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Distribution and nest - hole selection in the breeding Pallid Swift

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The breeding range of the Pallid Swift (*Apus pallidus* Shel.) covers northern Africa and the Mediterranean; Piedmont, our study area, is at its northern boundary (Boano 1979, Pulcher and Boano 1984, Cramp and Simmons 1985).

In Piedmont, fourteenth and fifteenth century brick buildings are usually selected as nesting sites because of the abundance of holes, placed at regular intervals in their facades, a feature of churches and buildings of that period. The Swift *Apus apus* and the Alpine Swift *A. melba* are known to nest there, as well as the Pallid Swift. This paper describes the three largest Pallid Swift colonies in Piedmont and strategies of the Pallid Swift in hole selection in comparison with the Swift.

MATERIALS AND METHOD - We studied the following colony sites:

Torino: East, West and South walls, and the towers of Palazzo Madama, a Royal Castle.

Moncalieri: South-East and South-West Cathedral walls of the Santa Maria della Scala Church.

Saluzzo: North and South walls of the Cathedral, the Holy Mary of the Assumption Church.

The study was carried out in 1984. Nest holes were checked during 17 visits to Turin, 4 to Moncalieri and 34 to Saluzzo. Drawings of the three buildings were prepared, with details on the available holes (those that on visual inspection appear to be un-obstructed) and on the main reference points or marks (windows, doors and drain pipes) and were used to assess nest distribution. Any hole in which a swift entered during the breeding period was considered occupied; nests were not classified as occupied when one or more swift were seen clinging to the hole entrance without actually entering. Nest observations started in June when eggs or nestlings were found; birds were not watched at sunset or at sunrise when non-parent birds are known to explore cavities. Futhermore in the Saluzzo colony, the depth of 106 holes with 80 nests was measured by means of a folding rule.

To evaluate statistically Pallid Swift distribution in the colonies, the x^2 test was utilized. Equal size areas had to be sampled: in this case we selected nine neighbouring holes in 3x3 squares where possible. Since distribution was non-random, we used an aggregation index (A.I.), which was calculated according to the formula $A.I. = \sum (x_i - x)^2 / x (n-1)$ (Andrewartha 1970), where x_i = the number of birds in sample, x = the average number of birds in each sampled area and n = the number of sampled areas.

If values are greather than 1, one can expect aggregations. Values smaller than 1 indicate negative distribution i.e. where the individuals spread out and distribute evenly.

RESULTS AND DISCUSSION - Spatial distribution (Fig. 1, 2 and 3) - Of the potential nesting sites 24% were occupied in Saluzzo, 52% in Moncalieri and 33% in Torino. Aggregation indices reached high values pointing to aggregate nesting distribution (Tab. I). The Pallid Swift showed a preference for certain parts of the buildings, where a higher concentration of pairs was observed. The walls of Palazzo Madama in Torino were divided into four levels, each one with 6 lines of holes (Tab. II). As Boano (1979) suggested, the most intensively used level was the medium - low

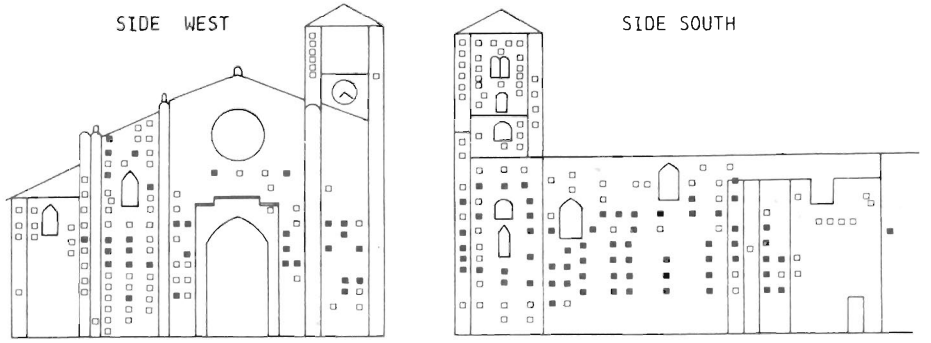

FIGURE 1. Distribution of the Pallid Swift (black squares) in the colony of Moncalieri (sides South and West).

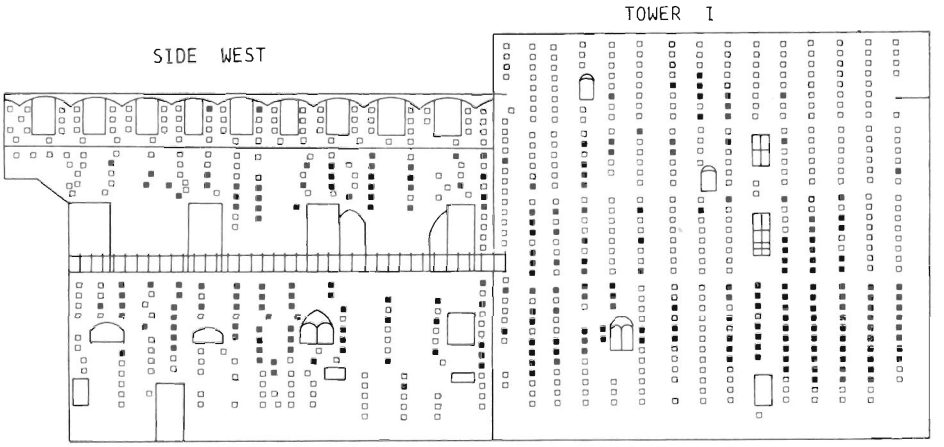

FIGURE 2. Distribution of the Pallid Swift (black squares) in the colony of Torino (side West and tower I).

one (8 to 13 m) where more than 50% of the pairs nested. Pallid Swifts selected the lower levels when Swifts were also present: in Turin all the holes in the lower 12 lines were taken up by Pallid Swift, and the same was true of the lowest three lines in the walls of Saluzzo and Moncalieri Cathedrals. Both species can nest side by side at a considerable height in the upper sections of the buildings. Fig. 2 underscores the Swifts' preference for the upper sections.

Selecting the hole. Holes used by the colonies in this survey had square-shaped entrances with 15 cm sides, and were up to 100 cm deep Holes with much smaller entrances (in some cases barely enough to let the adult in) were also selected if the nesting space was sufficient. According to some authors (Hoffman et al 1951, Castan

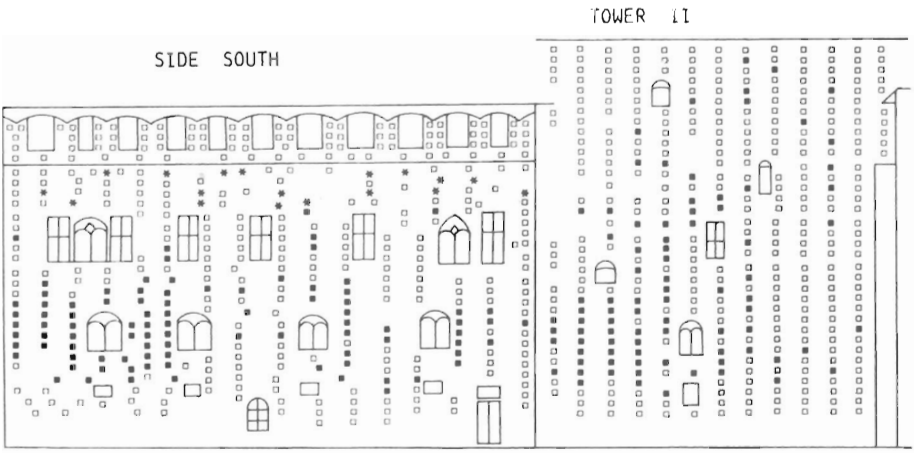

FIGURE 3. Distribution of the Pallid Swift (black squares) and the Swift (asterisks) in the colony of Torino (side S and tower 2).

TABLE I. Aggregation index in Pallid Swift colonies (sampling areas of 9 neighbouring cavities)

	number of sampling areas	number of Pallid Swifth pairs	Aggregation index	x^2	P<
MONCALIERI	17	76	2.03	32.5	.01
SALUZZO	56	120	2.43	136	.001
TORINO (Side S)	43	102	2.43	102	.001
TORINO (Side W)	33	97	2.37	75.8	.001
TORINO (tower 1)	52	172	2.34	119.3	.001
TORINO (tower 2)	41	113	2.24	89.6	.001

1955) Pallid Swifts built nests nearer the exit compared to the Swifts which preferred deeper cavities. However, many Swifts built their nests in places exposed to the sunlight (Mayaud 1951) or in the same sites as Pallid Swifts (Boano 1979). It is interesting to see what depth the birds select when a range of choice is available. In Saluzzo available holes ranged from 20 to 100 cm (Tab. III). Unused holes were mostly under 40 cm; most nests were placed at 60-80 cm in side holes of about 80-90 cm. The x^2 test confirmed that deep holes are selected ($P<0.01$).

In many bird species colonial breeding is an adaptation to various environmental factors (nest predation, shortage of suitable nest sites, increased foraging efficiency (etc.). In the Pallid Swifts pair aggregation in nesting areas shows that social factors play a determinant role in nest choice, even if physical contraints (hole height and depth) can limit the potential nesting sites. Moreover, it is still unknown how swift coloniality evolved from the ancestral situation (nest crevices in cliffs for the Pallid Swift, Cramp 1985).

TABLE II. Height distribution of nest holes occupied by Pallid Swift

Altitudinal band	Available holes	Occupied holes Number %	Expected value Number
	Facade West	(p <0.001)	
High 74	2	2.7	20
Medium - high 90	29	32	24
Medium - low70	37	53	19
Low 72	14	19	19
	Facade South	(p<0.001)	
High 85	-	0	19
Medium - high109	6	5.5	25
Medium - low112	59	53	26
Low 85	25	29	19

TABLE III.. Location of Pallid Swift nests in relation to cavity depth

		Cavity depth (cm)									Nests
		20	30	40	50	60	70	80	90	100	(total)
Nest location (cm)	20	1	1		1						3
	30		4		1						5
	40			3	4	2		2			11
	50				3			6			9
	60					2	4	9			15
	70						4	6	8		18
	80							8	9		17
	90								2	2	2
	100										-
Unused cavities		5	9	5	3	-	1	2	-	1	
Cavities (total)		6	14	8	12	4	9	33	19	1	106

Useful information will derive from the study of nest distribution on cliffs and from comparing Pallid Swift ecology with (1) *Apus melba* who share quite similar nesting habits and with (2) *A. apus* , who have different original adaptations (nests in hollow threes).

Further research should also explain why the Swift is the species that has most widely adopted the new possibilities offered by human buildings (Cramp 1985).

RIASSUNTO - Distribuzione spaziale e scelta della cavità di nidificazione nel Rondone pallido

- Si descrive la strategia di occupazione dei siti di nidificazione nel Rondone pallido in tre città del Piemonte.
- Nelle figure 1, 2 e 3 sono indicati i fori occupati dalle coppie nidificanti, in Fig. 1 inoltre sono riportati i fori occupati dal Rondone nero.
- Nella Tab. I si evidenzia la nidificazione di tipo aggregato, e nella Tab. II la scelta preferenziale delle cavità poste ad un'altezza medio bassa (8-13 m).

- I nidi vengono collocati preferenzialmente a 60-80 cm in cavità profonde 80-100 cm.
FIG. 1, 2, 3. Distribuzione del Rondone pallido (quadrati neri) e del Rondone nero (asterischi) nelle colonie di Moncalieri e Torino.
TAB. I. Indici di aggregazione nelle colonie di Rondone pallido.
TAB. II. Altezza da terra dei fori di nidificazione occupati.
TAB. III. Profondità dei nidi in relazione alla profonità della cavità.

RESUME' - Distribution spatiale et choix de la cavité de nidification chez le Martinet pâle
- Nous decrivons la strategie d'occupation des lieux de nidification chez le Martinet pâle dans trois villes du Piémont.
- Les figures 1, 2 et 3 indiquent les trous occupés par les couples nichants; la Fig. 1 représente également les trous occupés par le Martinet noir.
- Le tableau I met en évidence la nidification de type agrégé et le Tableau II le choix préférentiel des cavités placés à une hauteur moyenne-basse (8-13 m).
- Les nids sont placés de préférence à 60-80 cm dans des cavités profondes de 80 a 100 cm.
FIG. 1, 2, 3. Distribution du Martinet pâle (carrés noirs) et du Martinet noir (astérisques) dans les colonies de Moncalieri et Torino.
TAB. I. Index d'agrégation dans les coloneis du Martinet pâle.
TAB. II. Distribution en hauteur des cavités occupées.
TAB. III. Profondité des nids en relation à la profondité des cavités.

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