

THE COPULATORY COMPLEX OF *MEGALESTES MAJOR*
SELYS (COENAGRIIDAE : ZYGOPTERA)

By

BASIT ALI KHAN

Zoology Department, Agra College, Agra,

(With 2 Text-figures)

The present paper deals with the structure of the copulatory complex of *Megalestes major* Selys.

Like other Zygoptera, *Megalestes major* Selys bears two sets of copulatory or mating apparatuses, the first set, which is primary in nature, is situated on the venter of the ninth and tenth abdominal segments, while the second set, regarded as secondary complex, is located ventrally on the entire second and the apical part of the third abdominal segments.

The first set of the copulatory complex is used for holding the female during copulation, while the second set is used in actual coition.

Primary Copulatory complex

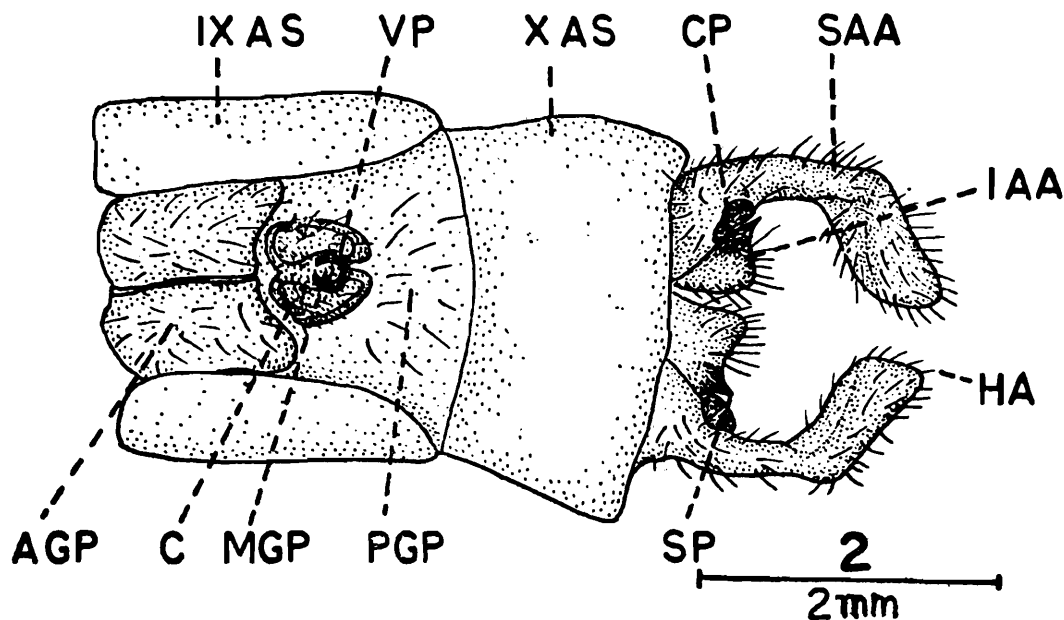
(Text-fig. 2)

The primary copulatory complex consists of a median vestigial or primitive penis (VP), a pair of reduced appendages or gonocoxites (C) (= gonapophyses, Fraser, 1956 in Tuxen's glossary of genitalia in insects; gonopods, Snodgrass, 1935; coxites, George, 1928; valvules, Whedon, 1918), a pair of infra-anal appendages (IAA) (= cerci, Fraser, 1956 in Tuxen's glossary of genitalia in insects; epiproct, Snodgrass, 1935), and a pair of supra-anal appendages (SAA) (= cerci, Snodgrass, 1935).

(i) *The vestigial penis* (VP).—The vestigial penis is represented by a reduced sclerite situated almost in the middle of the ventral surface of ninth abdominal segment (IX AS). The vestigial penis has an elongated opening, the male gonopore (MGP) (= genital meatus, Fraser, 1956 in Tuxen's glossary of genitalia in insects).

(ii) *The coxites* (C).—The male gonopore (MGP) and the vestigial penis (VP) are guarded laterally by a pair of reduced, oval appendages

or gonocoxites. The portions of the ninth sternum lying anterior and posterior to the male gonopore are modified to form the anterior and posterior genital plates (AGP), (PGP), respectively. The anterior genital plate (AGP) is comparatively longer than the posterior genital plate. Both the genital plates are furnished with hairs.



Text-fig. 2. Ventral view of the primary copulatory complex of *M. major* Selys.

AGP — Anterior genital plate ; AH — Anterior hamule ; AL — Anterior lamina ; APSF — Anterior portion of supporting framework ; AR — Arm ; AS — Abdominal segment ; C — Coxite ; CP — Conical process ; FL — Flagellum ; GLA — Glans ; GR — Groove ; HA — Hair ; HB — Horizontal bar ; IAA — Infra-anal appendage ; IB — Inner border ; IP — Inner plate ; LAB — Lamina-batilliformis ; LB — Lateral bar ; LI — Lip ; LP — Laminar process ; MGP — Male gonopore ; N — Notch ; OB — Outer border ; OP — Outer plate ; PGP — Posterior genital plate ; PH — Posterior hamule ; PPSF — Posterior portion of supporting framework ; PV — Penis vesicle ; SAA — Supra-anal appendage ; SP — Spine ; ST — Sternum ; STI — Stigma ; VP — Vestigial penis.

(iii) *The supra-anal appendages (SAA).*—The supra-anal appendages arise from the terminal end of the tenth abdominal segment (X AS). They are well demarcated, forcepate, with broad, rounded, incurved apices. Each supra-anal appendage bears a short conical process (CP) on the inner and lateral side near the base, and is heavily covered with hairs.

(iv) *The infra-anal appendages (IAA).*—The infra-anal appendages (IAA) also arise from the terminal end of the tenth abdominal segment, lying ventral to supra-anal appendages and lateral to the anus. They are very much reduced and somewhat conical structures, with broad bases, and bear spines (SP) on the outer and lateral sides.

Secondary Copulatory complex

(Text-fig. 1)

The secondary copulatory complex consists of the genital fossa (= fenestra, Fraser, 1956 in Tuxen's glossary of genitalia in insects), the anterior lamina (AL), the laminabatilliformis (LAB), the posterior lamina, the chitinous supporting framework, the hamules, the penis Vesicle (PV) (=vesicula spermalis, Fraser, 1956 in Tuxen's glossary of genitalia in insects; sperm receptacle, Snodgrass, 1935), the penis (= prophallus, Fraser, 1956 in Tuxen's glossary of genitalia in insects; intromittent organ, Snodgrass, 1935).

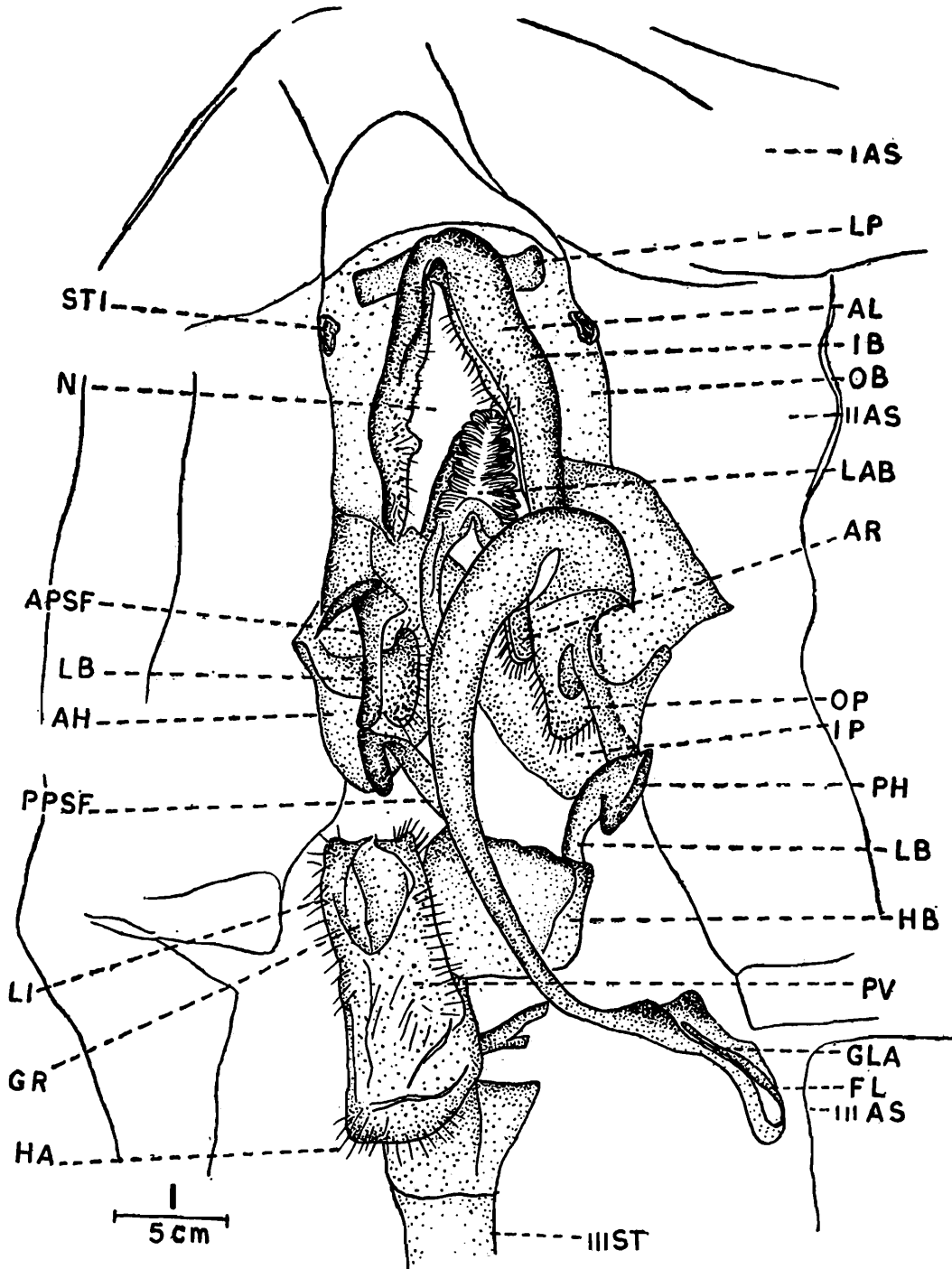
(i) *The genital fossa.*—The genital fossa is a median, shallow and membranous depression on the entire second and apical part of third sternum. It is supported by three sclerites. Anteriorly it is supported by the anterior lamina (AL) and lamina-batilliformis (LAB), posteriorly by a posterior lamina and laterally by a chitinous framework of sclerites. All the structures of the secondary complex are placed inside the fossa.

(ii) *The anterior lamina (AL).*—The anterior lamina is a chitinous, hood-like sclerite occupying the front part of the second venter and extending between the two ventral margins of the second tergum.

The anterior lamina is somewhat inverted V-shaped, plate, with a convex anterior margin having thick laminar processes (LP). At its posterior margin it is deeply cleft to form a prominent notch. The notch encloses the proximal portion of the penis. The anterior lamina has two prominent borders, the inner border (IB) and the outer border (OB). The outer border is broader than the inner border.

(iii) *The lamina-batilliformis (LAB).*—It is forceps-like chitinous structure, lying inside the notch, between the two arms of the anterior lamina. According to Thompson (1908), the lamina-batilliformis may be regarded as penis sheath in *Zygoptera*, because it lies exactly in the same position as the penis sheath in *Anisoptera*, and it also covers the proximal portion of the penis. The lamina-batilliformis (LAB) bears a spiny apex, and short, thick and slightly curved arms (AR).

(iv) *The supporting framework (APSF, PPSF).*—The genital fossa is strengthened and supported by a number of chitinous rods, which together make the complicated net-work of chitinous rods, the supporting framework. The supporting framework supports the various parts of the copulatory complex and also provides the various surfaces or facets for the articulation of the copulatory organs with each other.



Text-fig. 1. Ventral view of the secondary copulatory complex with penis of *Megalestes major* Selys.

(For explanation of legend see page 250)

It is divisible into two portions, the anterior portion (APSF) and the posterior portion (PPSF). The anterior portion of the supporting framework is an inverted V-shaped structure with two long rod-like lateral bars (LB). The posterior portion of the supporting framework is comparatively well developed and U-shaped structure, with short and curved lateral bars (LB), and broad, flat, rectangular horizontal bar (HB).

(v) *The hamules* (AII, PH).—The hamules are chitinous and robust structures. Behind the anterior lamina (AL) and articulated with the framework, there are two pairs of hamules.

The anterior pair of hamules are enormously developed, having four prominent plates; out of the four plates, the two are inner plates (IP) and two are outer plates (OP). The outer plates of the anterior hamules are shorter than the inner plates. The posterior pair of hamules (PH) are reduced to papillae, and located at the junction of the anterior and posterior portions of the supporting framework.

(vi) *The penis vesicle* (PV).—Penis vesicle is situated on the anterior part of the third sternum (ST), and projects forwards underneath the second sternum. It is elongated sacciform, with broad body. At the apical end the penis vesicle bears a prominent groove (GR) guarded by two lips (LI) in which the glans of the penis is placed during rest.

(vii) *The penis*.—The penis is located on the second segment and it does not arise from the penis vesicle as in Anisoptera. It lies on the ventral surface of second abdominal segment in an exactly homologous position as the penis sheath in Anisoptera. It is well developed, much elongated, unsegmented, slightly curved and chitinous structure, broader proximally while narrower distally. It bears a membranous elongated glans (GLA), having a long flagellum (FL) and some lobes.

SUMMARY

Like Anisoptera, *Megalestes major* Selys bears two sets of copulatory apparatuses, the primary copulatory complex and the secondary copulatory complex. The primary copulatory complex consists of a vestigial penis, a pair of supra-anal appendages and a pair of infra-anal appendages. But unlike Anisoptera, there are two infra-anal appendages. The secondary copulatory complex is located on the ventral surface of second and third abdominal segments. The anterior pair of hamules are well developed, while the posterior pair of hamules are very much reduced. The penis sheath is absent, but in place of penis sheath there is a well developed lamina-batilliformis. The penis is unsegmented and does not arise from penis vesicle but from the floor of the second segment.

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