

Phylogenic Study of Genital Armature of Family Megachilidae (Apoidea : Hymenoptera) in the Western Himalayan Region

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I. Introduction :

'Bees' belong to super family Apoidea Ashmead of order Hymenoptera of monophyletic super order aculeata (class insecta). These bees could be readily distinguished from all other Hymenoptera. Mainly by presence of plumose or feather hair over their bodies. The studies have shown that the solitary bees are the dominant pollinators of angiosperms that they constitute the most diverse group of flowers visiting insects in the areas. Bees are absolutely essential to the maintenance of the diversity in the flowering plants. A high species diversity in these bees is necessary to maintain high angiosperm diversity. The loss of bee diversity will surely be accompanied by the loss of flowering plants species, it has been shown that the bees are essential to the fertilization and reproduction large number of flowering plants and render excellent help to farmers, horticulturist and foresters by cross pollinating their valuable crops as well as fascinating interest of mankind.

The family megachilidae popularly known as leafcutter bee's mason bees, wood borers and resin users. Which are instrumental in pollination of variety of cultivated and wild plants. As regards habits to distinct groups of these bees are recognized parasitic and non-parasitic bees, they are cosmopolitan in distribution. In India they are common and occur almost in all the parts.

The taxonomic value of genital armature is a prime importance, than any other aspects for each fauna the megachilid bees exhibits the most uniformly character morphology. Easily recognizable by bear ventrally situated abdominal scopa, solitary bees are usually very fast movers. One can visit around 30 - 35 flowers with in a minute because of it. Megachilid bees are among the world most efficient pollinators.

Leafcutter bees, as their name implies, use 0.25 to 0.5 inches circular piece of leaves they neatly cut from plants to construct nest. Nest building is of particular interest, reflecting the material they build their nest cells from soil or leaves respectively, a few collect plants or animal's hairs and fibers and are called Carder bees. All species feed on nectar and pollens but a few are cleptoparasites (informally called Cuckoo bees) feeding on pollens collected by other megachilid bees. They construct cigar like nest that contains several cells, each cell contains a ball or leaf of store pollen and a single egg, each cell will produce a single bee. Leafcutter bees construct these nests in soil, in holes (usually made by other insects) in wood and in plants stems. A diversity of cavities, such as cells of dead snails, holes in concrete wall (like those produced for hurricane shutters) and other holes in man made objects are used as sites. Thus a nice variation in habits- habitat has derived themselves to the modification in the morphology of genital armature.

The taxa description for both sexes the methods group around 100 characters for both sexes. The method possessed by Mitchell (1973 and 1980) after studying the genital armature of megachilid bee intensively from American region. At the age of 'fauna' (Bigham 1897), proper Indian territories explored 53 megachilid species, including 8 genera under the common head Apidae. However present work does not suffice for all round claim. Study of Megachilid bees on genital armature and its parts is certainly useful for taxonomy of higher group. Himalayan region is rich in wild and cultivated, visitation of orchards, since many species of Megachilid bees are very common in this region; we propose the present Study keeping in view that not much more has been carried out in the past in their lines.

We do not hesitate in stating that this study can be regarded as first preliminary attempt on genital armature of Megachilid bee of western Himalayan region. It will be necessary to examine many more characters other than genital armature and its parts in order to establish the systematic of all categories of Apoidea.

II. Existing concept of study :

The leafcutter bees (megachilidae species) are a type of bee, which has the interesting trait of chewing little circles out of leaves flowers plants.

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such as shells of dead snails, holes in concrete wall (like those produced for hurricane shutters) and other holes in man made objects are used as sites. As regards habits megachilid bees are recognized.

They are over winter in these nests as newly formed adults. In the following spring these adults chew their way out of the nest. Leafcutters are solitary bees and do not live in large groups or colonies like honey bees. Leafcutters do not aggressively defend nesting areas like honey or bumble bees.

Leafcutter bees are important pollinators of many wild flowers, leafcutter bees also pollinate by commercial growers of blueberries, onion, carrots and alfalfa. Leaf cutting bees use the leaves of almost any broad leaf deciduous plant to construct their nest, some species of leaf cutting bees use petals in addition to leaves. The most commonly reported problem of leaf cutting comes from ornamental plants such as roses, redbud, ash, bougainvillea and others with thin smooth leaves.

Leaf cutting bees can be considered pests because of leaf cutting ornamental plants.

Very little is known about genital structure and its different parts of Indian megachilidae (Apoidea: Hymenoptera), our knowledge of genital armature of Indian Megachilidae bee has largely been derived from the work of Bingham (1897), Robertson (1903) also divide genus Megachilidae into several new and much smaller genera. Mielnicz (1944), Peters (1970) and Mitchell (1980) upgraded most of sub genera to generic owing to their increasing numbers of species.

After fifteen years Morsós, J.A. and Pasteels, J.J. studied the genital armature of Megachilid bees and proposed numerous sub genera of Megachilidae, and of them along with sub genera detailed in thirties by Mitchell himself (1980), this work also includes some notes on phylogeny of Megachilidae.

At the moment, when Friese, Cresson and Cockerell etc. were busy in rearranging few old taxa, Col. C.T. Bingham (1897), and G.R. Dull (1912) collected the Indian fauna and got them identified with those in catalogues of Smith (1853 and 1854) and Dalla Torre (1894 and 1896), and prepared an incredible account of Indian Hymenoptera.

Pasteels revised the Megachilid bees of Arabia region on the basis of genital armature, and also gave an account of phylogeny of the group. Torchio, P.F. and Bees (1981) studied the sex ratio, body size and seasonability in solitary bee - *Osmia lignaria propinqua* Tkalcu (1981) recorded a new genus *Waria* and two new species of it from western India and also discussed the taxonomic importance of their genital armatures. In the same year von Zander revised the Megachilid bee of Turkish and discussed the distribution of some rare Megachilid bees in reference to importance of genital armature in their Taxonomy. Crips (1985), Smelling and Wing (1986), Rust and Bohart (1987).

III. Review of Literature :

The phylogenetic study of megachilidae (Apoidea : Hymenoptera) literature dealing with the taxonomy and different morphological features and nesting behaviors of megachilidae is very extensively available in different languages in various journals but very little known about Phylogenetic significance of genital armature and its parts

The morphologists were familiar for 18th century and 1st important contribution regarding morphology of the genus comes, perhaps from Linnaeus (1758) and his placement of all known bees under the genus. Head of *Apis Schmiedeknecht* (1882-1886), should be referred whose classification in socials, solitaries and parasitic genera become the basis of origin this family. This sub category *castrilgidae*, under the 'Apidae solitaries' was been grouped with single family named megachilidae with the genera *Megachile*, *Lithurgus*, *Osmia*, *Heriades* and *Anthidium*.

Friese (1895 to 1897) merely increased the volume of Schmiedeknecht's classification by adding one more genus *Coclioxys* under the distinct sub family *Coclioxyne*. Dalla Torre (1895) more or less followed the same ways. Then Bingham came (1897) with his pioneer work of 'fauna' in that he included the genera of megachilidae into the common head of Apidae, along with the neighboring family of Apoidea

Just after Bingham, in (1899), Ashmead published a quite elaborated account of bees classification of sub divided into 14 families with 36 genera but his work completely ignored the Phylogenetic value of genital armature and its parts.

Later working of family megachilidae categorization are found with Robertson in 1899, Friese (1902-11), Michener (1944-65) and finally Mitchell (1934, 39, 43, 73, 80 and 2000) but most of the later working were either related with generic level or they were confirmed to continental or regional versions.

In these revisions worth will be mentioning namely Alfken (1926-42) from North Africa— Europe, some Palaearctic and Central – West Asia; Benoist (1926-61) from Central Africa, South Europe and extending up to Hands near to Africa; Cockerell, T.D.A. (from different museums of America and Africa in long period

from 1895 to 1948, in short separates); Krombein, (1935-79) from Australia, America upto preparation of the catalogues in 1967 and 1979; Mavromoustakis (1930-68) from African and European countries; Michener (1936-67) from America and Australia; Mitchell (1930-80) from America; Moore (1941-65) from South America; Pasteels (1960-76) from South-central Africa and South west Europe and Central Asia; Peters (1970); Popov (1945-65); Rayment, (1928-56); Rebmann (1965-75); Schwarz (1926-57); Tkalcu, (1965-78) and at the last Yasumatsu (from Japan and South East Asia in 1935-51).

Most of these short but complete taxonomic revisions supplied the important generic and species description but very few have discussed the taxonomic position with regard to morphology, phylogenic and bionomic point of view.

Any way it can be concluded that the evolution of the family Megachilidac is of quite recent period, other than the related families of Super-family Apoidae. Their habit-habitat, mode of feeding and nesting, and foraging behavior, solitary state and particularly since beginning, habitats of dense forest area have compelled them to become adoptively specialized. Thus morphologically well as functionally they became of considerable difference from rest of the Apoidae. Particularly, the scopa on abdominal sterna, being the highest evolved feature, and (still contir under developmental stage) two sub marginal cells in the fore-wings, some times put them among the most advanced, or other times less advanced than the bees with only one sub-marginal cell (considered more specialized forms), or from those who also carry that to open at apical end, In the all respect on one hand they seems to be much closed to Fidellinae and on to the other with Ceratini and Xylocopini.

The perusal of the literature shows that no attention has been paid so far the *study* of the Phylogeny on the basis of genital armatures and its parts of Indian megachilidac (Apoidea), therefore. We purpose to start the work on the topic Study of genital armature of family megachilidac (Apoidea : Hymenoplra) in the Western Himalayan region

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