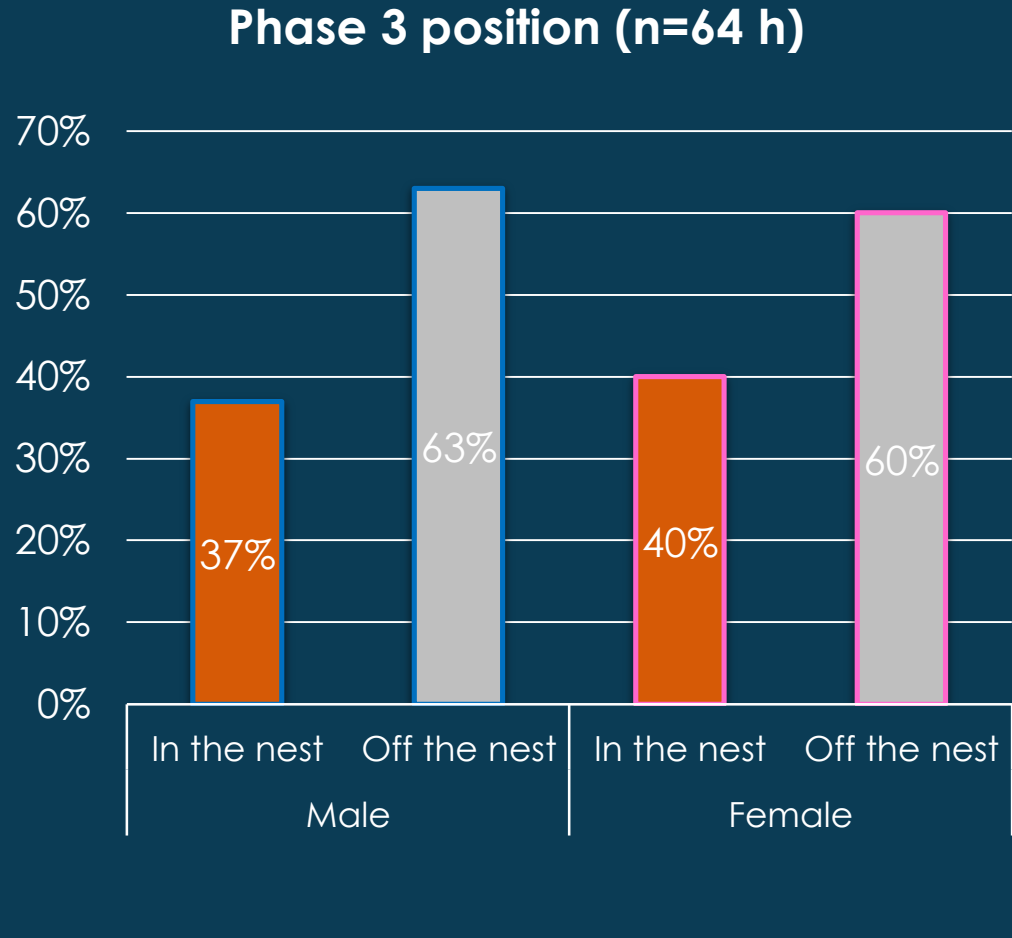
*U Mann-Whitney Test



*P-value** Brooding = 0,79
Standing in the nest = 0,76
Off the nest = 0,97

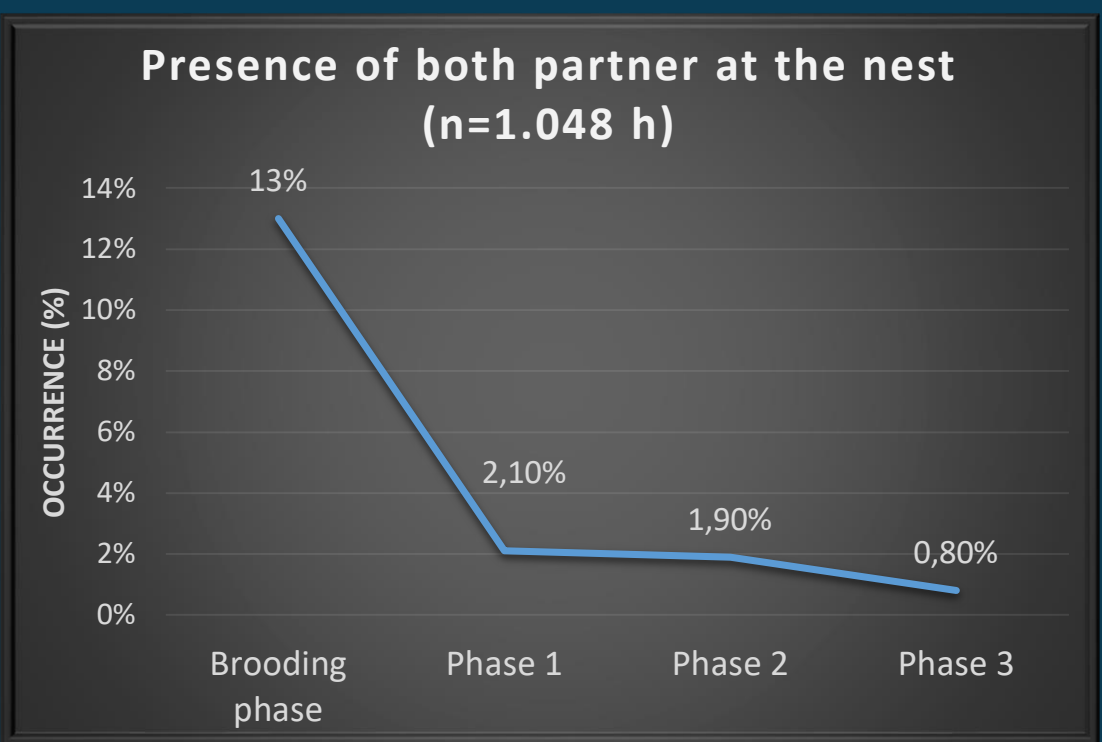


*P-value** Standing in the nest = 0,09
Off the nest = 0,09



*P-value** Standing in the nest = 0,87
Off the nest = 0,87

equal division of roles!

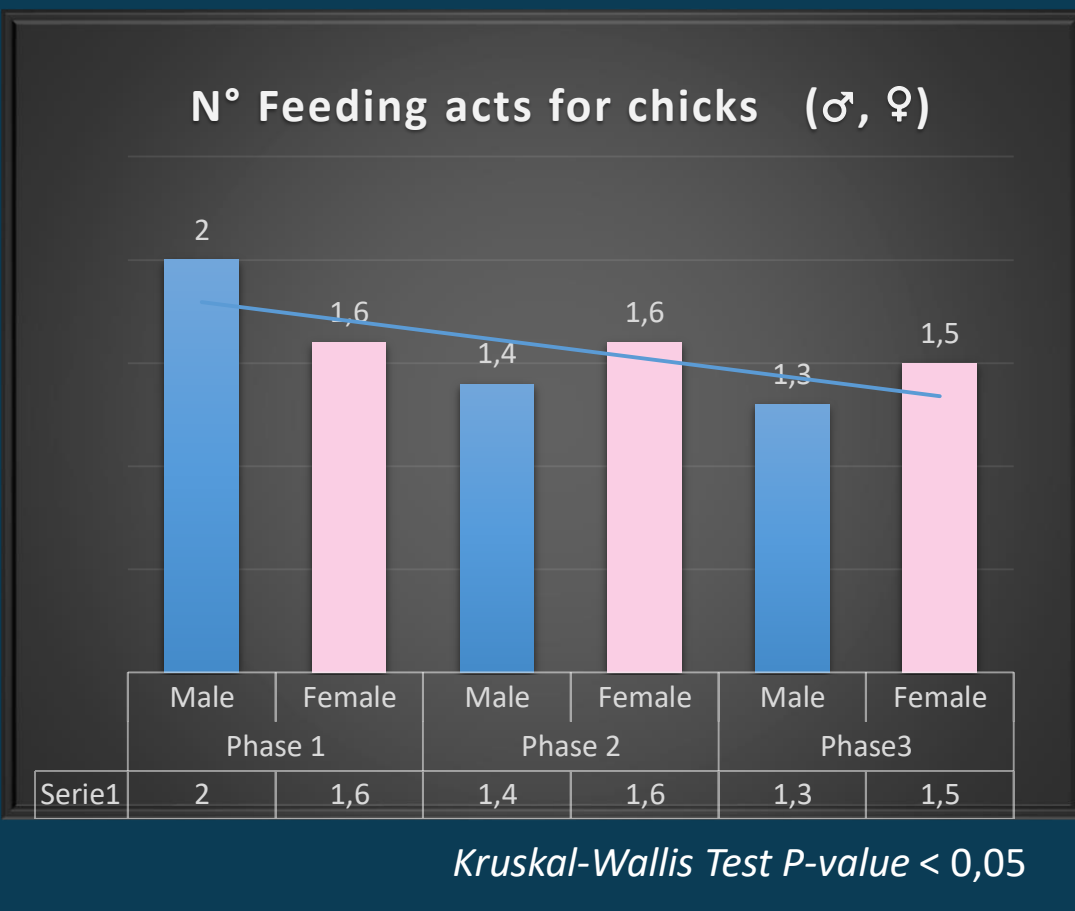


Frequency eggs turning	Male		Female		Total		U Mann-Whitney Test		
	Average	SD	Average	SD	Average	SD	p-value	z-score	U-value
	1,44	1,34	1,61	1,14	3,05	1,59	0,61	-0,506	145,5

	Brooding phase		Phase 1		Phase 2		Phase 3	
	Average	SD	Average	SD	Average	SD	Average	SD
Parental departure	4	1,9	3,9	1,1	3,3	1,3	2,9	0,85
Nest exchange	2	0,9	3,7	1	3	3,1	2,3	1,1

Maintenance actions of the nest

- Rearrangement occur at most once a day.
- Duration: 1-3 minutes.
- Primarily carried out during the Brooding phase and Phase 1.



CONCLUSION

- No significant behavioral differences based on gender, in the rearing of offspring.
- Males and females implement an **equal division of roles** throughout the breeding season.
- The decrease in the number of regurgitations during the various weaning phases is statistically significant.
- As time goes by, parental nest changes become less frequent, in line with the decrease in the number of feeding acts for chicks.
- There is a noticeable trend of increasing duration of the time spent away from the nest across the different weaning stages.
- The time spent standing next to the partner on incubation duty is limited to moments of duty change, egg rotation, and partner monitoring. These observations contrast with literature.

