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The female reproductive organs of Bruchidae and Chrysomelidae (Coleoptera)

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Summary

The female reproductive organs of 4 Bruchidae and 58 Chrysomelidae species were studied. Number of ovarioles and structure of oviducts, bursa copulatrix, vagina and of the capsule, duct and gland of spermatheca and vaginal pouches where present were examined in detail and mostly figured. Systematic importance of ovariole numbers and structural differences at different taxonomic levels were discussed.

Introduction

The female reproductive organs of Bruchidae and Chrysomelidae comprise a pair of laterally placed ovaries, paired lateral oviducts, the common oviduct, the spermatheca and spermathecal gland, bursa copulatrix and vagina. In some species, parts of the vagina and ovipositor may also be sclerotised. The size and number of ovarioles depend on the maturity of adults. When present, each ovariole contains a number of developing eggs. The ovarial flaments medially form a common ligament which runs posteriorly to attach to the hind gut. The structure of flaments and ligaments and the number of the ovarioles were attributed no systematic value by Donia (1958), Aslam (1961). Robertson (1961), Suziki (1974, 1975) and Kasap (1975) so that in this work, for only reference the number of ovarials (ov.no) were given in paranthesis after citation the species studied.

The length, width and contents of the lateral oviducts depend on the maturity of the insect and on the species. The lateral oviducts medially unite

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to form a common oviduct which has a chitinious lining. In some groups there is a well developed bursa copulatrix and the vagina and common oviduct are very distinct. In others, the bursa copulatrix is greatly reduced, vestigial or lost, in which case the posterior part of the common oviduct, reduced bursa copulatrix if present and the vagina are enclosed in a common sheath, which consequently obscures external definition of these structures; this type is referred to in this work as ««sheath type» to denote the common oviduct-reduced bursa copulatrix- vagina complex.

The spermatheca comprises a capsule, a duct and a gland; the capsule and duct are sclerotised. The capsule is the most conspicuous component, being usually curved in characteristic shapes. In some groups, it is possible to distinguish a *ramus* (the posterodorsal arm), a *collum* (the posteroventral arm), a *cornu* (the distal part) and a *nodulus* (the median part) e.g. (fig. 26), whereas in others, some or all of these parts are not distinct. The spermathecal duct opens to the collum when present, or to the ventral basal part of the capsule; it may be short, long or convoluted or very long or spirally coiled. The spermathecal gland may be tubular, ovoid or club-like. A muscle bundle connects the curved arms of the capsule.

Material and Methods

The specimens examined were collected in various localities of Great Britain by the authors and of Turkey by H. Kasap. The exotic specimens were taken from the collection of R.A. Crowson. Most specimens were examined in living state, i.e. each specimen was narcotised with ethyl-ether and dissected in Ringer's solution or distilled water under a binocular microscope. 70 % alcohol preserved specimens were also studied. After removing tergites the reproductive organs were freed from other parts of the abdomen, then examined. In the species with sheath-type bursa copulatrix, the muscular sheath was removed in 10 % KOH before examination. The figures were drawn by free-hand to show the fine structural details.

Results and Discussion

Family : *Bruchidae*

The female reproductive organs of *Bruchus pisi* L. and of *Zabrotes subfasciatus* Boh. were studied by Zacher (1930) and those of *Bruchus quadrimaculatus* F. and *Collosobruchus chinensis* (L.) were studied by Mukerji and Bhuya (1937) and those of *Acanthoscelides obtectus* (Say) by Daviault (1928) and Huignard (1975) and those of *A. obtectus* (fig. 1) (ov. no 6), *Caryedon serratus* (Ol.) (fig. 4) (ov. no 6), *Euspermophagus sericeus* Geoffr. (fig. 2) (ov. no 5) and *Zabrotes subfasciatus* (fig. 3) (ov. no 2) were investigated in this survey.

In this family, the oviducts may be long and narrow or short and wide.

A well developed and large bursa copulatrix is always present; its external structure exhibits very interesting features. In some species of *Bruchus* and *Collosobruchus* there is a pair of internal pad-like structures in the anterior of the vagina (Mukerji and Bhuya, 1937). Zacher (1930) noted two large, round structures posterior to the bursa copulatrix, being less distinct in *Z. subfasciatus;* we also observed similar structures in this species. According to Mukerji and Bhuya (1937) these structures guard the passage between the vagina and bursa copulatrix, whereas according to Zacher (1930) they are accessary glands yielding the substance for cementing the eggs to the seed coats. However, Mukerji (1949) suggested that they act as pouches for temporary storage of sperms. We found the similar structures in *Caryedon serratus, A. obtectus* and *Z. subfasciatus.* In the bursa copulatrix of *C. serratus* (fig. 4D) there is a more elaborate sclerotised structure with a dorsal and ventral compartment. The dorsal compartment is narrow anteriorly opening to the neck region of bursa copulatrix, posteriorly to the vagina. The ventral compartment is broad, pouch-like, anteriorly closed but posteriorly opening to the vagina. In *Z. subfasciatus,* a much reduced, and simple, sclerotised structure was also found in the bursa copulatrix. Zacher (1930) previously recorded the presence of a chitinious plate in the bursa copulatrix of *Bruchus cisti* Payk. As regards the function of this sclerotised structure and of the pad-like soft structure where present, it occurs to us that they may serve devices to occlude the proximal end of the vagina, so as to prevent the further penetration of the internal sac of the aedeagus and the diversion of the eggs in oviposition into the bursa copulatrix rather than as secretive structures; they may also serve as temporary storage for sperms. These suggestions support the views of Mukerji and Bhuya (1937) and Mukerji (1949). Huignard (1975) described the spermatophores of *Acanthoscelides obtectus,* being wrapped in a membranous sheath composed of protein substances, so being rather thick and strong. Probably such a spermatophoral membrane is also present in other bruchids and some of the sclerotised structures in the bursa copulatrix might be concerned in bursting this spermatophoral membrane after copulation. Furthermore in *C. serratus* (fig. 4D) there are a few small sclerites in the walls of the common oviduct more anteriorly, these may be additional security device to guard the passage of the common oviduct.

In this family ,the bursa copulatrix, the common oviduct and the vagina are externally well separated, even the atrium (the posterior part of the vagina) can be distinguished. In *C. serratus* another peculiarity is that the vagina posteriorly joins the rectum to form a short cloaca (fig. 4C).

The spermathecal capsule is hook-shaped in the species studied, except that of *C. serratus*, which is a round and small structure. In all species studied, the spermathecal duct is short and the gland is apically distended and long in relation to the capsule.

Family : *Chrysomelidae*

Subfamily 1. *Sagrinae*

Preparations from dry specimens of *Sagra congoana* Clav. (fig. 5) revealed that the general structure of the female reproductive organs is of rather bruchid-type, with a large, externally distinct bursa copulatrix. The vagina and atrium (the posterior part of the vagina) may be distinguished. Within the bursa copulatrix, there are two small sclerotised valves guarding the passage between the common oviduct and the vagina. The spermatheca opens to the vagina between the common oviduct and bursa copulatrix via a moderately long and sclerotised duct (fig. 5) .The capsule is rather big and U-shaped, with a distinct collum only, as also figured in *S. femorata* Drury by Varma (1955). The spermathecal gland is relatively small.

Another interesting feature of *S. congoana* is the presence of a four-branched pouch opening to the common oviduct (fig. 6). This structure may be homologous with similar vaginal pouches of Eumolpinae, Hispinae and Cassidinae.

Subfamily 2. *Orsodacninae*

Orsodacne cerasi (L.) (fig. 6) (ov. no 10) has a long common oviduct and a sheath-type bursa copulatrix.

The spermatheca is hook-shaped and connected with the common oviduct via a short and thick spermatechal duct. The spermathecal gland is short and apically distended.

Subfamily 3. *Donaciinae*

The female reproductive organs of *Donacia calvipes* F. were studied by Donia (1958) and of *D. vulgaris* Zschach. (ov. no 10), *Plateumaris sericea* L. (ov. no 16), *P. discolor* Panz. (fig. 7) (ov. no 19) were studied here.

The lateral and common oviducts are short and the common oviduct internally set with minute hairs directed posteriorly. The bursa copulatrix is sheath-type (figs. 7). The apical portion of the bursa copulatrix is sclerotised somewhat but not visiable through the muscular sheath. The common oviduct opens to the bottom of the bursa copulatrix; its opening is guarded with small chitinious projections but there is no sclerotised valve.

The spermatheca opens to the top of the bursa copulatrix via a short and thick duct. The spermathecal capsules of the species mentioned above and several species of *Donacia, Plateumaris, Sominella* and *Macrocnemia* figured by Spett and Lewitt (1926), *D. aeraria* Baly studied by Varma (1955) has the collum and ramus distinct and the cornu and nodulus more or less fused. The bursa copulatrix and the common oviduct posteriorly merge into a small vagina which communicate outside just below the anus. Stein (1947) similarly figured the spermatheca ,the bursa copulatrix and the common oviduct of *Donacia simplex* F..

Subfamily 4. *Criocerinae*

The female reproductive organs of *Crioceris asparagi* L. were previously figured by Donia (1958) and those of *C. asparagi* (ov. no 12) and *Oulema cyanella* L. (ov. no 5) were studied here.

The lateral oviducts and the common oviduct are internally furnished with fine hairs directed posteriorly. The bursa copulatrix is sheath-type.

The spermatechal duct is short. In *C. asparagi* (fig. 10) the spermathecal capsul is anchor-shaped; the cornu and nodulus are fused forming a comma-, shape but still distinguishable the ramus is also distinct and the collum is narrow, long, tubular and convoluted in two thirds of the whole capsule. The gland is small and distally broadened. In *Ou. cyanella* parts of the capsule are less distinct. Spett and Lewitt (1926) figured the spermatheca of several species of *Lema, Oulema, Crioceris* and *Lilioceris* showing some generic and specific differences.

Subfamily 5. *Megalopodinae*

In *Zeugophora flavicollis* (March.) (fig. 8) (ov. no 10). The lateral oviducts are short but the common oviduct is rather long and convoluted. There is no distinct bursa copulatrix.

The collum and ramus of the capsule are distinct but the cornu and nodulus are fused to form a sausage-like structure. The spermatheca of *Sphondylia afra* Klug. (fig. 9) presents a rather peculiar structure in having a double connection with the common oviduct; one of these arms may correspond to the spermathecal duct and the other to the ramus to which the gland may attach. As shown in the figure, the main part of the capsule consists of two bulbous parts connected with each other via a short neck; the small part may correspond to the collum and the big part to the cornu plus nodulus. The spermathecal gland was not observed in both species.

Subfamily 6. *Lamprosomatinae*

In *Oomorphus concolor* (Sturm.) (fig. 11) ,(ov. no 5) the oviducts are short and wide. The bursa copulatrix is not distinct.

The main part of the spermathecal capsule is sausage-shaped and formed by the fusion of cornu and nodulus. The ramus and collum are fused together forming a long, tubular, convoluted and once looped tube where the spermathecal gland opens. The capsule of *Lamprosoma assamensis* Jac. described by Varma (1955) lacks the narrow and convoluted part shown in *Oo. concolor*. The gland is tubular. In *Oo. concolor,* relative to body size, the capsul is very large. On the other hand, apart from a single male in the collection of Glasgow University, all the specimens we collected in April, May and September in Marrioch Bay (Scotland) were female. So the large size of the capsule and rarity of males imply that this species is parthenogenetic or more likely the males are short-lived consequently the rate of copulation is very low, thus their large capsule is utilised to store sperms to be used gradually for a long period after copulation.

Subfamily 7. *Cryptocephalinae*

The female reproductive organs of *Cryptocephalus aureolus* Suffr. were studied by Donia (1958) and those of *C. rugicollis* Ol. (fig. 12) (ov. no 16) and *C. labiatus* L. (ov. no 5) were studied here.

In these species oviducts are moderately long. The bursa copulatrix is sheath-type. The spermathecal duct is long, uniformly narrow in *C. aureolus* and *C. rugicollis* but extremely long and convoluted in *C. labiatus*. The capsule is sickle-shaped; only the ramus and collum are distinct. The gland is longer and wider than the capsule. The spermatheca of several species of *Cryptocephalus* and *Pachybrachys* were likewise figured by Spett and Lewitt (1926) and of several species of *Cryptocephalus* by Varma (1955).

Subfamily 8. *Clytrinae*

The female reproductive organs of *Clytra novempunctata* Ol. (fig. 14) (ov. no 8-10) and *Labidostomis taxicornis* F. (fig. 13) (ov. no 7) were studied here.

The oviducts are shorter in *C. novempunctata* than in *L. taxicornis*. The bursa copulatrix is sheath-type in both species.

The spermathecal duct opening to the bursa copulatrix short and uniformly thick in *L. taxicornis,* long, anteriorly and posteriorly dilated and convoluted in *C. novempunctata*. In both species, the capsule is sausage-shaped, only ramus and collum are distinct and the gland is rather long, opening to the ramus. The spermatheca of the species of *Labidostomis*, *Coptocephalus, Clytra, Gynandrophtalma* and *Anomoea* were figured by Spett and Lewitt (1926) and those of the species of *Diapromorpha* and *Gynandrophtalma* by Varma (1955).

Subfamily 9. *Chrysomelinae*

The female reproductive organs of a number of species of Chrysomelinae were studied by Stein (1847), Hamnett (1944), Pavlovskiy and Teravskiy (1958), Donia (1958) and those of the following species were studied here : *Chrysolina americana* (L.) (fig. 16),*Chrysomela herbacea* Duft. (ov. no18-19), *Chrysomela polita* L. (ov. no 15), *Gastroidea virudula* (DeG.) (fig. 18) (ov. no 30), *Phaedon tumidulus* Germ. (fig. 20) (ov. no 12-18), *Phytodecta pallidus* (L.) (fig. 17) (ov. no 12),*Phytodecta olivaceus* Forster (ov no 10-12), *Phyllodecta vulgatissima* (L.) (fig. 19) (ov. no 10), *Phyllodecta vitellinae* L. (ov. no 12), *Hydrothassa marginella* (L.) (fig. 21), *Prasocuris phellandrii* (L.) (fig. 22) (ov. no 14), *Plagiodera versicolerea* (Laich.) (fig. 23) (ov. no 12) and *Timarcha tenebricosa* (F.) (fig .15) (ov. no 5).

In these species ,the oviducts are usually narrow, and long except in the viviparous genus *Phytodecta,* in which they are very broad and short (fig. 17) (this genus has also no spermatheca). Only *Gastroidea virudula* has a sheath-type bursa copulatrix but other species studied have no bursa copulatrix.

The spermathecal duct is very variable; it is short and simple in *Chrysolina polita, Ch. herbacea* and in the species shown in figs. 15, 17, 18, 21, 22, long, partly narrow and partly broad and usually coiled in *Pl. versicolerea, Ph. olivaceus* and *Phyll. vitellinae* and in the species shown in figs. 16, 20. The spermatheca of many species of this subfamily were figured by Spett and Lewitt (1926), Varma (1955), Donia (1958) and by the other authors cited above and in this work the spermatheca of many species are also figured (figs. 15, 16 and 18, 23). The capsule shows a great variability between the species studied; it is usually hook-shaped, the cornu and nodulus are often fused or sometimes the nodulus may be distinct (fig. 20), the collum and ramus often fused together or both are distinct as in figs 15, 16. The spermathecal gland is also very variable but generally small and distally broad.

Subfamily 10. *Halticinae*

The female reproductive organs of a few species were studied by Stein (1847) and Donia (1958), Robertson (1961) and those of *Derocrepis rufipes* (L.) (fig. 24) (ov. no 10), *Crepidodera transversa* (Marsh.) (fig. 25) (ov. no 6), *Chalcoides fulvicornis* (F.) (fig. 26) (ov. no 6), *Mantura obtusata* (Gyll.), *Longitarsus melanocephalus* (DeG.) (ov. no 10), *Psylliodes cuprea* (Koch.) (fig. 27) (ov. no 4), *Aphtona coerulea* (Geoffr.) (ov. no 4-6), *Apteropeda orbiculata* (Marsh.) (fig. 30) (ov. no 6), *Podogrica menetriesi* (Fald.), *Sphaeroderma testaceum* (F.) (fig. 28), *Haltica ericeti* All. (fig. 29) (ov. no 10), *H. palustris* Ws. (ov. no 20), *Chaetocnema concinna* (Marsh.) were studied in this investigation.

The oviducts are usually narrow and long but short and wide in the species shown in figs 29, 30. The bursa copulatrix is usually sheath-type, being rather distinct in the species shown in figs 25, 26, 29.

The spermathecal capsule of the species mentioned above and those of the species studied by Spett and Lewitt (1926), Varma (1955) and Donia (1958) exhibit a typical shape, with all the parts more or less distinct but the gland is variable in size (figs 24-30).

Subfamily 11. *Galerucinae*

The female reproductive organs of some species were studied by Dufour (1825), Khatib (1946), Donia (1958) and those of *Luperus longicornis* (F.) (fig. 31) (ov. no 20), *Phyllobrotica quadrimaculata* (L.)(fig. 32) (ov. no 6), *Galerucella nymphaeae* (L.) (fig. 33) (ov. no 8) and *Lochmaea suturalis* (Thoms.) (fig. 34) (ov. no 5) were studied here.

The lateral oviducts are short but the common oviduct is longer. The bursa copulatrix is sheath-type, and externally more visiable in *Ph. quadrimaculata* and *L. suturalis,* but *L. longicornis* has no bursa copulatrix. In *L. longicornis* in the place of bursa copulatrix there are two sclerotised lateral plates; similar structures were figured before in some Elateridae species by Becker (1958).

In the species studied by Spett and Lewitt (1926), Varma (1955), Donia (1958) and in those studied here, the structure of the spermathecal capsule is very variable in shape and size. However, it may be characterised with its hook-shape. The duct is short and thick (figs 31, 34): it is a little longer and convoluted in *Ph. quadrimaculata* (fig. 32). The gland may be narrow or broad but usually long.

Subfamily 12. *Eumolpinae*

The female reproductive organs of *Bromius obscurus* (L.) were figured by Stammer (1936) and those of *Spilopyra sumptuosa* Baly (fig. 36) (ov. no 5), *Macrolema vittata* Baly (fig. 36), *Chrysochus cobaltinus* Lec. (fig. 40), *Pseudopiomera andrewesi* Jac. (fig. 37), *Nodina acneicollis* Jac. (fig. 42), *Pagria signata* Motsch. (fig. 41) (ov. no 5), *Tricliona* sp. (fig. 38) and *Geloptera jugularis* (Er.) (fig. 39) were studied here.

The sizes of the oviducts are variable. An externally distinct bursa copulatrix was found in *P. signata, Tricliona* sp. and *G. jugularis* but it was much reduced in other species studied. Its position in relation to the common oviduct is shown in a potashed specimen of *M. vittata* (fig. 36).

The shape of the spermathecal capsule are very variable in the species studied by Spett and Lewitt (1926), Varma (1955) and of the species studied here: the parts of the capsules are not distinct. The capsule is narrow and hook-shaped in *S. sumptuosa* and *M. vittata,* sickle-shaped in *Tricliona, B. obscurus* and *Ps. andrewesi,* thick and sausage-shaped in *N. acneicollis,* variable between the sac-shaped and U-shape in other species. The duct is short in the species shown in figs 35, 38, 39, 42, long and convulated in *Ps. andrewesi* (fig. 37), very long and spirally coiled up in *M. vittata* (fig. 36). The gland is variable in size and shape.

An interesting feature of Eumolpinae is the presence of pouch-like structures opening to the vaginal region of the common oviduct complex. We found one pair of these vaginal pouches, clup-like with a long neck in *S. sumptuosa* (fig. 35), *Ch. cobaltinus* (fig. 40), club-like with a short neck in *Tricliona* sp., *Ps. andrewesi* and narrow, long and tubular in *G. jugularis, Pachnephorus pilosus* Rossi and *N .acneicollis* (fig. 42). Our observations showed that these structures always coexist with the enteric caeca of the gut. These vaginal pouches accomodate bacterium-like symbionts which are transmitted to the next generation in secretion smeared onto egg shells, later to be eaten up by larva (Stammer, 1936).

Subfamily 13. *Cassidinae*

The female reproductive organs of a number of species were studied by Dufour (1825), Stein (1847), Spett and Lewitt (1926), Varma (1955), Donia (1958) and those of *Cassida rubiginosa* Müell. (fig. 43) (ov. no 12), *Calopepla leayana* Latr. were studied here.

In *C. rubiginosa* the lateral oviduct are long and common oviduct is short. The bursa copulatrix is well developed and externally very distinct. The vagina posteriorly broadening forms a bell-shaped structure.

The spermathecal capsule of 16 species studied by above mentioned authors and those of *C. rubiginosa* (fig. 43), *Cal. leayana* (fig. 44) figured here show that in this subfamily the capsule varies in shape and structure; it may be hook-shaped or sickle-shaped, and its parts may be fused all together or some parts are distinct. The duct is very long and spirally coiled up in *Cassida viridis* L. (Donia, 1958), *C. murraea* L. (Spett and Lewitt, 1926), *C. rubiginosa* (fig. 43), *Cal. leayana* (fig. 44), long and convoluted in *C. nebulosa* L. (Stammer, 1936). The gland is relatively small and narrow.

Two groups of three branched vaginal pouches were found in *C. viridis* by Dufour (1825), Stammer (1936), and Donia (1958), in *C. rubiginosa* by Stein (1847) and in this work ,and in *C. muraea* by Spett and Lewitt (1926). Stammer (1936) also recorded two groups of three pouches in *C. viridis, C. hemisphaerica* Hbst., *C. rubiginosa* and *C. vibex* L., two groups of two vaginal pouches in *C. nobilis* L. but neither pouches nor symbionts in *C. nebulosa* L. and *C. flaveola* Thunb.. These pouches may also serve to transmit the symbionts as in Eumolpinae.

Subfamily 14. *Hispinae*

The female reproductive organs of *Promecotheca reichei* were studied by Taylor (1937), those of *Hispa testacea* L. by Donia (1958) and those of *H. testacea* (*fig.* 46) (ov. no 5) and *Aproida balyi* Pasc. (*fig.* 46) (ov. no 5) were studied in this survey.

In these species the lateral oviducts are long and wide and the common oviduct is short and wide. As previously recorded by Donia (1958), posterior parts of the lateral oviducts are sclerotised as seen in potashed specimens. The bursa copulatrix is sheath-type, but more or less distinguishable in three species.

The spermathecal capsule of above mentioned species and those of 8 species studied by Spett and Lewitt (1926) and Varma (1955) show some diversity in shape and size and usually no distinct parts. The spermathecal duct is long and convoluted in *A. balyi* (fig. 45), *H. testacea* (fig. 46), very long, spirally and tightly coiled up in *P. reichei*. The gland is variable.

P. reichei and *A. balyi* have a pair of vaginal pouches; each pouch is 3-branched in *A. balyi* (fig. 45) but 5-branched in *P. reichei* figured by Taylor (1937). If these pouches are analogous with those of Eumolpinae and Cassidinae then they might function similarly in transmitting symbionts. On the other hand, in the subfamily of frequently leaf-mining larval habit, the tranmission of the symbionts may not be by the egg shells as in Eumolpinae and Cassidinae, because Taylor (1937) records that the larva of *P. reichei* immediately after hatching leaves the egg case untouched to proceed to its mine. Another possibility might be that the symbionts penetrate direct to the embryo in the eggs or to the larva just before leaving the egg. However, this phenomenon still remains to be investigated.

Systematic Conclusions

(1) The number of the ovarioles is very variable. In some species it has a wide range, e.g. between 12-18 in *Phaedon tumidulus*. Sometimes different authors record different ovariole number in the same species, e.g. in *Cassida*

viridis there are 7 ovarioles per ovary according to Stein (1847) but 14-15 ovarioles according to Donia (1958); if their observations are right then ovariole number in this species may change according to growth and size of individuals. An asymmetrical number of ovarioles also occurs, e.g. in *Timarcha tenebricosa* we found 5 ovarioles in one ovary but 7 in other. Besides this detailed variability in number, it appears that the larger the insect, the bigger the number of ovarioles tends to be. However, the number of ovarioles may be important in some groups at most at specific level.

(2) The size of the oviducts varies greatly in different groups, but the viviparous species have larger oviducts, e.g. *Gastroidea viridula, Phytodecta pallidus.*

(3) A large externally visiable bursa copulatrix is present in Bruchidae, Sagrinae, some Galerucinae and Eumolpinae. In other Chrysomelidae it is much reduced and enclosed in a muscular sheath (sheath-type), but it is completely lost in most of Chrysomelinae, Cryptocephalinae, some Galerucinae and Hispinae.

(4) The vagina is bell-shaped in Cassidinae and Hispinae but tubular, long or short in others studied.

(5) Parts of the spermathecal capsule are all distinct in Halticinae; cornu and nodulus are fused to each other but collum and ramus are distinct in Criocerinae, Megalopodinae, Lamprosomatinae, Cryptocephalinae, Clytrinae; cornu and nodulus are distinct and the ramus and collum are either fused or absent in Galerucinae; all the parts are fused in Bruchidae and Orsodacninae and presence and fusion of the parts of the capsule and its shape very variable in Chrysomelinae, Eumolpinae, Hispinae and Cassidinae. However, the detailed structure of the parts of the capsule and its shape vary considerably within genera and subfamilies, but may be systematically important at specific level.

(6) The structure of the spermathecal duct is important at generic and specific levels, e.g. in Clytrinae, *Labidostomis* having a short and uniformly thick spermathecal duct can be distinguished from *Clytra* having long anteriorly and posteriorly dilated and convoluted duct; in Cryptocephalinae, *Cryptocephalus rugicollis,* having a long uniformly narrow and convoluted spermathecal duct can be distinguished from *C. labiatus* having extremly long and spirally coiled spermathecal duct.

(7) The spermathecal gland is very long and clup-shaped, proximally very narrow and distally very dilated in Bruchidae, small and tubular in Cassidinae and Hispinae but very variable in other groups studied.

(8) The vaginal pouches are present in Sagrinae, Eumolpinae, most Cassidinae and Hispinae. They are one pair, except in Sagrinae having only a single pouch, and each pouch is divided to three or more branches or unbranched as in Eumolpinae.

(9) The female reproductive organs of Bruchidae have some special features, such as the sclerotised armature within the bursa copulatrix in *Caryedon serratus* and *Zabrotes subfasciatus*, the soft, pad-like valves at the posterior end of the bursa copulatrix found in most of the species studied and a cloaca present in *C. serratus*.

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Özet

Bruchidae ve Chrysomelidae (Coleoptera) familyalarının dişi üreme organları.

Bruchidae familyasından 4, Chrysomelidae familyasından 58 türün dişi üreme organları incelendi. Yumurta kanalları, bursa copulatrix, vagina, spermatekanın kapsül, kanal ve salgı bezinin ve vaginal bezlerin anatomisi ayrıntılı olarak incelendi ve çoğunlukla şekillendirildi; ovariol sayıları saptandı.

Yumurta kanalları, bursa copulatrix, vagina ve vaginal bezlere ait anatomik farklılıkların tür üstü taksonomik düzeylerde, ovariol sayısı ve spermatekaya ait farklılıkların ise tür düzeyinde sistematik önemi olduğu saptandı.

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Abbreviations for all figures : bc, bursa copulatrix; co, common oviduct; col, collum; cor, cornu; cor-n, cornu and nodulus fused; d, spermathecal duct; lo, lateral oviduct; ov, ovary; ovf, ovarial flament; ovp, ovipositor; ra, ramus; rm, removed muscular sheath; rbc, reduced bursa copulatrix; stg, spermathecal gland; stm, spermathecal muscle; v, vagina; vp, vaginal pouch.

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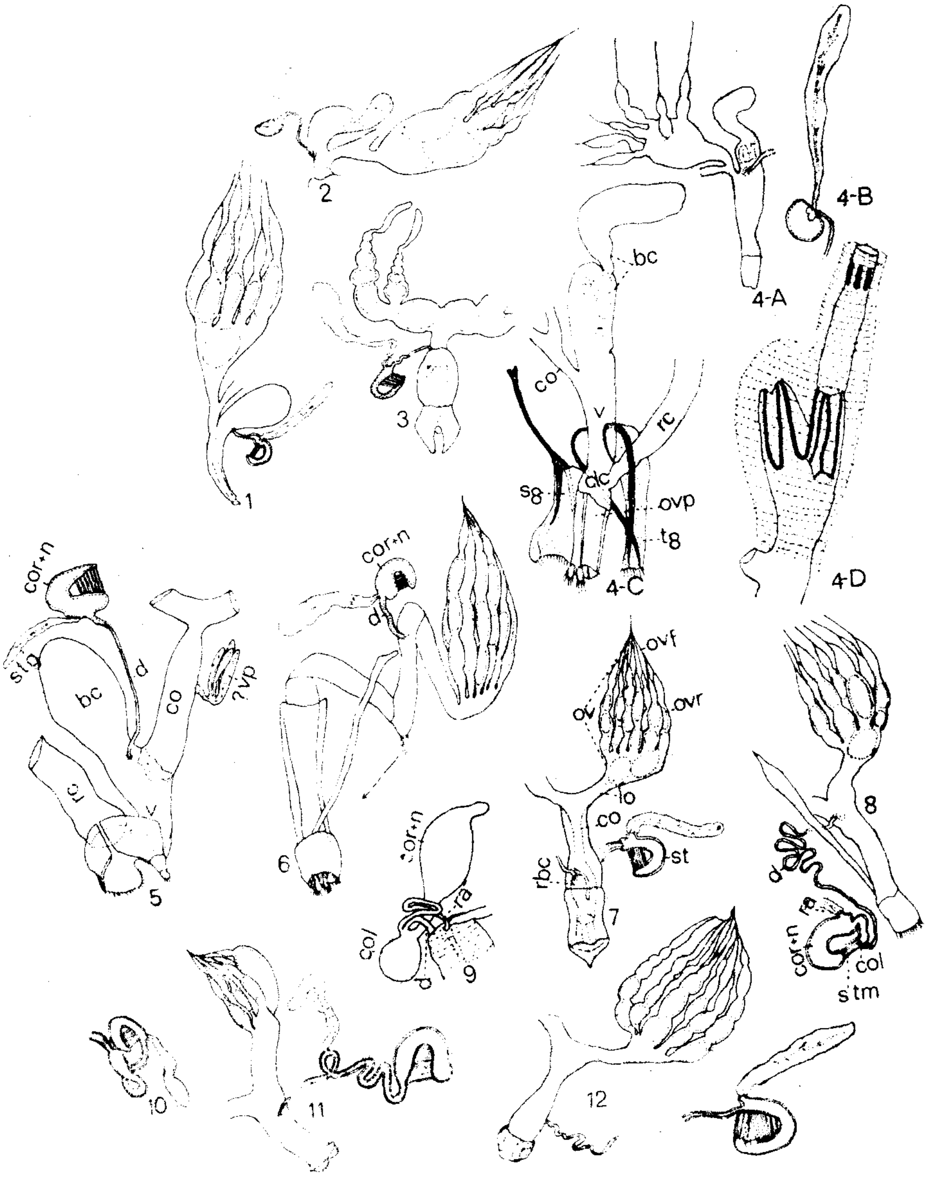
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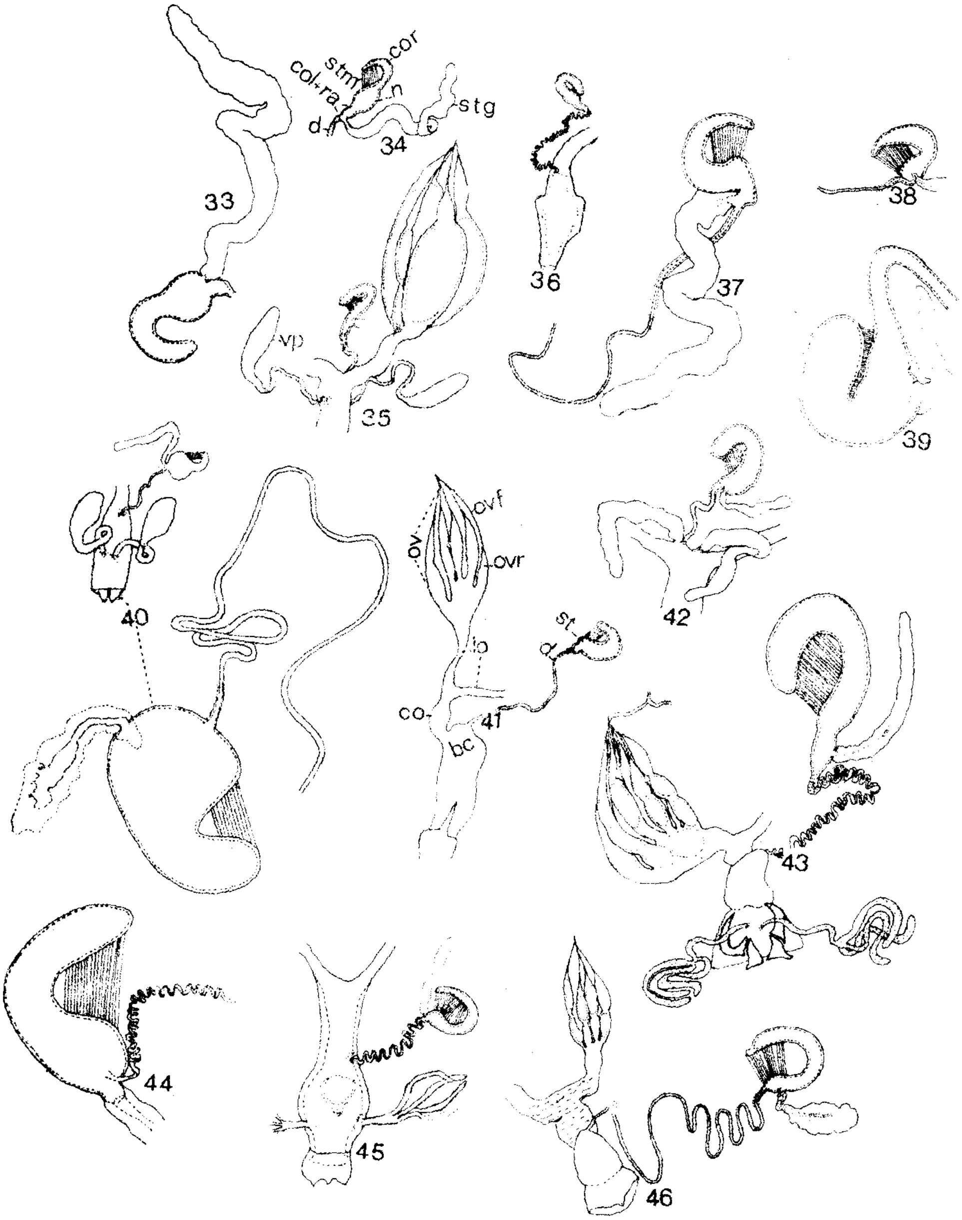

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