



ORIGINAL ARTICLE

Analysis of Genitalia of Indian Odonata with Reference to *Bradinopyga geminata* (Rambur)**Amita Parihar and Sunil Kumar Jain**

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Email: amita.singh.parihar@gmail.comReceived: 4th Oct. 2017, Revised: 13th Dec. 2017, Accepted: 16th Dec. 2017**ABSTRACT**

The genitalia specially of male are unique insects. They have to sets of copulatory of mating apparatuses, The first set which is primary in nature, and found as in other insects on the ninth sternum, While the second set regarded as Secondary complex is located ventrally on the second and the apical part of third abdominal segments On the second sternum is a genital fossa in which the complex are lodged and its walls are supported by a complex sclerotized framework. Hence the present study is designed to analyze genitalia of *Bradinopyga geminata* (Rambur).

Key words: Genitalia, Indian Odonata, *Bradinopyga geminata*

INTRODUCTION

The depression communication posteriorly with a small sac, the penis vesicle the penis and serve to guide and retain ovipositor in position during mating, Great variation of families. The first set of the copulatory complex is used for capturing the female and leading of guiding her about, While the second set is used in actual coitus both stes are important in recognition of species. In this work the genitalia of thirty one genera and thirty nine species of different families of Odonata are studied in relation to the classification of this order. The Anisopterus dragonflies and Zygopterus demselfies are well know insects and are among the most interesting of all insects of tropic and sub-tropic regions. The Importance of the study of the genitalia of these insects has been realized since long and the genitalia have been largely used in taxonomic studies. As a whole in Odonata, the genitalia highlight the characters of great systematic importance. The genitalia of dragonflies and damsselfies are unique among the insects both male and female appendages are equally characteristic, they are very similar superior, Twice as long as segment 10, Cylindrical, Slightly broader at the base, Curved, Pincer like towards one another at the apex, inferiors very short, More robust, Blunt at the apex. The genitalia are different in several genera. The usual genitalia of the abult insects are the bonoport of the genital segments and the uroports or cerci, of the 11 segment The usual genitalia of the adult insects are the bonoport of the genital segments and the uroports or cerci, of the 11 Segment. Since genitalia serve only one function and are located internally, they are probably less affected than most other morphological features by environmental conditions and less subject to adaptive change during phylogenetic history. A study of appendages may therefore help to trace the inter-relations of the families and genera more clearly than the other external characters, on which the current classification is based.

MATERIAL AND METHODS

Representatives of thirty one genera and thirty nine species were studied since the specimens used were mostly dried, They were first put in a relaxing box for 24 hours or more. When the Tissues and sclerotic structures were sufficiently soft, the copulatory complex of male was raised with a needle, the second and the third abdominal segments were cut laterally and the whole cut portion with copulatory complex was then separated. The second and the third segments with copulatory complex were than immersed in 10 percent alcoholic caustic potash solution 2-16 hours, this was found preferable to boiling in casuistic potash solution which was too drastic. Further treatment consisted of removing the muscular tissues and washing in water. After washing, the material was passed through alcoholic series for dehydration. In the beginning it was found difficult to orientate all parts of the genitalia in exactly corresponding position but after few attempts a successful

method was devised to mount the entire complex over slide in exactly corresponding position but after few attempts a successful method was devised to mount the entire complex over slide in exactly corresponding position. Due to the thickness of the material it is difficult to mount on an ordinary slide. Cavity slides and plastic rings may be used in mounting. It was specially difficult to mount the penis, since it is curved in most peculiar manner. Except a few, all the complexes were mounted from ventral aspect, in a position to show their structure more clearly.

For the primary copulatory complex the anal ends of the male and female were cut by the seventh segment and treated as above. Generally the whole complex was mounted in situ, But in some cases the second and the third sterna together with genital lobes were put apart with the help of forceps, and the hamules were folded outwards and laterads on the second sternum with the help of needles and the penis was removed, To show the sclerotic framework and a ns penis sheath more clearly and also their inter-relation with the hamules. In some cases whole complex was taken out, leaving the second and third sterna with genital lobes than the hamules were folded outwards in order to make the complex clearly visible. All the separated penises were mounted laterally while the primary complex ventrally. The whole primary and secondary complex were then figured with a camera Lucida. In those cases where the penis were removed, The Sclerotic framework together with penis sheath and hamules were drawn separately from the penis.

RESULTS AND DISCUSSION

The genital parts of *Bradinopyga geminata* (Rambur) are shown in (Plate-1) which includes-

PRIMARY COPULATORY COMPLEX:

MALE:

A. The Supra-Anal Appendages (SAA): The supra-anal appendages are long, tubular and hollow structure, broader proximally, narrower distally and terminating into black spines (SP). Each supra-anla appendage (SAA) is 2.0 mm long with a prominent spur like process (S) near the base on the inner and lateral side, and six black teeth-like tubercles (T) on the outer and lateral margin. Both the supra-anal appendages (SAA) are heavily furnished with hairs (HA).

B. The Infra-Anal Appendage (IAA): The infra-anal appendage is sac like hollow structure broad in the middle, narrower at the two ends and furnished with hairs (HA). It is 1.8mm long and slightly shorter than the supra-anal appendages (SAA). The apex of the infra appendage is truncated, with two teeth like black protuberances (PR).

FEMALE:

A. The Supra-Anal Appendages (SAA): The supra-anal appendages (SAA) are short with prominent black spines (SP) at apices. Each supra-anal appendages is 1.0mm long and heavily coated with hairs (HA).

B. The Vulvar Scales (VS): The vulvar scale is small extending slightly over anterior margin of the ninth sternum (ST), and slightly cleft at the apex. The ninth sternum (ST) is modified in the form of an oval plate extending forward and covering the anterior part of the tenth sternum (ST). The rudimentary median gonapophyses (MG) are present on the ninth sternum on either side of the middle line.

SECONDARY COPULATORY COMPLEX:

A. The Anterior Lamina (AL): The anterior lamina is broader than long and not clearly demarcated into two region. The anterior margin of the anterior lamina (AL) is straight while the posterior margin is concave in the centre. The posterior region of the anterior lamina (PRAL) is highly sclerotized specially at the posterior margin and larger in size that the anterior region of the anterior lamina (ARAL). The posterior corner of the anterior lamina (AL) are produced into conical process (CP).

B. The Supporting Framework: The anterior protion of the supporting framework (APSF) is W-shaped with very prominent and rounded dorsal process near the distal end of the lateral bars (Lb). The posterior portion of the supporting framework (PPSF) is weak bar of chitin (BC).

C. The Hamules: The posterior hamules (PH) are very stout but small in size. The hooked portion (HP) of the hamule is slightly larger than the truncated protion (TP) and has prominent black

incurved hook (H0) at the distal end. The truncated protion (TP) is membranous and somewhat triangular in shape. Both the protion of the hamules are furnished with hairs (HA).

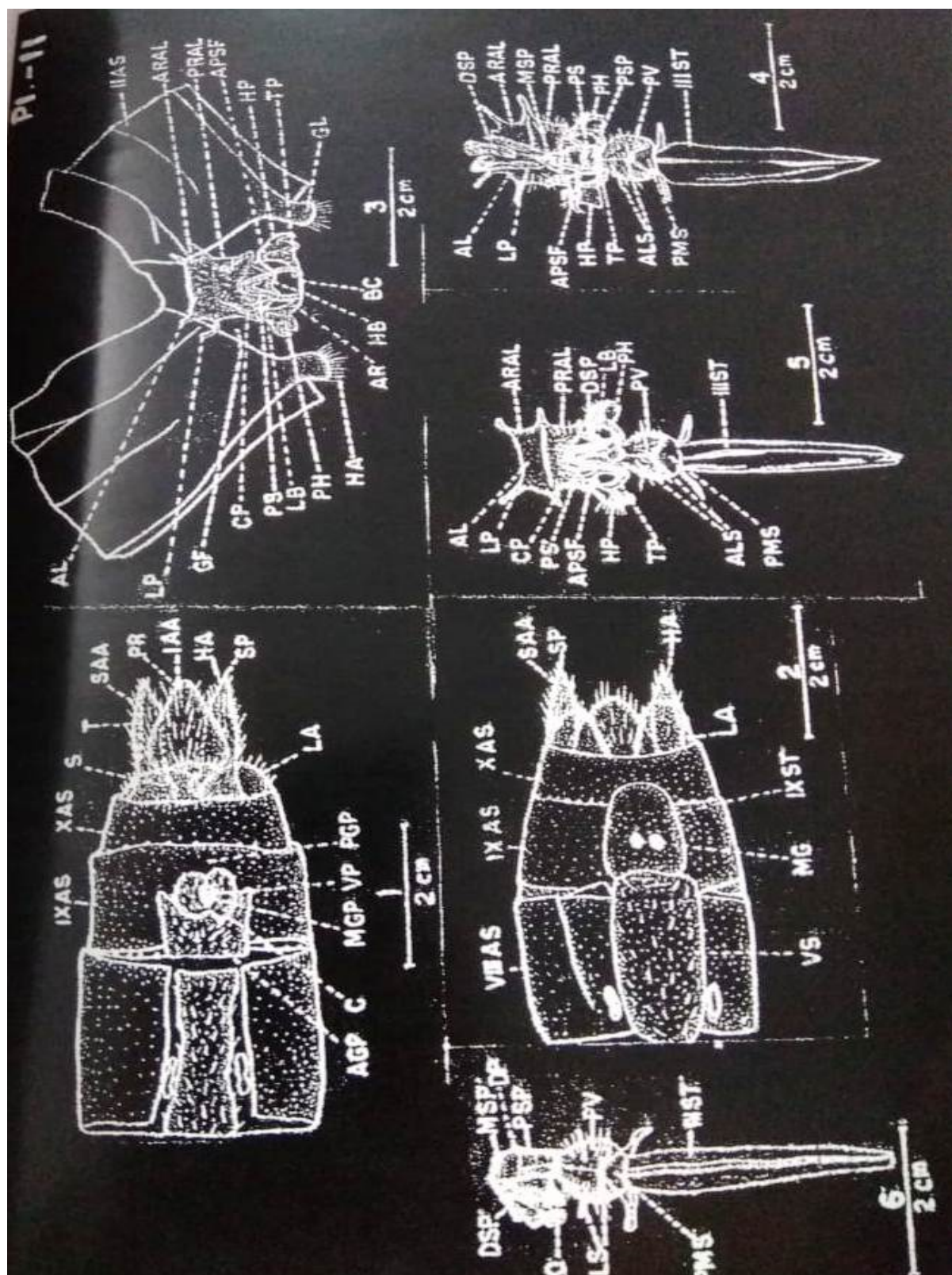


Plate 1: Showing Genital Parts of *Bradinopyga geminata* (Rambur) (Fig. 1: Ventral view of primary appendages; Fig. 2: Ventral view of eighth, ninth and tenth abdominal segments of female; Fig. 3: Ventral view of secondary anal appendages; Fig. 4: Ventral view of secondary anal appendages with genital fossa and penis; Fig. 5: Secondary appendages and penis; Fig. 6: Lateral view of penis)

Abbreviation-

AGP= Anterior Genital Plate; AL= Anterior Lamina; ALS= Antero Lumber Sclerite; APSF= Anterior Portion of Supporting Framework; ARAL= Anterior Region of Anterior Lamina; AS= Abdominal Segment; BC= Bar of Chitin; C= Coxite; CP= Conical Process; GF= Genital Fossa; GL= Genital Lobe; HA= Hair; HP= Hooked Portion; IAA= Infra Anal Appendages; LA= Lamina Anal; LB= Lateral Bar; LO= Lobe; LP= Laminar Process; MGP= Male Gonopore; MSP= Median Segment of Penis; PGP= Posterior Genital Plate; PH= Posterior Hamulke; PSP= Posterior Segment of Penis; PV= Penis Vesicle; S= Spur; SP= Spine, ST= Sternum; S= Spur; VP= Vestigial Penis; VS= Vulvular Scale

D. The Penis Sheath (PS): The penis sheath is well sclerotized. The apex the penis sheath is rounded, membranous and non flappy while the arms (AR) of the penis sheath are long and slightly curved in the middle.

E. The Penis Vesicle (PV): The penis vesicle is rounded and ball-like . The postero-median sclerite (PMS) is small and triangular while the two antero-lateral sclerites (ALS) are large and furnished with few long hairs (HA).

F. The Penis: The penis is clearly demarcated into three segments. The proximal segment of the penis (PSP) is short and stout, narrow at the base and broad at the apex. It has small dorsal process (DP) at the distal end. The median segment of the penis (MSP) is very small and simple while the distal segment of the penis (DSP) is very complicated and larger than the other two segments. It is narrow at the base, very broad at the apex and partly membranous and partly sclerotised with a prominent rounded lobe (LO) at the apex.

G. The Genital Lobes (GL): The genital lobes are poorly developed, elongated at the base, rounded at the apices a heavily coated with long hairs (HA).

REFERENCES

1. Asahina S. (1990): The Odonata of Korean Peninsula, a summarized review. Part 4. Anisoptera 3 (Libellulidae). Gekkan Mushi, 228: 16-22.
2. Fraser F.C. (1933): The fauna of British India, including Ceylon and Burma (Odonata). London, Taylor and Francis, 1: 13-423.
3. Prasad S.N. and Srivastava B.K. (1964): The morphology of the male reproductive organs of *Bradinopyga geminate Rambur* (Odonata: libellulidae). Ann. Zool., 4(12): 123-144.
4. Rathke M.H. (1832): De Libellularum partibus genitalibus. Königsber, pp.1-38, pls.iii.
5. Siebod C.T.H. (1842): Sur la mode de reproduction des Libellulines. Rev. Zool., pp. 283-288.
6. Snodgrass R.E. (1935): Principles of Insect Morphology New York- London: MC. Graw. Hill Book co., pp. 1-667,319.
7. Snodgrass R.E. (1957): A revised interpretation of the external reproductive organs of male insects. Ibid, 135 (6): 1-60.
8. Tillyard R.J. (1925): Origin of the Australian and NewZealand, insects Faunas. Rep. Auastra. Ass. Adv. sci. Sydney, 16: 407-413.