BREEDING BIOLOGY OF THE SOUTHERN HOUSE WREN (*TROGLODYTES MUSCULUS*) IN CHILE: A COMPARATIVE ANALYSIS OF STUDIES BASED ON NEST BOXES

Biología reproductiva del chercán (*Troglodytes musculus*) en Chile: un análisis comparativo de estudios basados en cajas anideras

OSCAR SKEWES & JAVIERA CALVO-REBOLLEDO

Departamento de Ciencia animal, Facultad de Ciencias Veterinarias, Universidad de Concepción, Campus Chillán, Av. Vicente Méndez 595, Chillán, región del Ñuble, Chile.

Correspondence author: Javiera Calvo Rebolledo, javieramcalvo@udec.cl

RESUMEN. - El chercán (*Troglodytes musculus*) se distribuye ampliamente en Chile, habitando diversos hábitats. Sin embargo, la información sobre su biología reproductiva en el país es escasa. En esta revisión, sintetizamos y comparamos seis parámetros reproductivos del chercán reportados en seis estudios realizados entre el centro y el sur de Chile. Los parámetros evaluados fueron la tasa de ocupación de cajas anideras, el tamaño de nidada, éxito nidal, éxito reproductivo, y la duración de la incubación y la crianza de los polluelos. La ocupación de las cajas anideras promedió 58,5 ± 24,2 % (media ± DE). La media del tamaño de nidada fue 4,9 ± 0,7 huevos. Los periodos de incubación y crianza promediaron 14,6 ± 1,9 y 15,5 ± 2,7 días (media ± DE), respectivamente. El éxito nidal y éxito reproductivo fueron altos, promediando 81,9 ± 10,5 % y 81,4 ± 17,3 %, respectivamente. La tasas de ocupación de cajas anideras y el éxito reproductivo tuvieron mayor variación (CV > 20) que los otros parámetros reproductivos. Aunque analizamos pocos estudios, nuestros resultados sugieren que la variación geográfica en los parámetros analizados pudo ser influenciada por las condiciones ecológicas y climáticas locales.
PALABRAS CLAVE: disponibilidad de cavidades, éxito reproductivo, incubación, microclima, periodo de crianza, tamaño de nidada.

ABSTRACT. - The Southern House Wren (*Troglodytes musculus*) is broadly distributed in Chile and inhabits a variety of habitats. However, information regarding its reproductive biology in the country is scarce. In this review, we synthesize and compare six reproductive parameters of the Southern House Wren reported in six studies conducted in central and southern Chile. The parameters evaluated included nest box occupancy rate, clutch size, nest success, reproductive success, and incubation and chick rearing periods. Nest box occupancy averaged 58.5 ± 24.2 % (mean ± SD). The mean clutch size was 4.9 ± 0.7 eggs. The mean incubation and rearing periods were 14.6 ± 1.9 and 15.5 ± 2.7 days, respectively (mean ± SD). Nesting success and reproductive success were high, with mean values of 81.9 ± 10.5 % and 81.4 ± 17.3 %, respectively. Nest box occupancy rates and reproductive success exhibited greater variation (CV > 20) than the other reproductive parameters. Despite the limited number of studies, our analysis suggests that geographical variation in the parameters analyzed may have been influenced by local ecological and climatic conditions.
KEYWORDS: cavity availability, clutch size, incubation, microclimate, nestling period, reproductive success.

INTRODUCTION

Environmental variations across geographic ranges can exert selective pressures that shape the ecology and behavior of species. Habitat-generalist species (*i*.e., those that occupy multiple environments) often exhibit local adaptations to such pressures, which determine their reproductive behavior (Finch 1991, Bellocq *et al*. 2011, Callaghan *et al*. 2019, Wanamaker *et al*. 2020). One example is the Southern House Wren (*Troglodytes musculus*), an insectivorous passerine widely distributed from the Yucatán Peninsula in Mexico to Tierra del Fuego in southern South America (Walters 1994, Fernández *et al*. 2024).

Originally described as *Troglodytes aedon* (Vieillot 1809), this designation encompassed populations from North America to South America until well into the 20th century. However, genetic and bioacoustics studies revealed significant differences between northern and southern populations, leading to the recognition of South American populations as a distinct species: *T. musculus* (Brumfield & Capparella 1996, Sosa-López & Mennill 2014).

Southern House Wrens nest in natural cavities and exhibit biparental care, with occasional polygyny (Alworth 1996, Fernández *et al*. 2024). Females typically lay two to seven eggs per clutch, usually incubating them alone, while both parents feed altricial nestlings until fledging (Fernández *et al*. 2024). Nestlings reach their maximum size and weight around 11 days of age, although they remain in the nest for 15-17 days before fledging (Llambías *et al*. 2015).

As cavity-nesters, Southern House Wrens accept rapidly human-made cavities for nesting (Llambías & Fernández 2009, Alexandrino *et al*. 2022). Artificial cavities have proven to be an effective tool for studying the breeding biology and behavior of the species. Although nest box occupancy can vary across sites simply as a consequence of nesting-site availability, it may, in general, increase the clutch size and enhance the breeding success (Vergara 2007, Llambías & Fernández 2009). Thus, nest-box installation has become a widely used method that facilitates comparisons among different habitats.

Several authors have measured the clutch size, nesting success, reproductive success, and the duration of incubation and nestling periods of the Southern House Wren in Chile and Argentina (*e.g*., Muñoz-Pedreros 1996, Martínez Jamett 2005, Vergara 2007, Llambías & Fernández 2009, Riveros Velásquez 2009, Acuña Daza 2012, Ippi *et al*. 2012, Medrano Martínez *et al*. 2019). Research from other regions of the species' range is comparatively scarce or taxonomically inconsistent, as many South and Central American studies refer to Northern House Wren rather than the Southern House Wren. Although some authors have compared southern populations with North American populations (*e.g*., Young 1994, Llambías 2012, Llambías *et al*. 2015), their analyses do not provide intra-specific comparisons for Southern House Wrens across its distribution. To date, no author has assessed how the reproductive parameters of Southern House Wrens vary across environmentally distinct sites. Chile provides a practical opportunity to address this gap, as the species inhabits the full length of the country, from 30° to 56º S (Ippi *et al*. 2018), and from sea level up to around 3400 m a.s.l. (Fjeldså & Krabbe 1990).

In addition, there is substantial knowledge on the Northern House Wren's breeding biology across its range, which is a suitable reference for exploring how reproductive traits may vary among the Southern House Wren populations. Previous studies from North America have revealed that environmental differences can shape aspects of reproductive behavior in the Northern House Wren, including nest construction, clutch size, incubation, chick-rearing effort, and responses to predation or environmental stress (Klomp 1970, Finch 1991, Halfwerk *et al*. 2011, Kight & Swaddle 2011, Ortega 2012, Capilla-Lasheras 2022, Levin *et al*. 2023, Hanson 2025).

The reproductive traits of Southern House Wrens are expected to vary among habitats owing to differences in vegetation structure, landscape configuration, and levels of human influence. This review compiles and compares the available information on the reproductive biology of this species in the Chilean environments where it has been studied. Although the number of studies is limited, the contrasting ecological contexts, from urban areas in Santiago to monoculture plantations and transitional forest and shrublands in Chiloé Island, provide an opportunity to examine whether reproductive parameters differ among populations.

Based on published work, we describe variations in nest-box occupation, clutch size, incubation and nestling periods, and reproductive output, considering that geographic and environmental differences may be reflected in these traits. The review also highlights inconsistencies and gaps in existing studies, identifying methodological aspects that would benefit from greater standardization and integration of information previously reported in isolation into a broader ecological framework. Given the restricted evidence available, our analysis was primarily descriptive and comparative rather than statistical.

MATERIALS AND METHODS

Data collection and organization

We conducted a systematic search to identify studies on the reproductive biology of the Southern House Wren in Chile, including those published in English and Spanish. The search primarily covered formal academic databases, including Google Scholar, Web of Science, Scopus, and the University of Concepción Library repository, which provided access to theses. We used ResearchGate as a complementary resource to access theses, abstracts, or other reports that were not indexed in formal databases. We also used Scispace, an AI-supported literature exploration tool, to identify key publications and connections among the studies.

We conducted a progressive search in five stages, moving from general to specific terms. Below, we summarize these five stages.

Exploratory stage
Initial searches used the species' scientific name "*Troglodytes musculus*" to assess overall availability of publications. This revealed that few studies were indexed in Scopus and Web of Science, whereas Google Scholar retrieved a larger number of records. To account for taxonomic inconsistencies in the literature, we also searched for "*Troglodytes aedon"*, as some studies may have referred to Chilean populations using this broader species designation. Additional searches also included the common names "Southern House Wren" and "Chercán" to capture local literature and reports that may use common names instead of the scientific name.

Refinement stage
We gradually incorporated additional search terms to focus on reproductive ecology and nest boxes. Given the limited number of studies available no year restrictions were imposed. We tested the following keyword combinations of keywords.

"Reproductive ecology"/"Ecología reproductiva"
"Reproductive behavior" / "Comportamiento reproductivo"
"Nest boxes" / "Cajas nido"
"Nesting houses" / "Cajas anideras"

We used Boolean combinations when supported by the platforms. For example:

("*Troglodytes musculus*" OR "Southern House Wren" OR "Chercán") AND ("reproductive ecology" OR "reproductive behavior") AND "Chile"
("*Troglodytes musculus*" OR "Southern House Wren" OR "Chercán") AND ("reproductive ecology" OR "reproductive behavior" OR "nest boxes" OR "houses for nesting") AND "Chile"

When the platforms did not support Boolean operators, we combined single keywords with scientific and common species name to ensure no relevant studies were missed. We included the term "Chile" to prioritize national studies, although we consulted papers from other countries only for contextual understanding.

Study selection and inclusion criteria
We only included studies conducted in Chile that used nest boxes and reported at least one of the parameters listed above for quantitative or descriptive comparisons. The reproductive parameters considered in this review were as follows:

Occupancy of nest boxes.- Refers to the percentage of nest boxes showing any stage of nest construction (from initial material deposition to completed nests, eggs, or nestlings). For studies that did not provide an occupancy percentage, we calculated it as follows: (number of occupied nest boxes divided by the number of all nest boxes) × 100. Although it is not a reproductive trait per se, it helps interpret how nesting activity varies among environments and supports comparisons of other reproductive parameters.

Clutch size. Refers to the number of eggs laid per nest.

Nesting success. Represents the percentage of eggs hatched relative to eggs laid.

Reproductive success. Represents the percentage of nestlings that fledged relative to eggs laid.

Incubation period. Refers to duration in days of incubation as defined by each study. The incubation period is typically measured from the laying of the last egg or from the first recorded egg until hatching, depending on each protocol.

Nestling period. Refers to the number of days from hatching to fledging, following the definition provided in each study, noting that visit frequency and specific criteria varied among sources.

We excluded studies that lacked data on nest boxes, did not report the reproductive parameters of interest, or were anecdotal and not scientifically validated. Owing to the multiple sources and combinations of search terms used, a precise count of initial records was not feasible. After applying the inclusion criteria, six studies were retained for comparison.

Data extraction
When available, we extracted reproductive parameters directly from published tables. If a study did not provide a summary value but reported sufficient raw information (*e.g.*, number of eggs, occupied boxes), we calculated the corresponding parameter using standard formulas. Where the information was only partial (*e.g.*, counts that required reconstructing intermediate values), we estimated the parameter using the raw data provided by the authors. To do so, we applied standard arithmetic derivations. Because these parameters were not originally calculated or summarized in the source studies, we treated the values obtained here as approximate estimates derived specifically for this review.

Reconstructed parameters and methodological exceptions

When studies reported summary values for the reproductive parameters, we extracted these directly. For studies providing only raw counts (*e.g*., number of eggs, hatchlings, fledglings, occupied boxes), we calculated the corresponding parameters using the same operational definitions as in the studies that reported those parameters. If data were insufficient for direct calculation (such as when only monthly totals were available) we estimated the parameters from available raw data. Table 1 summarizes the distinction between reported and calculated parameters. Only one study required extensive estimation: Martínez-Jamett (2005). For this study, we derived clutch sizes and success metrics from monthly egg totals and numbers of occupied nest boxes after excluding nest boxes used by other species.

Two studies required additional consideration due to the peculiarities in sampling design and information analysis. Muñoz-Pedreros (1996) reported nest-box occupancy for two separate sites (Temuco and Valdivia), which were therefore treated as independent entries. Medrano Martinez *et al*. (2019) presented occupancy, clutch size, and reproductive success separately for two breeding seasons, but combined incubation and nestling periods across both years.

Due to two inconsistencies among studies, our temporal parameters should be interpreted as broadly comparable estimates rather than strictly equivalent metrics. Firstly, the distinct authors monitored nests daily, every three days, or weekly. Secondly, the operational definitions of the incubation and nestling periods differed slightly between authors. We considered these inconsistencies when interpreting cross-study comparisons and acknowledged them as a limitation of the dataset.

Data analysis

Our analysis aimed to summarize and visualize reproductive parameters from the studies we reviewed. First, we compiled all data collected into a general database. Subsequently, we imported them into R, a free software for data standardization and analysis. (R Core Team, v. 4.4.1)

The response variables were all those we described previously in the section “study selection and inclusion criteria.” These were nest occupancy, clutch size, incubation period, nestling period, nesting success, and reproductive success. These metrics were either explicitly reported or could be derived from available data in at least three of the selected studies. Together, these metrics represent key stages of the reproductive cycle. We considered the geographic location and habitat type as the two main explanatory variables. This enabled us to examine reproductive parameters with regard to the geographic position of each study site and the environmental context in which other authors studied the Southern House Wren.

We calculated the mean, standard deviation (SD), range, and sample size for each reproductive parameter. We used scatterplots to explore geographical trends in reproductive parameters available. Linear regression lines were fitted for illustrative purposes only, without statistical inference or assumption testing. Additionally, we assessed the relative variability of each reproductive parameter among studies using the coefficient of variation (CV = [SD / Mean] × 100). This allowed us to compare variability across traits measured on different scales and identify which reproductive traits show greater heterogeneity among study sites.

RESULTS

We analyzed six studies (see Table 1). These studies covered localities from Santiago (33°34′S) to Chiloé Island (41°52′S) and various environments. These environments included university campuses (Riveros Velásquez 2009, Acuña Daza 2012, Medrano Martínez *et al*. 2019), cherry (*Prunus avium*) orchards (Martínez Jamett 2005), Monterey pine (*Pinus radiata*) plantations (Muñoz Pedreros 1996), and forest and shrubland edges (Ippi *et al*. 2012). The number of monitored nest boxes ranged from 38 to 350, and nest heights varied from 1.3 to 3 m.

The nest occupancy ranged widely from 23 % to 80 %, with a mean of approximately 58.5 % (Table 1). The clutch size, nesting success, and reproductive success varied less widely (Table 1). The mean clutch size was nearly five eggs, with a range from about four and six eggs. Notably, nesting success was high, averaging 82 %. Riveros Velásquez (2009) documented the highest nesting success in a university campus in Chillán (> 90%). Overall, reproductive success averaged 81 %, ranging from about 51 % to 91 %. The incubation period and the nestling period (from hatching to fledging) averaged approximately 15 and 16 days, respectively. There was low variation in the duration of these periods across studies (Table 1).

Visualization of the available data for the six parameters using scatterplots revealed apparent differences among localities. The incubation and nestling periods showed greater variability for the northern sites than for southern sites (Fig. 1). Clutch sizes were generally larger in the northern and central localities and smaller in the southern localities. In contrast, both incubation and nestling periods exhibited the opposite trend, with longer durations in the southern localities and shorter durations in the northern localities (see Fig. 1). Nest box occupan-

Table 1. Summary of studies on the breeding biology of Southern House Wrens (*Troglodytes musculus*) in Chile and its reproductive parameters. The latitudes and longitudes correspond to the approximate geographical locations of the study sites. Geographical coordinates for the Temuco and Valdivia sites were obtained from nearby cities, as the Muñoz-Pedreros (1996) study did not specify exact position. Asterisks (*) indicate data not included in the respective study but calculated for this analysis. Dashes (-) indicate missing data. Nest box external dimensions are given as width × depth × height (cm). Entrance characteristics are indicated in parentheses as (E: Ø = entrance diameter; H = height from base).

Reference	Location	Latitude, longitud	Environ-ment	Study year and period	No. of nest boxes	Nest box height (in m)	Nest box external dimensions and entrance (Ø; H) (cm)	Occu-pancy (in %)	Clutch size (number of eggs)	Nesting success (in %)	Repro-ductive success (in %)	Incuba-tion period (in days)	Nestling period (in days)
Medrano Martínez *et al*. (2019)	Santiago	33°34'S, 70°37'W	University campus	2007-2010 (Aug-Jan)	100	1.3-2.5	13×13×27 (E: Ø 4)	23*	5.3 ± 2	-	89.5*	12.6 ± 5.5	12.7 ± 5.8
								51*	4.8 ± 1.1		84.8*		
Martínez Jamett (2005)	Chillán	36°36'S, 72°16'W	Cherry orchards	2003-2004 (Sep – Feb)	103	2	16×14×28 (E: Ø 3.4; 16)	50.5*	6.2 ± 2*	75.3 %*	91.3	-	-
Riveros Velásquez (2009)	Chillán	36°35'S, 72°04'W	University campus	2004-2007 (Aug-Dec)	110	1.5-2	11.4×10×18.7-20.7 (E: Ø 3.5; 11)	80	4.4 ± 0.7	94%	90.6	16.8 ± 4.0	18.4 ± 3.4
Acuña Daza (2012)	Chillán	36°35'S, 72°04'W	University campus	2009-2010 (Sep-Jan)	38	1.7-2	11.2×10×18.6-20.6 (E: Ø 3.3; 11.6)	50	4.9 ± 0.5	76.3 %*	50.8*	14.9 ± 0.7	17.8 ± 1.4
Muñoz-Pedreros (1996)	Temuco	38°44'S, 73°04'W	Monterey pine plantation	1992-1993 (Sep-Sep)	61	3	16×16×16 (approx.) (E: Ø 5)	98.4	-	-	-	-	-
	Valdivia	39°46'S, 73°39'W	Monterey pine plantation	1992-1993 (Sep-Sep)	55	3	16×16×16 (approx.) (E: Ø 5)	56.6	-	-	-	-	-
Ippi *et al*. (2012)	Chiloé Island	41°52'S, 73°39'W	Scrubland/ forest edge	2002-2005 (Oct-Jan)	350	1.5	16.5×18×25-30 (E: Ø 3; 19)	-	4.3 ± 0.7	-	-	16 ± 1.0	16 ± 1.0
Overall mean ± SD	-	-	-	-	-	-	-	58.5 ± 24.2	4.9 ± 0.7	81.9 ± 10.5	81.4 ± 17.3	14.6 ± 1.9	15.5 ± 2.7

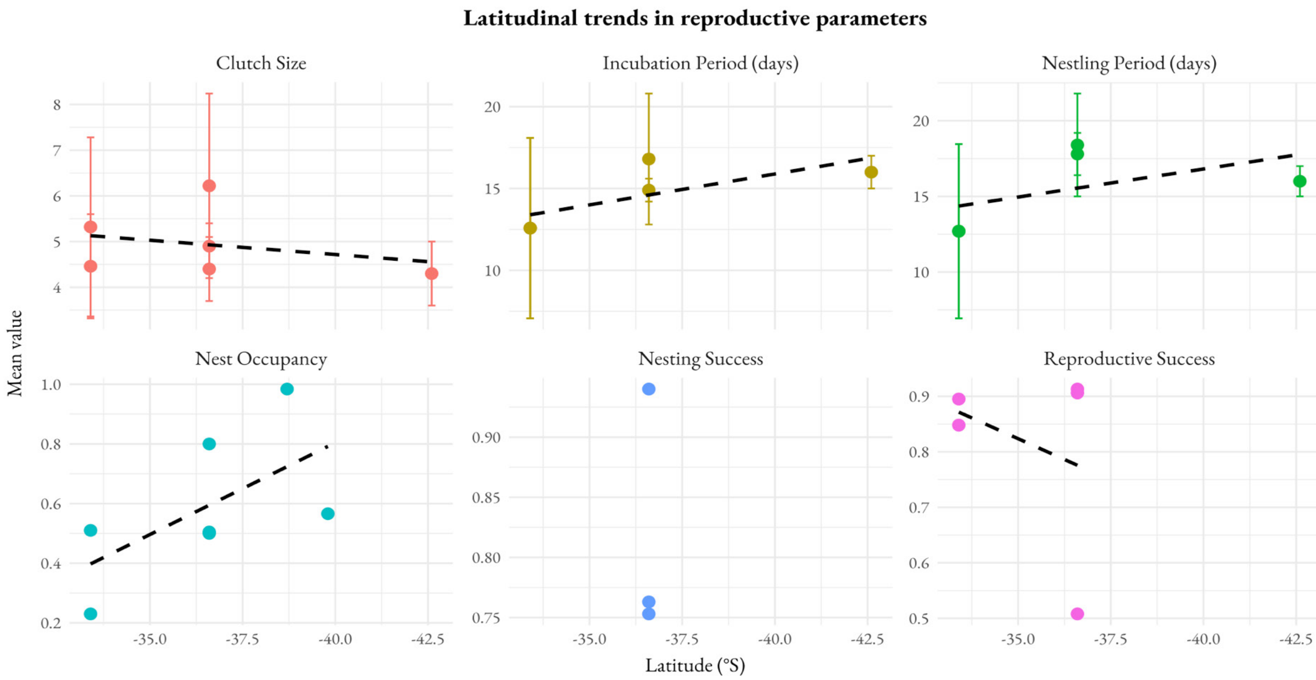

Figure 1. Latitudinal trends in reproductive parameters of Southern House Wrens (*Troglodytes musculus*) in Chile. Information was obtained from six studies conducted between central and southern Chile. Bars show the mean ± SD for clutch size, incubation period, and nestling period. Dashed lines indicate latitudinal trends from north to south.

cy showed the greatest variation, followed by reproductive success and nestling period. Clutch size, incubation period, and nesting success exhibited the least variation (Table 2).

DISCUSSION

Methodological limitations

Our analysis is the first to combine all the available information on the reproductive breeding biology of the Southern House Wren in Chile. This includes studies conducted in a variety of habitats and climates. The primary constraint of our analysis was the low number of available studies, which were conducted across a relatively narrow geographic range. However, when considered as a whole, our approach enabled the identification of geographical differences in the breeding habits of Southern House Wrens. At the same time, it highlights methodological challenges that constrain the interpretation of the observed patterns.

One of the main limitations during our review was the marked methodological heterogeneity among studies. The analyzed studies contained inconsistencies in monitoring frequency, in the definitions of laying and incubation, in the fledging dates, in the criteria to calculate reproductive success, and in the level of detail with which reproductive parameters were reported. Such inconsisten-

Table 2. Descriptive statistics of reproductive parameters of Southern House Wrens (*Troglodytes musculus*) calculated from six studies conducted in Chile. SD = standard deviation, CV = coefficient of variation, and n = number of studies.

			Range			
Parameters	Mean	SD	Min	Max	CV (%)	n
Nest occupancy (%)	58.5	24.2	23	98.4	41.4	7
Clutch size	4.9	0.7	4.3	6.2	14.9	6
Nesting success (%)	81.9	10.5	75.3	94	12.8	3
Reproductive success (%)	81.4	17.3	50.8	91.3	21.3	5
Nestling period (days)	15.5	2.7	12.7	18.4	17.5	5
Incubation period (days)	14.6	1.9	12.6	16.8	13.3	5

cies greatly precluded direct comparisons across studies. Added to this is the taxonomic inconsistency present in part of the South American literature, where populations that, based on geographic distribution, would correspond to Southern House Wren were presented as Northern House Wren or its subspecies (Muñoz-Pedreros 1996, Martínez Jamett 2005, Ippi *et al*. 2012, Aguilar Estalles 2014, Llambías *et al*. 2015, Medrano Martínez *et al*. 2019, Alexandrino *et al*. 2022). This reflects the long-standing debate over the taxonomic revision of *T. aedon*, which ultimately led to the recognition of Southern House Wren as a separate species (Brumfield & Caparella 1996, Klicka *et al*. 2023, Remsen & SACC 2025). This lack of methodological and nomenclatural standardization complicates direct comparison among studies and limits the possibility of evaluating broader ecological gradients. This underscores the need to move towards common definitions and comparable protocols that allow for a more accurate assessment of reproductive variation in among Southern House Wren populations.

Explaining for geographical variations in reproductive traits

Due to limitations of the available data, we could not elucidate the true causes of the observed geographical variations among reproductive traits of Southern House Wrens in Chile. It is possible that the observed variations are merely an artifact of the limited number of studies included in the analysis. Even so, the coefficients of variation indicate that traits closely linked to artificial cavity use and overall breeding output varied more markedly among sites. Conversely, parameters describing the core developmental phases (clutch size, incubation period, nestling period) exhibited comparatively lower variation (Table 2). This finding aligns with the hypothesis that traits associated with microhabitat use may be more strongly influenced by local environmental context. On the contrary, physiological traits tend to be more conserved, even across ecologically contrasting contexts (Martin *et al*. 2007, Llambías 2012, Fernández *et al*. 2024).

Geographical variations in nest box occupancy may reflect variation in the local availability of natural cavities (Tomasevic *et al*. 2006). In environments such as cherry orchards, pine plantations, and university campuses where natural cavities are presumably scarce, Southern House Wrens occupied a greater proportion of nest boxes (Muñoz-Pedreros 1996, Martínez Jamett 2005, Riveros Velásquez 2009). In contrast, in more natural environments, Southern House Wrens occupied a smaller proportion of nest boxes (Ippi *et al*. 2012). We recognize that these variations preclude us from determining underlying causes. Moreover, comparable estimates of population density were not available across the studies examined. Nonetheless, the observed pattern is consistent with the idea that local ecological factors, such as the abundance and quality of natural cavities, predation, and microclimatic conditions, can modulate the use of artificial nesting cavities (Llambías & Fernández 2009, Alexandrino *et al*. 2022). Thus, nest box occupancy should be interpreted mostly as a structural response to environmental context rather than a direct indicator of population density or productivity.

The observed latitudinal variation in the durations of incubation and nestling periods aligns with the well-known effect of temperature on embryonic and nestling development rates in passerines (Conway & Martin 2000). In general, we found that Southern House Wrens in warmer localities had shorter incubation and nestling periods, whereas those in the colder locality had longer and more homogeneous periods. This suggests that ambient temperatures can influence the development of Southern House Wren embryos and nestlings, even within the relatively narrow geographic range considered here.

The observed clutch sizes of the Southern House Wren across localities fall within the range reported for temperate populations of the species (Vergara 2007, Llambías & Fernández 2009, Fernández *et al*. 2024). In addition, observed clutch sizes were larger than those reported for the species in more tropical environments (McKenney 2013, Hayes 2014). Although clutch sizes in south-central Chile were slightly larger, these remain within the known range for the species. Perhaps these geographical variations in clutch sizes of Chilean populations were influenced by local food availability, habitat structure, or predation pressure (Finch 1991, Capilla-Lasheras *et al*. 2022). Some authors reported that, at continental scales, the clutch size of various passerine species tends to increase toward higher latitudes (Young 1994, Evans *et al*. 2005, Guo & Lu 2022). However, our analysis did not reveal that trend in the Chilean populations of the Southern House Wren. The absence of a pattern likely reflects both the limited geographic scale considered and the predominant influence of local environmental conditions at the study sites.

Some of the revised studies reported higher nesting and reproductive success in more human-modified environments. Instead, studies conducted in more natural habitats reported slightly lower success. However, we found that even studies from the same site can give very different estimates. That is the case of Riveros Velásquez (2009) and Acuña Daza (2012), who conducted their studies on the university campus in Chillán. These authors reported notably different values for reproductive success, despite using the same study site. More than reflecting a true change in reproductive traits, these discrepancies could be related to environmental differences between the sampled years or to variations in monitoring. Given that both studies followed similar protocols, it is likely that year-specific conditions contributed to the reported results. This highlights the importance of developing standardized protocols that allow for identifying the underlying causes of such differences.

Our results are indicative rather than conclusive. Even so, these results helped us to identify which aspects of the reproductive cycle may be most sensitive to local environmental conditions. Habitat structure, cavity availability, and microclimatic conditions are among the factors that could influence the local expression of reproductive traits in cavity-nesting passerines (Martin *et al*. 2007, Llambías 2012, Fernández *et al*. 2024). Several ecological attributes make Southern House Wrens an appropriate model for future large-scale comparisons regarding their breeding habits. Some of these attributes are their extensive range, high tolerance to human-modified habitats, and rapid acceptance of nest boxes. This is not only useful for studies focused on Southern House Wrens but also for examining how passerines' reproductive traits respond to contrasting environmental conditions. However, moving toward consistent reproductive definitions and standardized protocols constitutes a crucial step for strengthening such comparisons. Although descriptive, our analysis provides a necessary foundation for guiding more *systematic* comparative research and for identifying which methodological aspects require further standardization.

CONCLUSION

A lack of systematic studies and consistent methods hindered a more thorough analysis of the geographical variation in the Southern House Wren's reproductive traits. However, we were able to identify which reproductive parameters vary most and which vary least across studies. These preliminary results highlight the traits most sensitive to local environmental conditions. Consequently, future research should include both the northernmost and southernmost populations. Taken together, this review provides a foundation for future studies and strengthens the comparative approach to Southern House Wren reproductive biology in Chile.

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