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ORIGINAL ARTICLE

Comparative Studies on Some Indian Veliidae in Different Zoogeographical Regions in Uttar Pradesh

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ABSTRACT

The Indian region represents an extremely varied topography with high and precipitous mountain peaks, sharp and steep hill slops having thick and coniferous tropical deciduous forests and annual rainfall of more than 2000mm.; in contrast to the first levelled low plain with lower amount of rainfall and forest of stunted growth. Vellidae is represented as at present known by 35 species belonging to 9 general. A reference to the table 1 would clearly show that about 44.4% genera and 57.14% species are endemic. The knowledge regarding the Veliidae fauna of India through at the moment is far from complete; but we can profitably venture on an analysis of the zoogeographical composition of the fauna on the basis of present study which should be fairly an accurate index of the general faunal conditions of the area. As should be expected a relatively high percentage, about 40% species constitutes the Oriental fauna of Veliidae. In the Northern mountain region of the country which falls under the Palaearctic region, about 8.57% species have so far been recorded. The Ethiopian, Australian, Neotropical and Nearctic realms constitutes about fairly similar percentage, i.e. 5.7% of the total fauna. Besides this, about 17.1% species are widespread in different realms. This is important from a scientific point of view because it opens the door to further studies and new species identification and their relation to zoogeographical climate conditions. The present work summarizes common and important Indian Valiidae, their zoogeographical distribution and concentration towards Indian states.

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INTRODUCTION

Vellidae is represented as at present known by 35 species belonging to 9 general. A reference to the table 1 would clearly show that about 44.4% genera and 57.14% species are endemic. The knowledge regarding the Veliidae fauna of India through at the moment is far from complete; but we can profitably venture on an analysis of the zoogeographical composition of the fauna on the basis of present study which should be fairly an accurate index of the general faunal conditions of the area. As should be expected a relatively high percentage, about 40% species constitutes the Oriental fauna of Veliidae. In the Northern mountain region of the country which falls under the Palaearctic region, about 8.57% species have so far been recorded. The Ethiopian, Australian, Neotropical and Nearctic realms constitutes about fairly similar percentage, i.e. 5.7% of the total fauna. Besides this, about 17.1% species are widespread in different realms. This is important from a scientific point of view because it opens the door to further studies and new species identification and their relation to zoogeographical climate conditions. The present work

summarizes common and important Indian Valiidae, their zoogeographical distribution and concentration towards Indian states.

MATERIALS AND METHODS

The material for the present study was collected from the various localities of Uttar Pradesh. The veliids were easily recognized by their hind femora not exceeding beyond tip of abdomen and collected by using ordinary pond net. They were killed immediately in 90% alcohol which was found to be very good preservative. The genitalia were taken out with the help of forceps. From the dry specimens the genitalia was similarly taken out after the insects were softened in dessicator. The genitalia were then mounted on DPX after processing. All the drawings were made with camera lucida.

RESULTS AND DISCUSSION

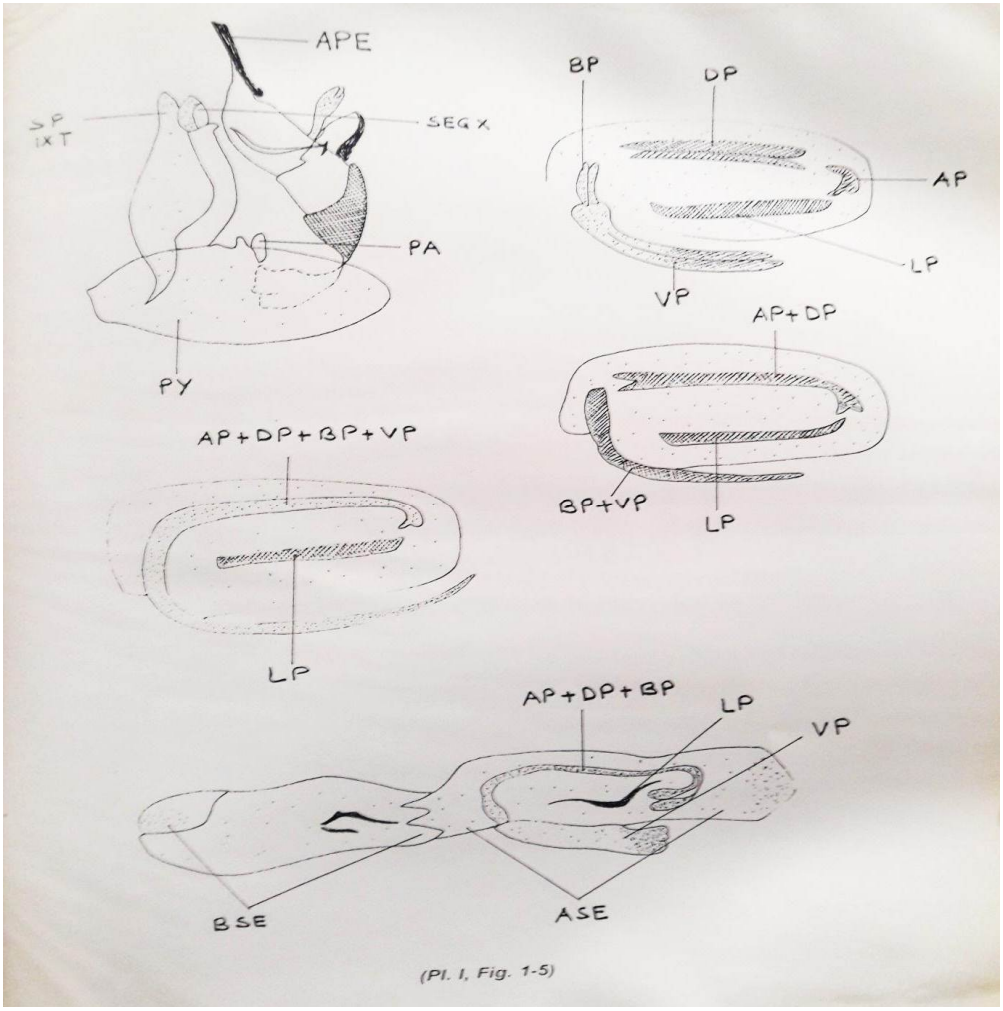
The study of the copulatory complex in the species ofthe Veliidae of India has brought to the notice a large number of significant point to the knowledge. In primitive veliids the seventh abdominal segment is similar in form to the preceding segment but this primitive condition in the Veliidae immediately raised difficulty in that in no species of the Veliidae is the posterior margin of the seventh segment on the ventral surface straight as is the sixth. It is either broadly concave or curiously modified, and often the seventh segment at the sides is strongly produced posteriorly as the connexival spines. As the posterior margin is often concave and the segment has a strong tendency to produce laterocaudally, the relative length ofthe seventh to the sixth segment on the ventral surface is nearly equal. This condition was observed in more primitive species of more primitive genera of Rhagovelrinae such as Rhagovelia, and more Primitive species of Rhagovelrafs. str.. In these species the second to sixth segment are long and subequal to each other in length and the lateral projectionsof the seventh segment are more or less conspicuous, In the primitive veliids the seventh segment on its median longitudinal axis is about two thirds to three founds as long as sixth segment ventrally and the posterior margin is more or less strongly concave and laterally produced. From this primitive condition the seventh segment seems to have undergone various modifications in different species ot Veliidae. The connexival spines are not found in Microveliinae, but are present in more primitive species of more primitive genera of Rhagovelinae and Veliinae.

The absence of connexival spines in the more specialized genera of the Vellidae simulate the conditions found in Velfa. In Velfa the abdominal segments are generalized and long while in the species without connexival spines in Rhagovelinae, the abdominal segment are greatly reduced. The reduction of abdominal segments reflects the progressive reduction of the connexival spine in Rhagovelih and Velirnae. The connexival spines, therefore, do not occur in Veliinae and the absence of connexival spines in more specialized species of Rhagoveliinae is the results of secondary loss. It is therefore, difficult to determine that the absence or presence of connexival spine is a primitive or specialized condition in the Veliidae. The absence of small size of connexival spines in Veliidae appears to be a specialized condition. Possibly the most primitive condition in the absence of monexival spines combined with a generalized abdominal form as Been in Vella, The evolution of seventh segments in somewhat different in two Bexe, In male in Rhagoveliinae the connexival spine are found in Rhagovelra, Angifovelra and Angilia. In these genera the connexival spines have become gradually obliterated with the specialization ofthe abdominal Segments, The degree of prolongation of the seventh Segment is observed in more specializedspecies of mole generalized genera and in all species of more specialized genera. The degree of prolongation is evinced by the length of seventh segment on the veledian ventral longitudinal axis in relation to the sixth segment. In the primitive Veliidae the median length of the ventral surface of the seventh segment is shorter than the sixth segment. The seventh segment has prolonged simultaneously

with the reduction of second to sixth ventral abdominal segment. This was observed at both the specific and generic level with in the subfamily Rhagoveliinae.

The greatest prolongation of segment was observed in Pseudovelra and Bapfista. In Velia the ventral posterior margin of seventh segment has become more or less emerginated at the middle with the reduction of the preceding abdominal segments. The modification of seventh segment in the Angifovelra and Ragovelra is peculiar. In some veliids the connexival spines occur with more primitive abdomens. The spines are progressively reduced with the specialization ofthe abdomen and have lost in certain highly specialized species with the specialization of the preceding abdominal segments. There have arisen processes like the spines but more ventrally than the connexival spines. These structures have gradually migrated more and more ventrally and eventually have located near the median longitudinal axis of the abdomen. The vulva is located between the inner lobes of the first valvulae. The second valvular are connected by the intervalvular membrane. The apical margin of intervalvular membrane is close to the apices of the second valvulae. The ranum of the second valuvae arises along the inner margin of the second valuvla near its apex and after extending cephalic turns laterally along the inner margin of the first valvular. The apical end of the ramus is loosely attached to the inner margin ofthe ramus of first valvula due to loss of second valvifer. In some species of Veliidae the distal end of the ramus of second valvula is attached to the base of the second valvifer, which bears the third valvula apically. Since the female copulatorycomplex partly occur in the eighth abdominal segment, the study of this segment is of a great importance.In male the most important evolutionary tendency of the eighth segment is its prolongation, Thisl8 true of all the genera of Veliidae, In Borne of the more primitive genera of Veliidae, the eighth segment itself does not prolong much.

In Angilovelia, Vella and Perrttopus in which the seventh segment is not greatly modified in shape, the eighth segment has also not much modified apart from its prolongation, A similar condition is also observed in Lathriovelia. In other genera of Veliidae evolution has proceeded further to the point where the ventral surface of the segment is more or less greatly modified. In Veliidae the basal ventral region has become more and more depressed and the ventral apical margin has become progressively asymmetrical with the development of a process on the one side of the apical margin. In Perittopus the ventral surface of the eighth segment has become more and more longitudinally elevated at the middle in more specialized species. In Lathrioveliathe ventral apical margin has undergone modification with theformation of the processes of various shapes in the middle. In Pseucfovelia the ventral surface as well as the ventral apical margin is curiously modified. In Veliinae the most primitive eighth segment is found in Bapfista in which the segment is not appreciably prolonged in the species examined. In Vella there is found a depression on the basal region ofthe ventral surface as in some genera of Rhagovelrinae. In Angilra is found a median longitudinal elevation which is comparatively more pronounced in Angilovelia of Rhagoveliinae. In Microvelrinae the eighth segment is greatly prolonged and possesses a longitudinal sulcus in the middle. In Baptista, two pairs of processes dorsolaterally and ventrolateral have become more and more conspicuous. The ninth tergite in male in Veliidae is rather Cylinder, and the lateral margins are parallel to one another as they are in more primitive genera such as Angilovelia and Rhagovelia. The tergite has undergone various modifications. InVeliinae the suranal plate is simple or feebly widened basally in most genera. Conspicuous modifications of the lateral margin are seen in Rhagovelia. In Rhagovelia the basal lateral process has become more and more conspicuous and in some specialized species of the genus there occurs an additional pair of processes inside the lateral pair of spinous processes. In Baptista and Lathtiovelra no conspicuous modification of the basal lateral margin of the suranal plate is observed. The most distinct modification of suranal plate has occurred in Perittopus in which the basal lateral margin has become modified progressively with the produce on of asymmetrical processes. In Mfcmvelimae the suranal plate is dilated behind its middle.



Copulatory complex of typical veliids species (Fig. 1: Lateral view of the male ninth and tenth abdominal segment; **Fig. 2-4**: Diagrammatic drawings of sclerotized plates in endosome of Veliidae; **Fig. 5**: Endosoma)

Where:- APE- Apical sclerotyized part of endosome; SEG- Segment, SP- Suranal plate, T- Tergum, PA- Paramere, PY- Pygophore, DP- Dorsal plate, BP- Basal plate, AP- Apical plate, BSE- Basal segment of endosome, ASE- Apical segment of endosome, LP- Lateral plate, VP- Ventral plate

The dialation is more conspicuous in Microvelia. In Lathriovelia the process of modification of the basal to lateral region of the suranal plate progresses gradually. A highly generalized condition in observed in BaptistaanaPseudovelia. In Mrcmvelirnae the suranal plate is somewhat dialated but no distinct modification is seen. The loss of parameres has occured independently in some or all genera of all subfamilies except for Microveliinae. In Veliidae the parameres have virtually lost. In except for Angifovelia, the parameres are not conspicuous and are more or less greatly reduced or completely lost. In Microveliinae the parameres are well developed in Mrcmvella, short but robust in Baplista and completly lost in Lamtiovelia. The parameres are greatly developed in pemopus. In Angilfa the basal lateral region of suranal plate is modified into a conspicuous process but the parameres are absent. In Angilovelra the parameres are simple. In Rhagovelra the parameres have been retained in all species and have undergone modification apically. In Veliiidae the parameres are distinctly retain in Velia

but are reduced in unrecognizable in Angilia. In general the parameres in Veliidae have an overall tendency to be lost. The shape of paramere where present offers an excellent specific character. The presence and absence of parameres is constant in most genera.Pmlongation of pygophore is one of the most important aspect. In same species the pygophore is retained lateral towards the high. The apical margin of pygophore is modified in various species of Baptista and Pseudovena. In the species of PeMpus the apical hak of pygophore is greatly modified. The degree of rotation and demodification of pygophore apical margin varies considerably in various species even within the seven genus and hence an important character at species level than at genehc level. The swloids are found only in Rhagovelia and their presence represents a primitive condition because the structure tends to be either fused to the pygophore or lost in more specialized species ofthe Veliidae. The endosoma showed well differentiated sclerized plate in apical plate in its apical segment

These plates are dorsal, apical, lateral, basal and ventral. The vahous plates and their sclerotization is quite a good taxonomic character at the species level in the family. A well developed ovipositor is a primitive condition in Hetempteta. In the veliidae the well form long ovipositor is present in only Rhagovelinae in which it serves for the insenion of eggs in the tissue of the plant. In this subfamily the Hrst and second valvulae are greatly prolong but basic structural plate is the same as in oMer subfamily ofthe veliidae. The rami of the first and second valvulae are a« ached with the black subtriangular plate at the apex of the ninth tergite. A second valvifer as well as third valvulae have been lost as in the subfamilies. In all the subfamilies of Veliidae the Rrst and second valvulae are well developing. The firstvalvulae either are not differentiated into outer and inner lobe or are so differentiated only apically and inner lobes. The inner lobe is usually attached with vulva. The ramus of first valvulae has shifted its point of attachment to the outer margin in various species and genera in the family. A secondvalvulae are usually pointed apically and forms a sheath above the first valvulae. The valvulae are often apically are free from each other. The vestigeal third valvulae are retained only in Perittopus. The apical margin of intervalvular membrane is highly sclerotized in Velfa but membranous or thickly sclerotized in Mecrovelra. The study of the female genitalia offers excellent taxonomic characters at the subfamily level in the family Velidae.

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