

# The Musculature of the Male Genitalia of *Poekilocerus pictus* (Fabr.) (Pyrgomorphidae; Acridoidea; Orthoptera)

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## INTRODUCTION

Studies of the abdominal musculature of acridoid grasshoppers have been carried out by Ford (1923), Snodgrass (1935; 1936) and Albrecht (1953). However musculature of the male genitalia in particular has received little attention. The musculature of the male genitalia of *Poekilocerus pictus* Fabr. shows a significant variation from the muscular pattern of other sub-families of the family Pyrgomorphidae both in muscular attachment and size.

## MATERIALS AND METHODS

The grasshoppers after collection were preserved in Bouin's fluid, 10% formaldehyde, glacial acetic acid or micro-chlor-acetic acid. Of these Bouin's fluid and micro-chlor-acetic acid yielded satisfactory results and exposed muscle bands were easily preserved. After fixation, the genital segments were severed from the rest of the body. Since the attachments were essential for the study, the genitalia was sectioned from various angles so as to observe the musculature. The dissections were carried out with dissecting needles under a microscope. The drawings were made by means of an ocular grid and the muscles and their attachments were preserved in 70% alcohol.

## PHALLIC MUSCLES OF POEKILOCERUS PICTUS

### *Elevator of the epiphallus*: (No. 1)

A narrow elongated strap-like band which originates from the distal aspect of the zygoma (Z) of the cingulum and is attached to the anterior process of the epiphallus (AP). This muscle causes the protrusion of the epiphallus and during this process, the lateral plates (LP) and lophi (L) are extended so as to depress the sub-genital plate of the female before coitus.

### *Depressor of the epiphallus*: (No. 2)

A fan shaped, less compact and thinner muscle, it originates from the anterior and ventro-lateral part of the apodemes of the cingulum (AC) and is attached to the postero-lateral margin of the ectophallic membrane (EM). This muscle controls the movement of the lophi (L) and depresses the epiphallus and returns it to its normal position.

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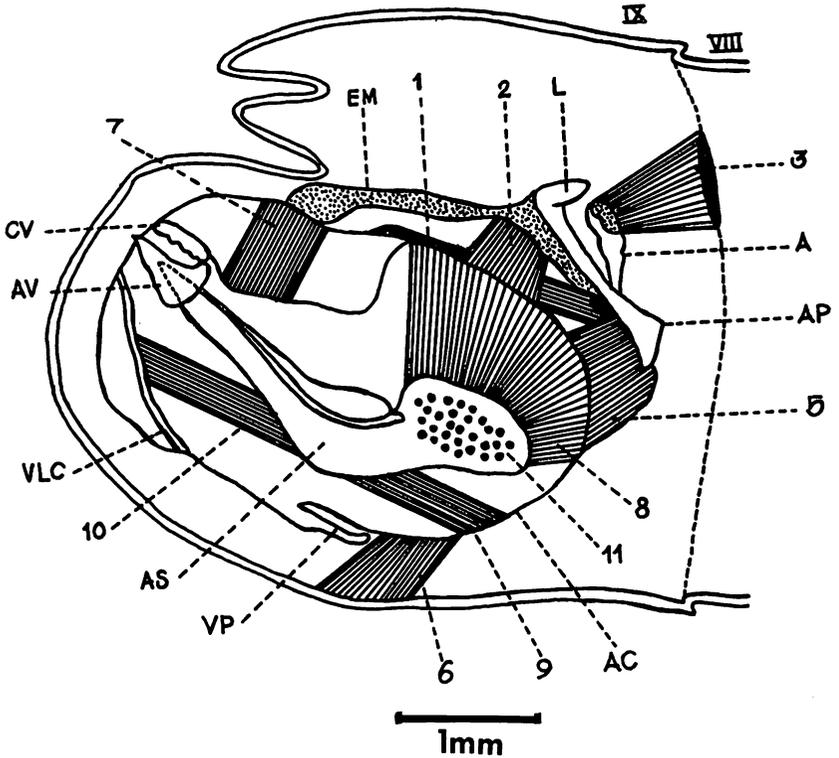


FIG. 1. Longitudinal section through the genital segments showing a general view of the musculature of the phallus.

*Retractor of the epiphallus:* (No. 3)

This is a broad and compact band of muscles which originates from posterior dorso-lateral aspect of the VIII tergum and is inserted into the postero-lateral part of the dorso-lateral appendices (A). It restores the epiphallus to its normal position and is an accessory to muscle No. 4. Its function is similar to the "Retractors of the phallus" (Snodgrass, 1935; Albrecht, 1953).

*Retractor of the phallus:* (No. 4)

A short compact band of muscles originating from the cingulum in the region of the rami (RC) on the ventral side and is attached to the sternum. Its function is the restoration of the phallus to its normal position after protrusion.

*Protractor of the epiphallus:* (No. 5)

This muscle is broad, thin and fan-shaped and originates from the postero-ventral part of the apodemes of the cingulum (AC) and is attached to the antero-lateral part of the anterior process of the epiphallus (AP).

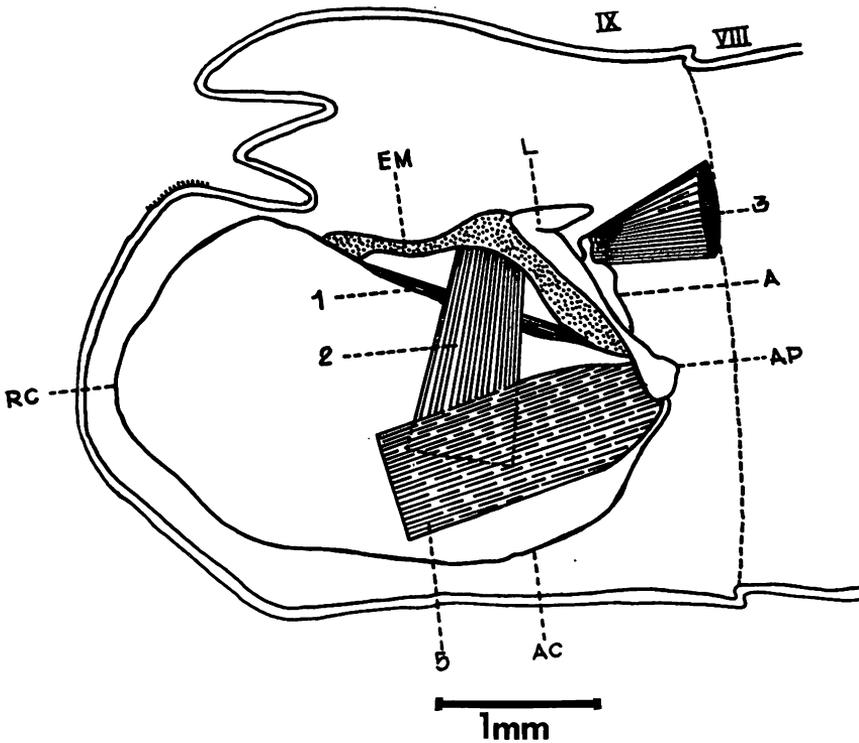


FIG. 2. Longitudinal section through segment IX showing epiphallic musculature.

This muscle helps in restoring the normal position of the epiphallus and during protrusion, it helps in extension of the phallus.

*Protractor of the phallus:* (No. 6)

This is a moderately heavy muscle band which runs for a considerable distance along the sternum. It originates from the antero-ventral part of the apodeme of the cingulum (AC), runs posteriorly and is attached to the sternum near the base of muscle No. 4. This protractor muscle works opposite muscle No. 4 and helps in protrusion of the phallus.

*Dilator of the valves of the cingulum:* (No. 7)

This muscle originates from the ventral wall of the supra-ramus, runs anteriorly and is attached to the upper ridge of the ramus. The function of this muscle band is to contract the supra-ramal cleft and consequently the valves of the cingulum (VC) so as to accommodate the broad aedeagal sclerites during copulation.

*Elevator of the endophallus:* (No. 8)

This broad and heavily muscled band is the most compact of all the muscles of the genitalia. It originates from the dorso-lateral aspect of the apodemes of the cingulum (AC) and is attached to the outer lateral region

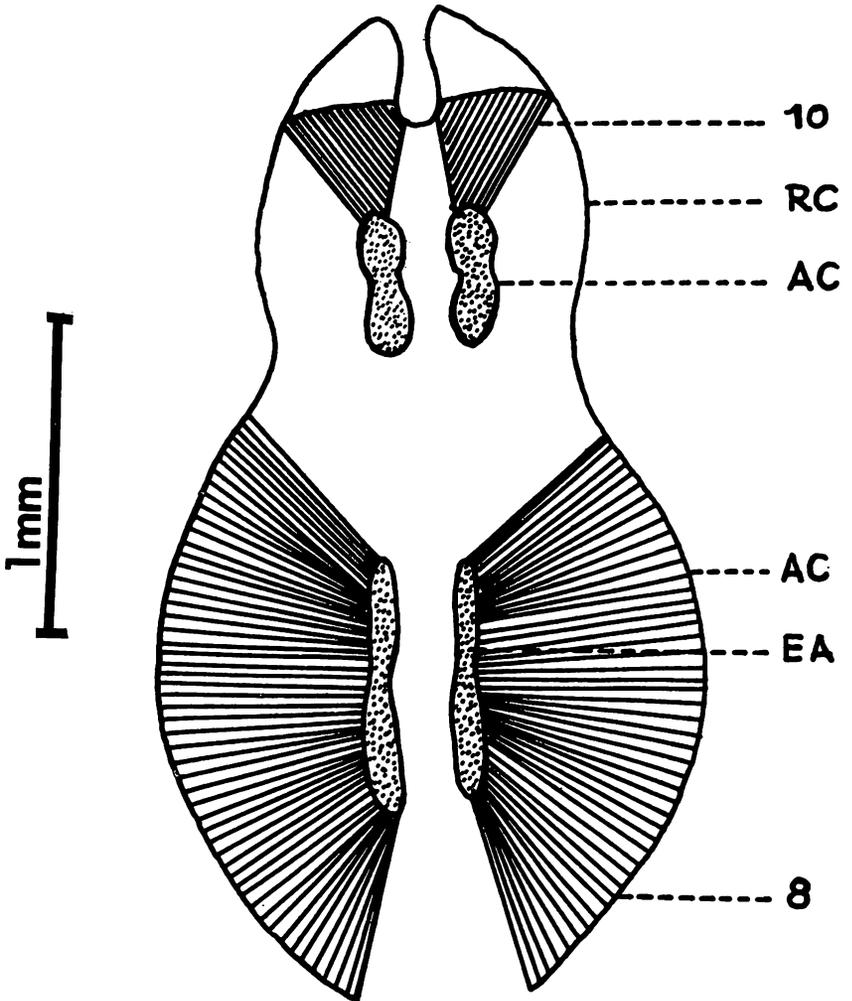


FIG. 3. Longitudinal (horizontal) section through the phallus showing the muscles of the endophallic apodemes and the aedeagal sclerites.

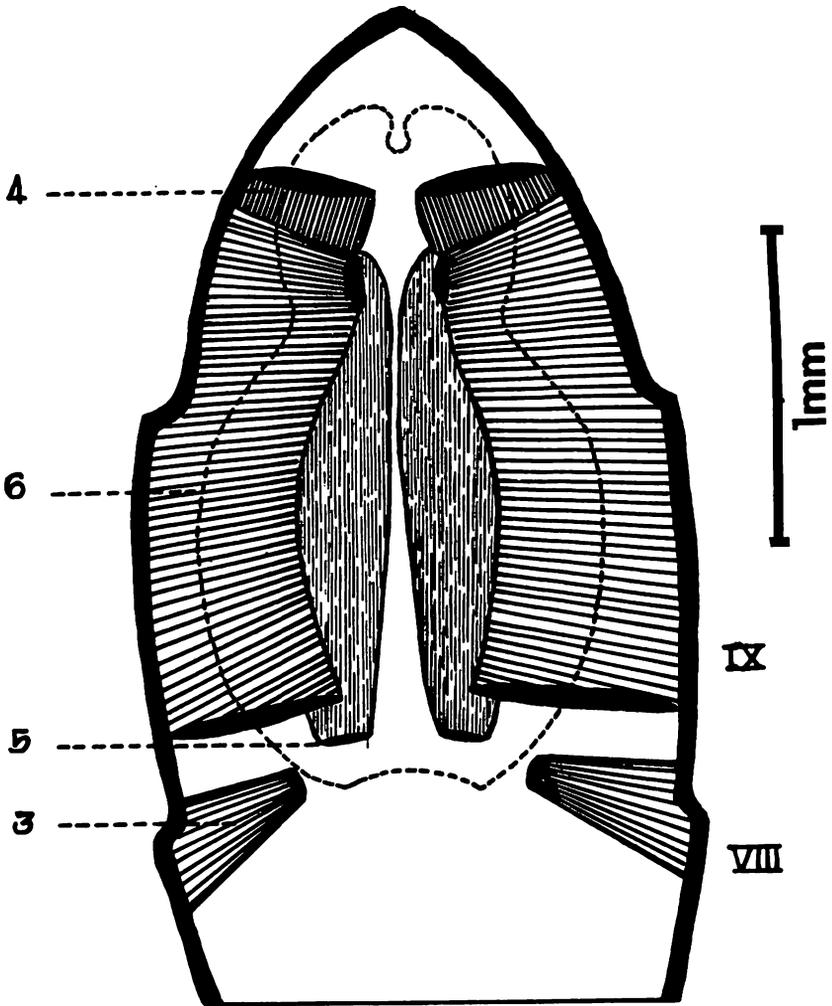


FIG. 4. Longitudinal section through segments VIII and IX showing the musculature of the sternum.

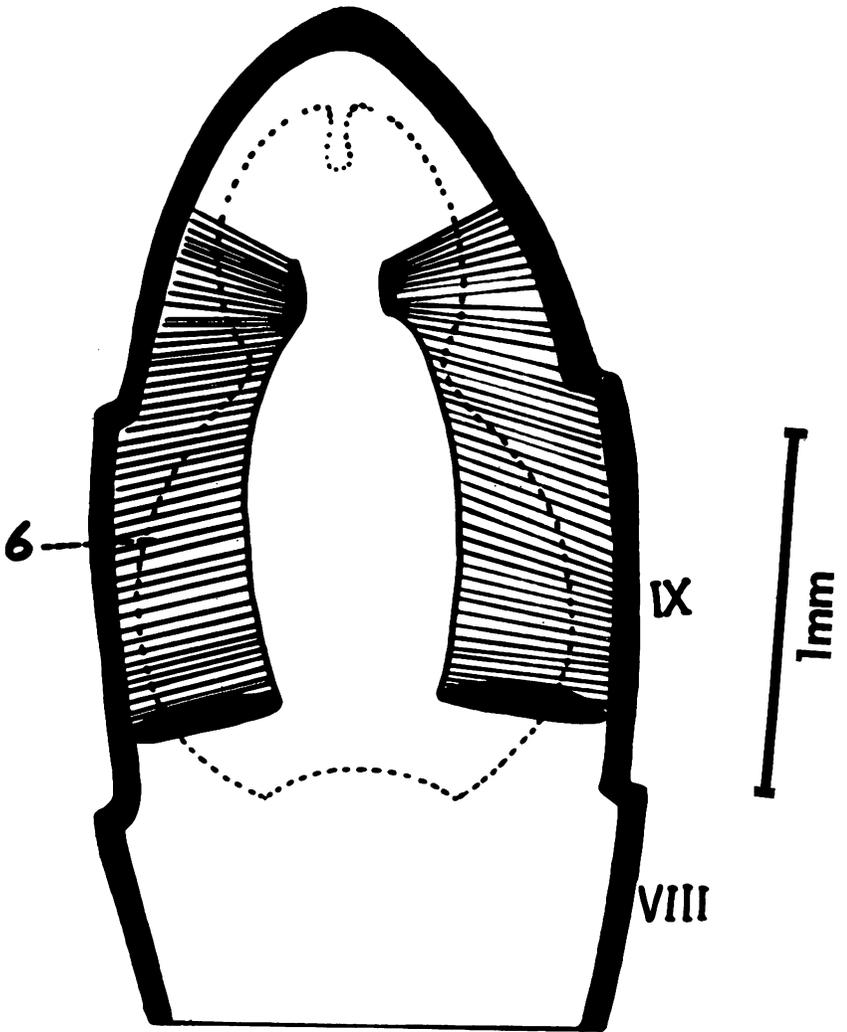


FIG. 5. *Diagram showing the attachment of Muscle No. 6 on the sternum.*

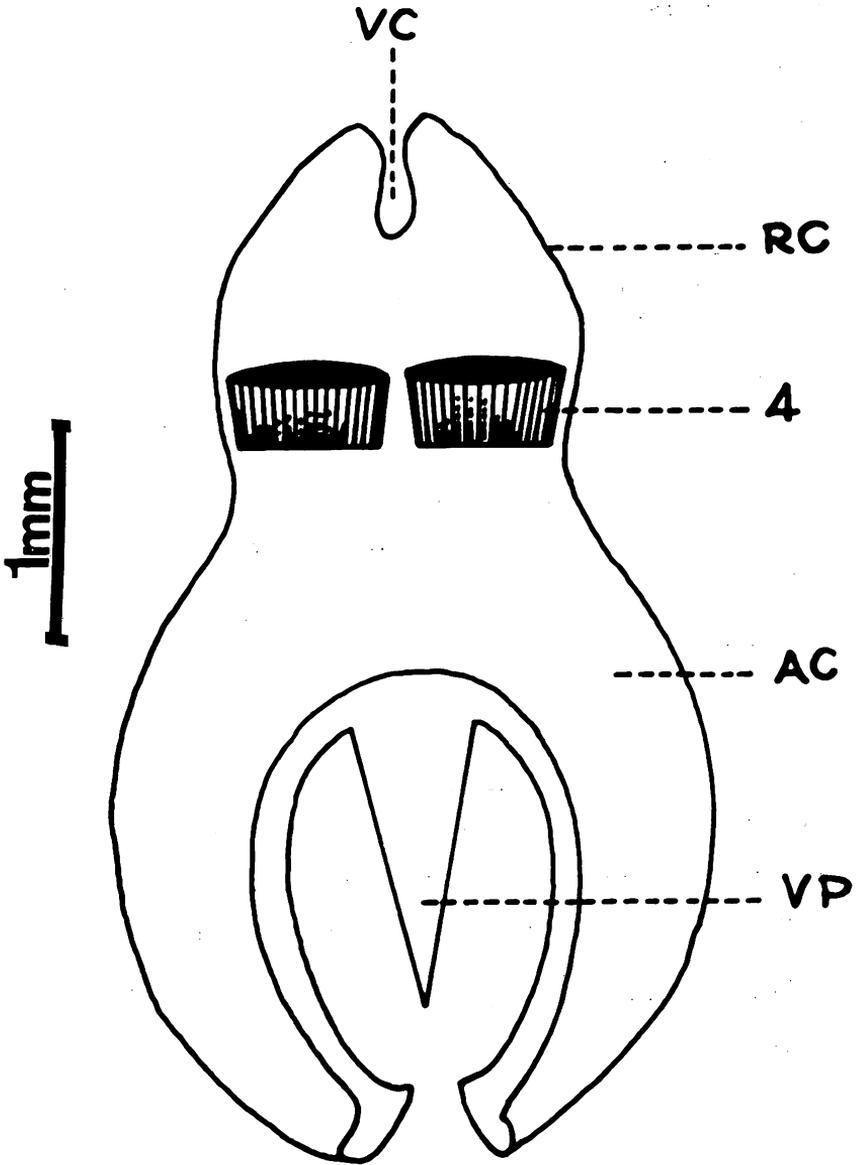


FIG. 6. *Diagram showing the attachment on the ventral side of the phallus of muscle No. 4.*

of the endophallic plate. This muscle elevates the phallus during copulation.

*Retractor of the endophallus*: (No. 9)

A comparatively shorter and narrower band of muscles which originates from the proximal part of the apodemes of the cingulum (AC) and is attached to the ventro-lateral aspect of the endophallic plate (EA). This muscle band helps in retraction of the aedeagus to its normal position.

*Protractor of the endophallus*: (No. 10)

An elongated narrow band of muscles taking its origin from the distal region of the aedeagal sclerites (AS) near its junction with the endophallic plate (EA) and is connected along the edge of the ventral longitudinal ridge of the cingulum (VLC). It protracts the aedeagus during copulation.

*Dilator of the endophallus*: (No. 11)

This is a broad band of muscles attached to the inner lateral aspect of the endophallic apodemes (EA) and connects the two endophallic plates internally. Since it binds the two endophallic plates, it promotes their movement in unison.

#### SUMMARY AND CONCLUSIONS

The basic plan of musculature of *Poeciloceris pictus* does not conform to a great extent to the basic plan of musculature in *Dissosteira carolina* outlined by Snodgrass (1936) and to that in the migratory locust, *Locusta migratoria migratoides* described by Albrecht (1953). The musculature varies not only in the attachments because of the difference in structure of genitalia, but also in the number of muscle bands encountered and in their size.

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ABBREVIATIONS

- A — appendices of the epiphallus
- AC — apodemes of cingulum
- AE — aedeagus
- AP — anterior projections of epiphallus
- AS — aedeagal sclerite
- AV — aedeagal valve
- B — bridge of the epiphallus
- BE — basal emargination
- BC — basal thickening of the cingulum
- BF — basal fold
- CM — central membrane
- CV — valves of the cingulum
- DC — dorsal cleft
- E — epiphallus
- EA — endophallic apodemes
- ES — ejaculatory sac
- G — gonopore
- L — lophi
- LL — lateral lobes
- LP — lateral plates of the epiphallus
- P — phallotreme
- RC — rami of the cingulum
- SS — spermatophore sac
- SZ — supra zygomal plate
- VC — ventral cleft
- VI — ventral infold
- VP — ventral process
- Z — zygoma