

**Breeding Habitat requirements of the Edible-nest Swiftlet in North and Middle Andaman
Islands**

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ABSTRACT

Swiftlets, (Order: Apodiformes), breed inside caves or cavern-like spaces and cling to the surface of walls and ceilings during roosting or on their self-supporting bracket-shaped nests (Ford and Cullingford 1976, Langham 1980, Koon and Cranbrook 2002). Swiftlets use saliva to bind nest material such as mosses, twigs, leaves, and their feathers (Medway 1962, 1963, Kang et al. 1991). Unlike in their other distribution ranges, Edible-nest swiftlet *Aerodramus fuciphagus inexpectatus*, in Andaman and Nicobar Islands nests exclusively in limestone caves (Sankaran 1998). The character of nest-site fidelity is proved in the Edible-nest swiftlets in the different ranges (Koon and Cranbrook 2002, Nguyen et al. 2002). The nest-site characters and the impact of microclimate on breeding of the Edible-nest swiftlet have been previously addressed by Nguyen and Voisin (1998) and Supaluck et al. (2002). Evaluation of nest-site selection, without quantifying availability of the nest - sites in the caves, was the limitation of the study by Supaluck et al. (2002). The present study attempts to bridge the gaps in knowledge and to unveil the nest-site preferences in the Edible-nest Swiftlet and the relation between nest-site characters, preference and nest success of the species in the Andaman and Nicobar Islands.

Characters of the nest-sites of the Edible-nest swiftlet were studied in a cave on the Interview Island, 11 caves at the Chalis-ek, Pattilevel near the Ramnagar and 42 caves on the Baratang Island in the North and Middle Andaman Islands, in the Bay of Bengal ($6^{\circ}45'N$ and $13^{\circ}41'N$, and $92^{\circ}12'E$ and $93^{\circ}57'E$). Nests of the Edible-nest swiftlet were serially marked and monitored daily during the breeding season. Data collected on the breeding habitat parameters (nest-site characters) for 643 nest-sites comprising of 296 active nests and 347 old nest-sites included:

- a. Texture of the rock surface at the nest-site: *rough, slightly rough and smooth rock surface*
- b. Presence and absence of nest support at the nest site
- c. Inclination of the cave wall at the nest-site location with respect to the ground: *flat, inwardly inclined and outwardly inclined wall*
- d. Data on the density of the nests were collected from 6 caves at Chalis-ek. Density was estimated by counting the number of nests/m².
- e. Micrometeorological conditions such as mean temperature (°C), and relative humidity (%) were measured at regular intervals inside the caves.
- f. Apparent nest success (Jehle et al. 2004) was determined based on daily observations from the date of egg-laying through fledging.

The individual nest-site characteristics (a, b and c explained above) were pooled together in all possible combinations to identify the most preferred and successful combination. Random points were taken on the cave walls and ceilings at various distances along a horizontal line transect to assess the availability of characters of the wall and rock face.

Proportions of the rock surface characters and their combinations were significantly different at nest-sites and random sites in all the study locations. The species preferred inwardly inclined walls for nest construction (E (Ivlevs' Electivity Index) = 0.3). Notable differences were recorded in the proportions of nests constructed on inwardly inclined walls in the studied locations (Fig 1). Overall 72% of nests had support ($E = 0.2$) and varied among study locations (Fig 2). Overall, 77% of nest-sites were rough textured surfaces and 19% slightly rough surfaces ($E = 0.08$). Smooth surfaces were avoided at Chalis-ek and Interview Island while slightly rough surfaces were avoided at Baratang and Interview Island (Fig 3). In pooled data nest-sites of the Edible-nest swiftlet with a combination of rough surfaces on inwardly inclined walls with / without support were preferred ($E = 0.3$ and $E = 0.3$). The observed nest density was 10.63 ± 3.61 nests/m². Different mean temperatures and relative humidity near the nest-sites at the three caves were recorded, ranging from 22.27°C to 25.35°C and 84% to 91%, respectively.

The nesting success of Edible-nest swiftlets was calculated from 983 breeding attempts at 350 nests. 81% nests were on rough rocks, 17% on slightly rough and 02% on smooth rock surfaces. 58% of the nests had support. More than 90% of the nests were on inwardly inclined walls, 07% on outwardly inclined walls and 03% on flat walls. Slightly rough rock surface and the height of the nest, were the significant predictor of nest success. About half of the nesting attempts made on the following three combinations were found successful; a) slightly rough, outwardly inclined walls with support, b) rough, inwardly inclined walls with support, and c) rough, inwardly inclined walls without support (Table 1). The combination of slightly rough surface, inwardly inclined wall, with / without support, and of rough surface, outwardly inclined wall with support seem to contribute the most to the nest success. Nest success did not show any

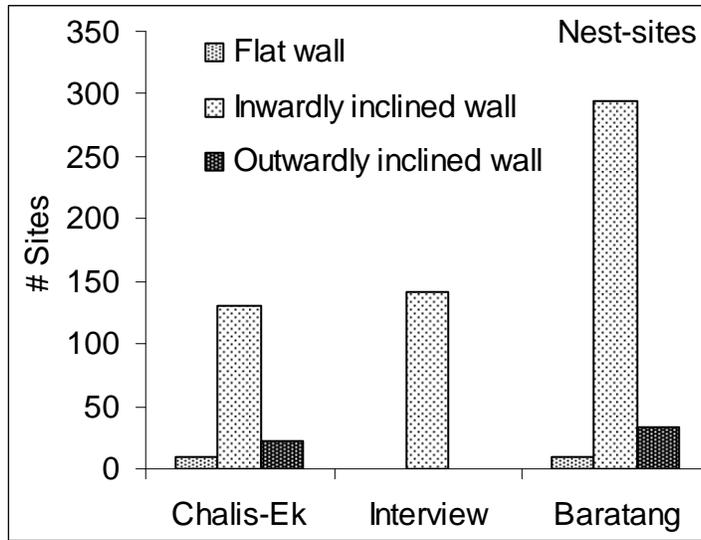
correlation with height ($r_s = 0.022$, $P = 0.584$) and nest density ($r_s = 0.314$, $P = 0.544$), whereas, it depicted significant correlation with the mean temperature ($r_s = -0.985$, $P < 0.001$) and relative humidity ($r_s = 0.997$, $P < 0.001$).

Present study reveals the importance of nest-site characters, their selection and preference towards nest success by the Edible-nest swiftlet. It is concluded that the species do select the nest-sites with discretion and these select characters play an important role in nest success. Studies on the role of the cave structure and the co-existing flora and fauna towards the population of the Edible-nest swiftlet are wanting. The information from the present exercise can invariably help improving the nest-sites provided in the swiftlet houses under ex-situ conservation program and also to construct new swiftlet houses with favored nest-site characters, to further improve the nest success of the Edible-nest swiftlets in the ex-situ houses.

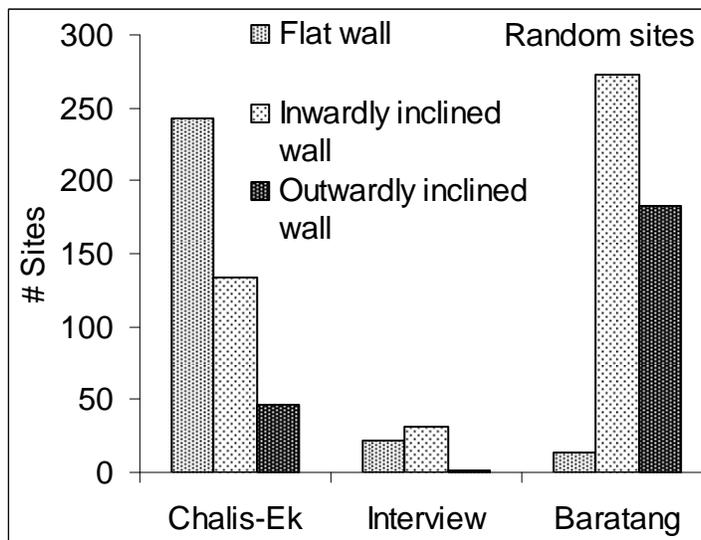
Table 1. The number of nest-sites with different combinations of the nest-site characteristics of Edible-nest swiftlets with the percentage of successful attempts in North and Middle Andaman Islands.

Nest-site combinations	Characteristic	# Nest-sites	# Nest-attempts	Breeding # attempts	Successful % Success	of
RI		119	354	177	50	
RO		8	20	8	40	
RSuI		91	350	176	50.3	
RSuF		5	22	6	27.3	
RSuO		15	47	24	51	
SrI		15	37	14	37.8	
SrF		2	2	2	100	
SrSuI		39	120	60	50	
SrSuF		2	6	0	0	
SI		2	2	2	100	
SsuI		7	23	7	30.4	
Total		305	983	476		

R: rough; Sr: slightly rough; S: smooth; Su: with supporter; I: Inwardly inclined wall; F: flat wall; O: outwardly inclined wall

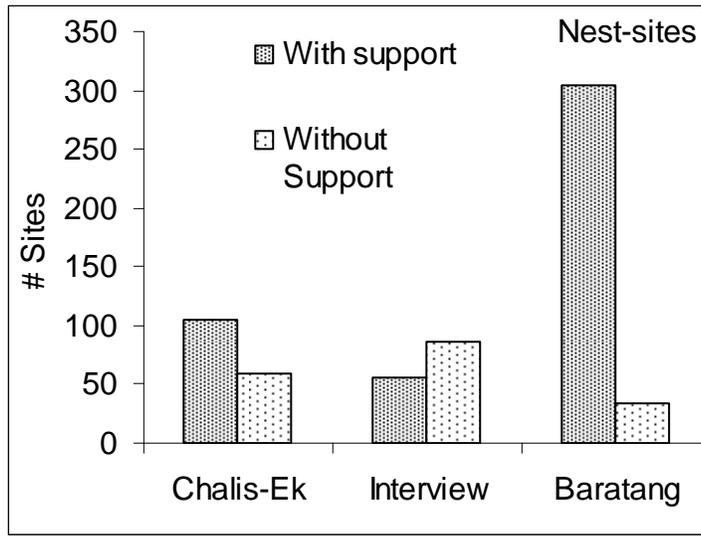


A

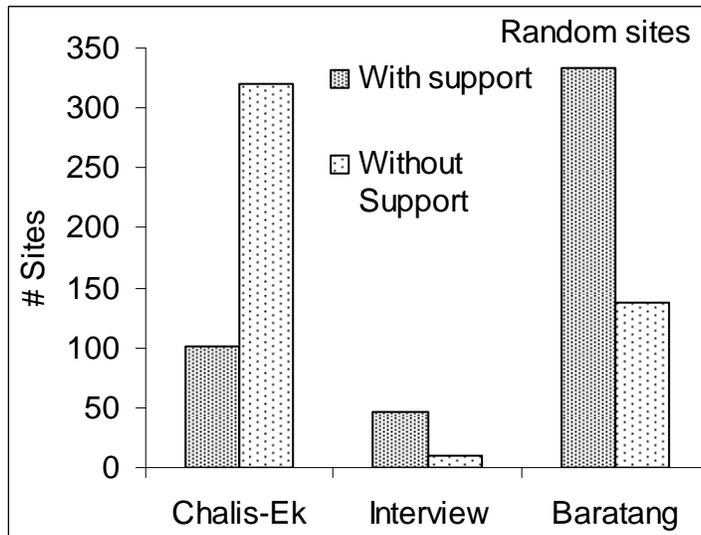


B

Fig 1. Number of used nest-sites (A) and the random sites (B) by the Edible-nest swiftlet at various wall inclinations at the three study locations in the Andaman Islands.

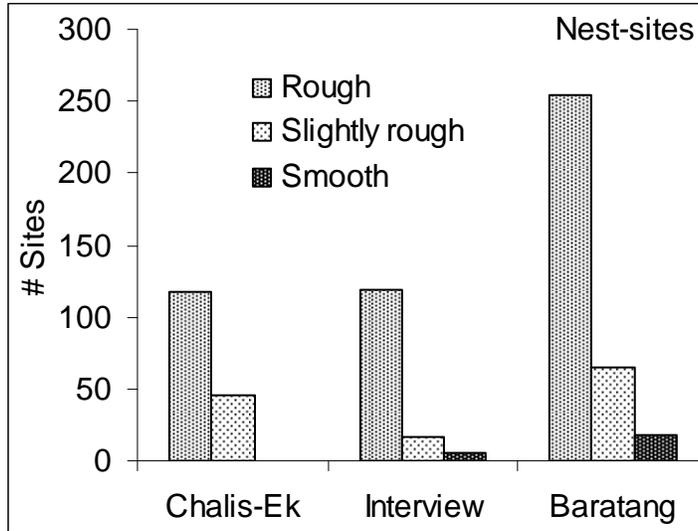


A

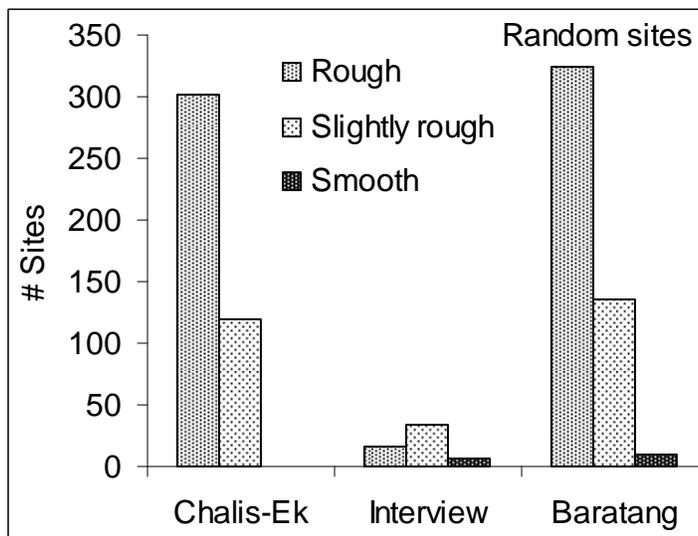


B

Fig 2. Number of used nest-sites (A) and the random sites (B) by the Edible-nest swiftlet with and without supports at the three study locations on the Andaman Islands.



A



B

Fig 3. Number of used nest-sites (A) and the random sites (B) by the Edible-nest swiftlet with different textures at the three study locations on the Andaman Islands.

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