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A TAXONOMIC STUDY ON THE HEAD APPENDAGES OF ADULT BRUCHIDAE (COLEOPTERA)

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A taxonomic study on the head appendages of 39 species of Bruchidae has been made. The antennae vary in size and shape and are 11-segmented with marked sexual dimorphism. The general appearance, the shape of molar and incisor areas alongwith the presence or absence of dents and cilia on the former are the mandibular characters for separating the sub-families. The maxilla has undivided cardo, stipes and galea; the setae on galea show variations at generic level being branched, simple, barbed and terminally bifid. The sclerotized stipital strips also show some variations at species level. The shape of the postmental sclerite and epilobes is important at subfamily level. However, the number of papillae considered on both the maxillary as well as, labial palps show specific variations.

INTRODUCTION

Bruchids are serious pest of beans and lentils and are causing heavy damage in stores as well as in the fields. A comprehensive work on the head appendages of adult bruchids of 39 species belonging to 9 genera and 3 subfamilies *viz. Bruchus*, *Callosobruchus*, *Specularius*, *Conicobruchus*, *Bruchidius* and *Sulcobruchus* (subfamily Bruchinae); *Spermophagus* and *Zabrotes* (subfamily Amblycerinae) and *Caryedon* of subfamily Pachymerinae) has been made to assess their value at the subfamily, generic and specific levels. The sifting of the literature reveals that the work conducted on the morphology of bruchids is too meager to draw any conclusion at taxonomic levels. However, Zacher (1930), Deviault (1928), De Luca (1956 & 1965), Mathur & Dhadial (1964), and Singh (1981 & 1982) are some of the workers who have attempted morphological studies on bruchids.

The present investigations reveal that the shape of antennae, mandibles,

molar and incisor areas, postmental sclerite and the epilobes; the types of setae on galea and, the number of papillae on palps etc. are good taxonomic characters for separating the subfamilies, genera and even the species.

The material for the present studies was collected from different localities of North-West India.

OBSERVATIONS AND DISCUSSION

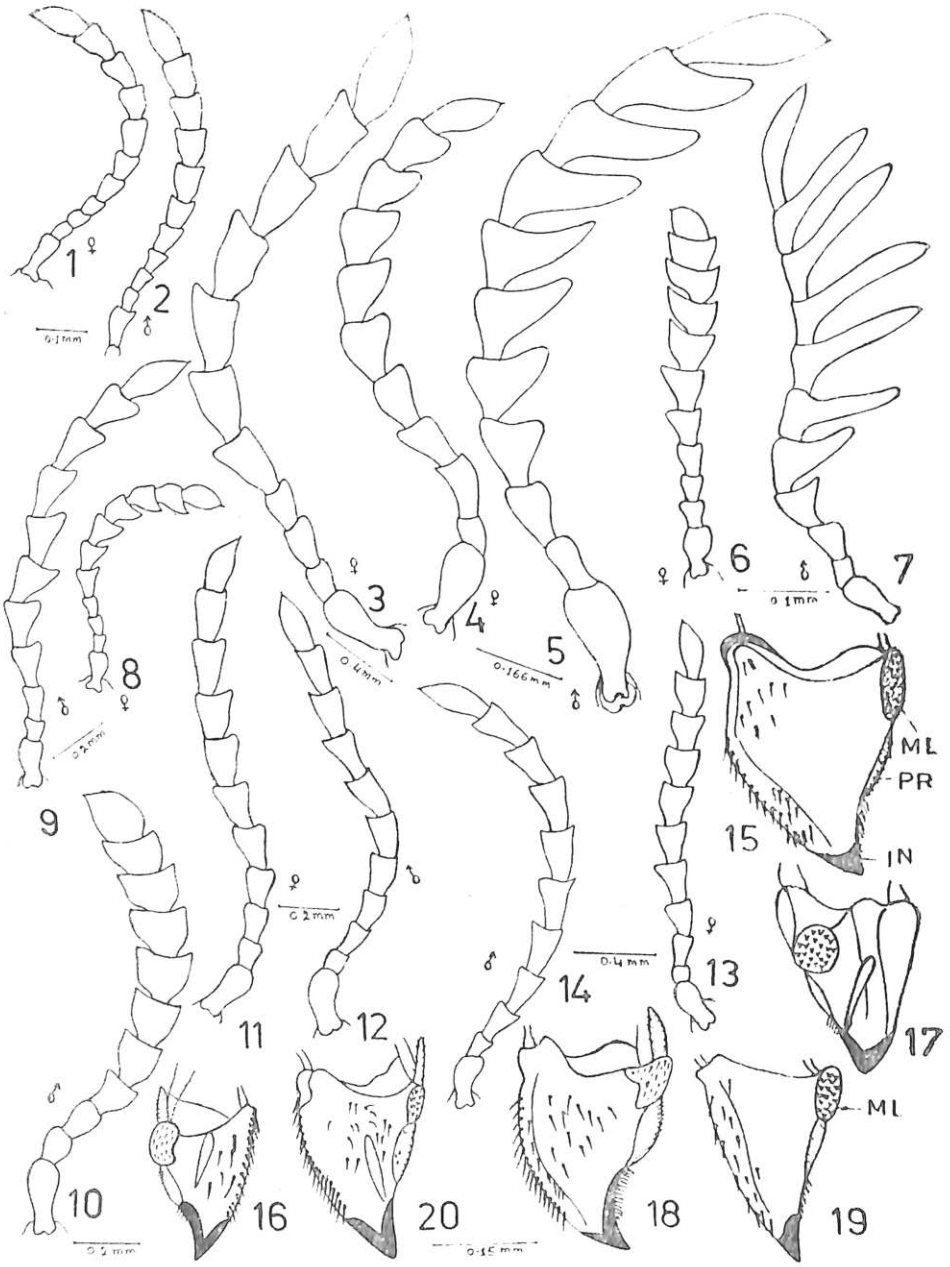
The head appendages include the antennae and the mouth parts.

The Antennae (Figs. 1–14)

The antennae are 11-segmented in the family Bruchidae. They are long, surpassing the pronotum and are similar in the two sexes in the genus *Spermophagus* (Figs. 1 & 2) of the subfamily Amblycerinae, in the genus *Caryedon* (Fig. 3) of the subfamily Pachymerinae and in *Bruchidius cassiae* of the subfamily Bruchinae. The subfamily Bruchinae can be divided in to two groups (1) in which the antennae surpass the pronotum but show sexual dimorphism being longer in the males, such as in the species of *Callosobruchus* (Figs. 4 & 5), *Specularius* (Figs. 6 & 7), in *Conicobruchus albopubens* and, in the four species of *Bruchidius (B. minutus, B. vulgaris, B. tephrosiae, B. angustifrons)* (Figs. 8 & 9) and (2) in which the antennae are short and identical in the two sexes in the species of *Bruchus* (Fig. 10), in *Conicorbruchus indicus, Bruchidius sahlbergi, B. andrewesi, B. saundersi, B. dimorphous, B. mimosiae, B. urbanus, B. lineolatus*, B. *multilineolatus, B. maculipygus, B. flavovirens, B. aureus, B. albizziae, B. schilski, B. pygomaculatus* and *Sulcobruchus kingsolveri. Zabrotes subfasciatus* (Figs. 11 & 12) (subfamily Amblycerinae) shares this character with the Ist group of Bruchinae.

The antenna may be serrate, sub-serrate or pectinate in the different members.

The antennae also show sexual dimorphism, being pectinate in the males of *Callosobruchus chinensis* (Singh, 1981) (Fig. 5) and *Specularius maindroni* (Fig. 7), and serrate in the females (Figs. 4 & 6). It is serrate in the males of *Callosobruchus maculatus* (Figs. 11 & 14), *Conicorbruchus albopubens, Bruchidius minutus, B. angustifrons, B tephrosiae* and sub-serrate in the females. The antennae show colour variations too and are unicolourus in the species of *Bruchus, Callosobruchus, Specularius, Conicobruchus, Sulcobruchus*, in some species of *Bruchidius*, species of *Spermophagus* and of *Caryedon* (except *C. lineatonota*). They are bicolourus in the species of *Zabrotes* and some species of *Bruchidius.*



Figs. 1–20. 1. Antenna of *Spermaphagus*. 2 *S. tessellatus*, 3. *Caryedon serratus*. 4. *Callosobruchus chinensis*. 5 *C. chinensis*. 6. Antenna of female *Specularius maindroni*. 7. *S maindroui*. 8. *Bruchid us angustifrons*. 9. *B. angustifrons*. 10. *Bruchus pisorum*. 11. *Zabrotes subfasciatus*. 12. *Z. subfasciatus*. 13. *Callosobruchus maculatus*. 14. *C. maculatus* 15. Mandible of *Callosobruchus chinensis* showing dents and cilia on molar area. 16 *Bruchidius angustifrons* showing presence of cilia only. 17. *Sulcobruchus kingsolveri* showing the blunt tooth. 18. *Zabrotes subfasciatus* showing dents on molar area. 19. & 20. *Specularius bredwelli* showing dents only on molar area.

The Mandibles (Figs. 15–20)

The mandibles are strongly chitinized, chewing and biting type in all the members. They are roughly conical in the subfamilies Bruchinae (Figs. 15–17) and Pachymerinae (Fig. 18) but are slightly elongate in the species of Amblycerinae (Fig. 19). The molar (ML) area is oval and provided with dents and cilia in the species of *Bruchus*, *Callosobruchus* (Fig. 15), *Conicobruchus* and *Sulcobruchus* of the subfamily Bruchinae; bean-shaped with dents but without cilia in the species of *Specularius* (Fig. 2), in *Bruchidius tephrosiae*, *B. minutus*, *B. cassiae* and in the species of Amblycerinae (Fig. 19); bean-shaped without dents but without cilia only in the species of Pachymerinae (Fig. 18), a character which is shared by the remaining species of *Bruchidius* of subfamily *Bruchinae*.

The incisor tooth (IN) is sharp in all the members except in five members of genus *Bruchidius e. g. B. minutus*, *B. vulgaris*, *B. tephrosiae*, *B. lineolatus* and *Sulcobruchus kingsolveri* (Fig. 17) where it is blunt.

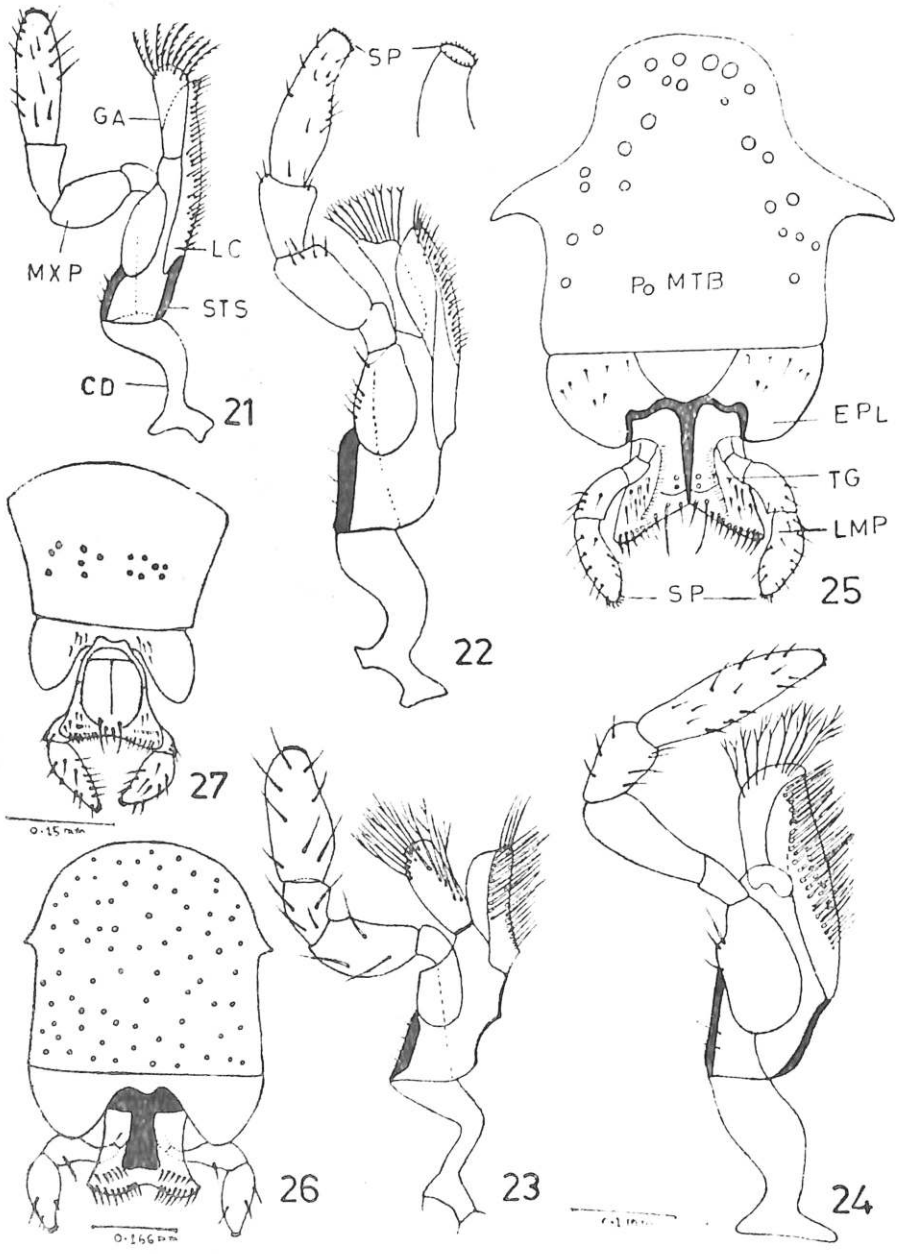
A prostheca (PR) or a membranous flap is present in all the members of the family.

The Maxilla (Figs. 21–24)

The maxilla in the family Bruchidae is with undivided cardo (CO), stipes (ST) and galea (GA) as also mentioned by Daviault (1928) and De Luca (1956 & 1965) However, Mathur & Dhadial (1964) have shown the stipes to be divided into basistipes and mediostipes in *Caryedon gonagra*. It is similar in its general structure in all the members except in the sclerotised areas of the stipes, in the setae of galea and in the number of papillae which show variations. A pair of sclerotized strips (STS) is present, one on each side in *Callosobruchus maculatus*, *Specularius bridwelli* (Fig. 21), *Bruchidius vulgaris*, *B. angustifrons*, *B. saundersi*, *B. albizziae*, *B. flavovirens*, *B. aureus*, *B. schilski* and *B. pygomaculatus* all belonging to subfamily Bruchinae. A strip is present on the outer side only in rest of the members of the family (Fig. 22), however, *Callosobruchus analis*, *Bruchidius sahlbergi*, *B. urbanus* of the subfamily Bruchinae, *Spermophpgus latescenta* and *Zabrotes subfasciatus* of the subfamily Amblycerinae are without such sclerotized areas.

The setae on the galea have importance at generic level being branched in the species of *Caryedon* (Fig. 24), simple and branched in *Callosobruchus* (Fig. 23), barbed in *Conicobruchus*, *Specularius* (Fig. 21), *Bruchidius*, *Sulcobruchus*, *Spermophagus* and *Zabrotes*. The species of Bruchus (Fig. 22) are specialised in

having terminally bifid setae on the galea. The number of papillae vary from 7 to many in the different species.



Figs. 21–27. **21**. Maxilla of *Specularius bredwelli* showing sclerotized strips on both sides of stipes and barbed setae on galea. **22**. *Bruchus pisorum* showing terminally bifid seta on galea. **23**. *Callosobruchus chinensis* showing simple and branched setae on galea. **24**. *Caryedon serratus* showing branched setae on galea. **25** Labium of *Caryedon serratus*. **26**. *Callosobruchus chinensis*. **27**. *Spermophagus tessellatus*.

The Labium (Figs. 25–27)

Basically the labium is similar in all the members of the family being divided into proximal postlabium and distal prelabium, the latter bearing the labial palps (LMP) on sides and the ligula or totaglossa (TG) terminally. However, at the subfamily level the shape of basal postmental sclerite (POMTD) and epilobes (EPL) is important. The basal postmental sclerite is shield–shaped, produced into a median lobe with a lateral process on either side in Pachymerinae (Fig. 25), shield–shaped and produced laterally into a process on either side in Bruchinae (Fig. 26), and, more or less quadrate without lateral process in Amblycerinae (Fig. 27). The epilobes are nipple–shaped curved inward in the subfamily Pachymerinae; broad, conical and low in Bruchinae and high and elongate in Amblycerinae (Fig. 27). The papillae (SP) which have specific value, vary from 3–11.

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