

NESTING BIOLOGY OF THE SOLITARY BEE, *MEGACHILE* (EUTRICHARAEA) *GATHELA* CAMERON (INSECTA, HYMENOPTERA, APOIDEA, MEGACHILIDAE)

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ABSTRACT This paper describes the nesting biology of *Megachile gathela* Cameron. Six nests were recovered during winter of year 2018. The nests had *Bougainvillea spectabilis* leaf cuttings' cover outside their chambers. Each nest varies in number of chambers, making a total count of 24 chambers in all. Many larvae reared out from the nests. In addition to, three cells containing cocoon of a cleptoparasite which were escaped from nest chamber after utilized the provision of immatures. No pupa was reared from nest means they prefer to pass the summer as pre-pupae or larvae. Seven adult bees which were reared from the nests shall be deposited at the National museum of Zoological Survey of India, Kolkata.

INTRODUCTION

Megachile (Eutricharaea) *gathela* Cameron is non-Apis solitary megachilid bee widely distributed in Punjab, Himachal Pradesh, Haryana, Rajasthan, Gujrat, Uttar Pradesh, Bihar, West Bengal, Madhya Pradesh and Maharashtra i.e. almost whole of north and central India. Gupta (1993) reported it as an intensive visitor of several cultivated and wild crops namely, *Lagersteroma* sp., *Bauhinia latifolia*, *Helianthus annuus*, *Tegetes* sp., *Gaillardia* sp., *Crotalaria juncea*, *Brassica compestris*, *Medicago sativa*, *Vitex nigundo*, *Derris pinnata*, *Verbicinia*

elicinoides, *Boerhaavia diffusa*, *Tephrosia Hamictoni*, *Jacardia mimosaefolia*, *Tridax procumbens*, *Grevia asiatica*, *Parkinsonia* sp., *Tecoma stans*, *Adethoda vasica* and many species of *Acacia*. Gupta and Yadav (2001) further described it as an intensive pollinator of *Cajanus cajan*, *Crotalaria juncea* and *Helianthus annuus* in eastern Rajasthan and adjacent U.P.

Previously described species of genus *Megachile* Latreille (viz. *M. creusa* and *M. cephalotes*) were placed under genus *Chalicodoma* Lepeletier, due to the subdivision of genus

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Megachile into genus *Chalicodoma* and *Megachile* (Michener, 1944). However, while making the taxonomic revision of the bees of the World, Michener (2000) again merged both into genus *Megachile*. Earlier *Chalicodoma* used to include those megachiline bees which construct their nests with the help of mud and resin (commonly called as mason bees) and genus *Megachile* spp. included those bees which construct their nests using leaf cuttings glued together with their mandibular secretions (commonly called as leaf cutting bees).

Megachile gathela belongs to the category of leaf cutting bees, grouped under subgenus *Eutricharaea*, its female have densely hairy abdominal scopa that provides the capability of carrying huge amount of pollen load. Gupta and Yadav (2001) have categorized this species as quite effective pollinators of several cultivated crops in the specified region. This is for the first time that a nest of such leaf cutting bee has been described.

NESTING SITE

The six nests of *Megachile gathela* was found at Marusthali colony, Jodhpur, Rajasthan, India on 18 February, 2018. The nesting site was found in the adobe wall of house at about 26° 15' 46.9" N of Latitude and 73° 01' 43.3" E of Longitude.



Figure - 1. The nesting site in the adobe wall at Marusthali colony, Jodhpur observed during February, 2018.

MATERIALS AND METHODS

The nests were built in the adobe wall of a hut. On 18th February, these nests were marked and kept under observation until 4th March, 2018. The nests were present about 0.6 m height from ground level and their openings facing towards southeast. On close observation made by author in their studies it was found that two adult bees were continuously bringing the nesting material. On 6th March, 2018 nests were brought to wild bee laboratory for further investigations.

ECOLOGICAL PARAMETERS

On 18th February, 2018 the temperature in the outfield was 32°C – 37°C during day. The Relative Humidity of the nesting site was approximately 50-65%.

NEST STRUCTURE

The adobe wall that contain nest was facing towards east. The length of crevice of adobe wall measured as 12.4 cm and the width of crevice of adobe wall was averaged as 0.64 cm. The beautifully sculptured of nest was externally lined with numerous pieces of *Bougainvillea spectabilis* leaves. All the leaf cuttings were dry and fitted quite loosely in the tube measuring 0.5 cm in diameter. When carefully isolated, the six nests were consisted of twenty four distinct chambers (also Michener, 1953; Michener, 1970b).

The nest was kept under cold water vapor for a few hours then some of the leaves near its basal region were segregated. Each chamber was found with three distinct profiles of arrangement of leaf pieces studied in the headings of base, cylinder and apex (also Maki & Moffett, 1985 & 1986).

The leaves lining the wall of chamber were arranged in two layers. The base consists of two large elliptical leaves having length and width of 0.9 and 0.6 cm respectively. These leaves were occupying almost whole of base having a strong convexity. At lateral margins basally fitted leaves

were overlapped towards apical margins, by those set at the lateral walls of the cylinder of the chamber. The leaves at cylinder had variable dimensions. It ranged from 0.9 X 0.9 cm, 0.9 X 0.6 cm and 0.9 X 0.4 cm. The largest leaf pieces were set at the center of cylinder covering whole of outer wall whereas, smaller leaves were set beneath the large leaves building inner wall of the chamber. Usually 6 to 7 larger leaves were arranged in outer wall followed by 4 to 5 leaf pieces in the inner wall (also in case of *M. brevis* Say in Michener, 1953), because leaves of *Bougainvillea* were thin two whorl provide extra support to it. The leaves fixed in outer wall were elliptical or oval and had alternate arrangement i.e. their bases were suppressed under apex of previous leaves and their apices were suppressed under apex of previous leaves and their apices were overlapping the bases of apical leaves arranged in the next whorl towards apical end of chamber (Malyshev, 1936).

Cap or disc at apical end of the nest chamber was concealed by two layers of oval and rounded leaf pieces maintaining a distinct concavity at apex so as to receive the leaves arranged in a strong convexity at the base of the next chamber. External disc of leaves at cap measured 0.45 cm whereas the inner disc of leaves arranged below the former

measured 0.40 cm. Both layers together built a perfect concavity. The leaf pieces arranged at cap were overlapped by the leaves of cylinder from all sides. Precisely, on an average, a chamber had 2-3 leaves at base, 15-25 leaves at cylinder and 3-5 leaf pieces arranged at cap or intercellular septa.

When both layers of leaves were removed a thin hard smooth layer of chamber was found. The each chamber had such type of layer and wall was fixed by leaves all around by mandibular secretion and did not allow an air in between the wall of leaves. The barrel shaped chamber was brownish red in color having both apical and basal margin convex. Its lateral walls configures in roundness. The inner cell measured to 0.85 cm in maximum length and 0.62 cm in maximum width at center of cylinder. Out of its length around 0.15 cm at base and 0.10 cm at apex was occupied by basal and apical convexity of the cell. Its apical convexity perfectly meeting with the inner surface of cap built of leaves, at centre. The fine layer that constitutes the inner cell is known to be constructed by the secretion of the abdominal dufour's gland and acts as a sealed, water proof barrier for many solitary bee species (Cane, J. H., 1981; Cane, J. H., 1984; Hefetz, A., 1987). The inner most layer of chamber was made up of cellphone covering.

Table- 1 *Megachile (Eutricharaea) gathela* Cameron: Averages of Nest Dimensions

	Nest character	Nest-1	Nest-2	Nest-3	Nest-4	Nest- 5	Nest- 6
1.	Outer length of chamber (cm)	0.80	0.97	1.1	0.90	0.85	0.92
2.	Outer width of chamber (cm)	0.42	0.60	0.59	0.45	0.59	0.58
3.	Total count of leaves at basal disc	3	4	3	2	2	3
4.	Total count of leaves at cylinder	15	21	24	24	20	18
5.	Total count of leaves at cap	2	4	5	5	3	2
6.	Total thickness of apical disc [outer and inner] (cm)	0.050 0.045	0.052 0.047	0.049 0.047	0.048 0.045	0.054 0.050	0.050 0.045
7.	Length of inner chamber (cm)	0.60	0.73	0.77	0.70	0.65	0.74
8.	Diameter of inner chamber (cm)	0.43	0.41	0.40	0.40	0.42	0.40
9.	Weight of each chamber (gm)	0.349	0.224	0.218	0.189	0.341	0.220
10.	Hole in the cell, yes or no	No	No	Yes	Yes	No	No



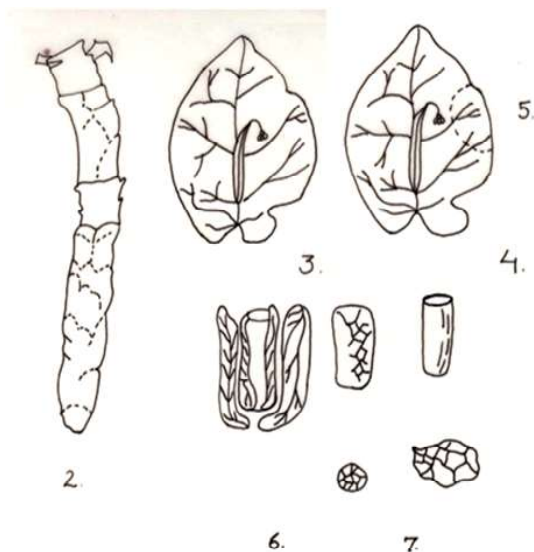


Figure - 2. A complete nest of *Megachile gathela*, 3 - Single petal of *Bougainvillea spectabilis*, 4-5- Leaf cuttings used by *M. gathela* for making their nest, 6-7 - different nest components.

CONTENT OF NEST CHAMBER

Externally 03 chambers of the nest had a fine perforation in their cylinder, this was indication of parasitic infestation and adult of mature cleptoparasites flew away from holes of the nest chamber. However, remaining chambers without any fine pores suggesting the absence of off-spring of the cleptoparasites that infested the nest (Tepedino, 1989). During six nests collection out of twenty four chamber of this megachilid bee, one chamber was opened with only provision deposit, egg was not laid in this chamber, reason unknown.

RESULT AND DISCUSSION

The megachilid bee belongs to subgenus *Eutricharaea* and this group includes well known small Megachilini that construct nests by using leaf cuttings and provisions her own nest. The chambers are built successively one by one, normally one cell was constructed in a single day as in the case of *M. brevis* and *M. gathela* (Michener, C. D., 1953b). This was first time in record for the nestings of *M. gathela* from Western Rajasthan. This species is a well-

known pollinator of many cultivated crop in almost half of manner of parasitic the India towards north (Gupta, 1993). The manner of parasitic infestation was similar to those found with the nest of *Megachile cephalotes* and *Megachile creusa*.

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