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## On the primitive and derivative characters of the families of beetles (Coleoptera)

The student may refer to CAIN & HARRISON (1960) and SIMPSON (1961) for understanding the principles of phyletic weighting and the theoretical background of this paper. These will not be discussed here. The classification of beetles (Coleoptera) and the arrangement followed here is the same as outlined by ABDULLAH (1969 b). Usually only one, primitive (*P*) or derivative (*D*), alternative of a distinguishing character is mentioned below for the sake of brevity.

According to CROWSON (1955), the primitive or original Coleopteron probably evolved in the Permian and had the following features:

1. 9 or 10 regular striae and a scutellary striole in the elytron (*P*).
2. Creeping under close fitting bark with special type of longitudinal ribbing and particularly the development of a convex yet flattened and elongate elytron (*P*).
3. Adult legs short (*P*).
4. Femoral plates on the hind coxae as in Dascillidae, etc. (*P*).
5. A transverse suture on the metasternum as in Carabidae, Dascillidae, Dryopidae, etc. (*P*).
6. 2 or 3 dorsal ocelli (*P*).
7. Hind wings with the apical part spirally rolled in repose as in Archostemata (*P*).
8. Larval legs of the Caraboid pattern (*P*).
9. Larvae with articulated cerci or urogomphi (*P*).
10. Larval mouth parts of the type found in such families as Anisotomidae or Hydraenidae (*P*).
11. Mould-eating habits of the larvae in view of the primitive mouth parts and the adaptations of the adults (*P*).

SMITH (1950) from his studies on the cytotaxonomy of the Coleoptera concludes a chromosome complement of 9 pairs of autosomes and an XY sex-determining pair, the sex-chromosomes in spermatogenesis forming a characteristic parachuteline figure as features of the primitive beetle (*P*).

The morphological characters of adults and larvae of the families and other groups are arranged under the heading 'head', 'thorax' and 'abdomen'. Other characters are analysed towards the end under the heading 'miscellaneous characters' (vide infra). Additional research is needed in case of many families of the Coleoptera.

Important phylogenetic conclusions (vide CROWSON 1955 and 1960, ABDULLAH 1964–1969, and ABDULLAH & ABDULLAH 1966–1968) on the primitive or derivative alternative of the distinguishing characters of the families and other groups of the Coleoptera follow:

### Head

Distinct labrum in larva in Rhysodidae (= Rhysodidae) (*P*). Groove on upper surface of head in Rhysodidae (*D*). Prognathism, loss of mandibular mola, hypopharyngeal sclerome in larva in Adephaga (*D*). Adult mandibular scrobe without seta in Caraboidea (*D*). Antennae moniliform in Paussidae (*D*). Larval mandibles unchanneled in Hygrobiidae (= Pelobiidae) (*P*). Antennae clubbed in Myxophaga (*D*). Mandibles with a distinct mola and with a supplementary articulated tooth behind the normal apical one in Myxophaga (*D*). Maxillae without distinct galea in Myxophaga (*D*). Larval mouth parts: mandibles with a basal molar part and more or less articulated retinaculum (lacinia mobilis), maxillae with well-developed galea and lacinia and large articulating area, and labium bearing a hypopharynx with distinct paragnathal structures in Polyphaga (*P*). Larval mandibles falcate, larval maxillary galea displaced to lie on an elongated palpiger in Hydrophilidae (= Helopheridae or Sphaeridiidae) (*D*). Palpiger antenna in Hydraenidae (= Limnebiidae) and Hydrophilidae (*D*). Antennae with 5 basal glabrous segments, a typical cupule and a 5-segmented loose pubescent club in Hydraenidae (*P*). Adult with 2 ocelli in Hydraenidae (*P*). Larval maxillae without galea, lacinia rudimentary; larval mandible with large retinaculum, mola small in Hydrochidae (*D*). Antennae with segment II and cupule pubescent, latter effectively part of club in Spercheidae (*D*). Maxillary palpi shorter than antennae in Georyssidae (*D*). A Y-shaped impressed line on vertex in Hydrophilidae (*P*). Prognathism, labrum fused into nasale, mandibles falcate, palpiger elongate in Histeroidea (*D*). Gular sutures separate in Syntellidae (*P*). 2 dorsal ocelli in adult in some Staphylinidae (*P*). Antennae with segments IX and X with small round internal vesicles in Leptinus, Leptinidae, Anisotomidae (= Agathidae or Leiodidae) and *Bulbeia*, Scydmaenidae (*D*). Larvae with peculiar fringes at apex of maxillary mala in Anisotomidae and Ptilidae (*P*). Clypeus with deep membrane-filled emargination in *Nicrophorus*, Silphidae (= Agyrtidae or Necrophoridae) (*D*). 2 dorsal ocelli, antennae filiform in *Brathinus*, Scydmaenidae (*P*). Maxillary palp with preapical segment III very large in Scydmaenidae (= Anisophaeridae) (*D*). Eyes entire in *Scaphium*, Scaphidiidae (*P*). Larval mandible with prosthema in Omaliinae and Proteininae, Staphylinidae (*P*). 5 or 6 larval ocelli in Paederinae, Staphylinidae (*P*). Mentum entire in Lucanidae (*P*). Maxillary galea with a chitinous hook at apex in Passalidae (*D*). Larval antennae 4-segmented in Acanthoceridae (*P*). Antennae 11-segmented in Trogididae (*P*). Antennae 10-segmented, labrum and mandibles distinctly exposed in Scarabaeidae (*P*). Larvae with distinct lateral ocelli in Cetoniinae, Scarabaeidae (*P*). Larval antennae long, multiarticulate in Helodidae (= Cyphonidae) (*D*). Larval mandibles with a ventral crushing tubercle and a rigid retinaculum in Heteroceridae (*D*). Antennae strongly pectinate or flabellate, inserted close together on a protuberance of front of head; labrum nasale-like, projected in Rhipicerioidea (*D*). Antennae 12-segmented in Rhipicerini, Rhipiceridae

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(*D.*) Larval labrum free in Buprestidae and Euryopogonidae (*P.*) Larval mandibles outwardly biting in Trixaginae, Trixagidae (= Throscidae) (*D.*) Larval mouth parts reduced, digestion extraoral in Eucnemidae (= Eucnemidae, Melasidae or Phylloceridae) (*D.*) Larval mandibles with inner surface channelled or longitudinally perforate in Cantharoidea (*D.*) Labrum fused with clypeus in Karumiidae (= Zardunioidea) (*D.*) Larvae without epicranial suture in Drilidae (= Rhagophthalmidae) (*D.*) Larval maxillary stipes free, carde absent in Drilidae (*D.*) Antennae 12-segmented and strongly plumose in male in Phengodidae (*D.*) Antennal insertion approximate of their sockets dorsal in Cantharoidea (*D.*) Eyes in male very large, divided by a horizontal canthus into two halves with different sized ommatidia in Rhagophthalminae, Lampyridae (*D.*) Antennae 11-segmented in Lampyridae (*P.*) 2 dorsal ocelli in Derodontidae (= Lariobiidae or Peltastidae) (*P.*) Antenna with apical club in Dermestidae (*P.*) Antennae 10-segmented or less in Anobiidae (*D.*) Antennae less than 11-segmented: 2-segmented in *Ectrephus*, 3-segmented in *Gnotus* and 9-segmented in *Ptinus*, Ptinidae (= Gnositidae or Ectrephidae) (*D.*) Antennae 10-segmented in Trogositidae (= Ostomidae) (*D.*) Antennae clubbed in Corynetinae, Cleridae (*P.*) Larval mandible with a distinct lacinia mobilis in *Callimerus*, Cleridae, Trogositidae and Melyridae (*P.*) Antennae 11-segmented in Cleridae and Melyridae (*P.*) Antennae with a 3-segmented club in *Acanthoconemus*, Melyridae (*P.*) Larval maxilla with apical lobe partially divided in Lymexyloidea (*D.*) Antennae weakly clubbed, inserted laterally in front of eyes in Cucujoidea (*P.*) Adult and larval mandibles with mola and prostheca in Cucujoidea (*P.*) Gular sutures distinct and separate in Cucujoidea (*P.*) Larvae with frontal sutures, distinct fronto-clypeal suture and free labrum in Cucujoidea (*P.*) Larval antennae 3-segmented in Cucujoidea (*P.*) Larval maxillae with well-developed articulating area, mala probably long and acute, palpi 3-segmented (excluding palpiger) in Cucujoidea (*P.*) Larval labial palpi 2-segmented, mentum and prementum clearly marked off in Cucujoidea (*P.*) Reduction of maxillary lobes to 1 in Nitidulidae, Corylophidae, Lathridiidae and Ptiliidae (*D.*) Antennae 10-segmented in Sphindidae (*D.*) Gular sutures confluent in Passandridae and Trogositidae (*D.*) Antennae filiform in Heteromera (*D.*) Larval mandible without a true prostheca and with a setiferous lobe below mola in Heteromera (*D.*) Larvae without or with a reduced median epicranial suture in Heteromera (*D.*) Larval mandible without a post-molar setose lobe in Biphylidae (*P.*) Antennae 10-segmented in Tenebrionidae (*D.*) Eleventh antennal segment greatly elongate in Lagriidae (*D.*) Antennae strongly pectinate in *Otenidia*, Mordellidae (*D.*) Eyes entire as in *Neopedilus* ABDULLAH, *Steropes*, Macratrininae, *Copobaenus*, most Eurygeninae and Anthicidae of Anthicidae, also in *Techmessa* and allies of Pyrochroidae, *Protomeloe* ABDULLAH and other Meloidae (*P.*) Antennae 11-segmented, apical 3 segments not much elongated in Anthicidae and related families (Pyrochroidae, Meloidae, Pythidae and Cephaloidea) (*P.*) Maxillary palp with apical segment simple or slightly dilated as in Pediliinae, Steropinae, etc. of Anthicidae (*P.*) Neck wide as in Pediliinae, Copobaeninae and Eurygeninae of Anthicidae, also in Pyrochroidae and Cephaloidea (*P.*) Larval maxilla with mala undivided in Chrysolmoidea and other Cucujiformia (*P.*) Larval mandible with a mola in Curculionoidea (*P.*) Short antennae in Cerambycidae (*P.*) Labrum connate in Cerambycidae (*D.*) Gular sutures separate in *Parandra*, Cerambycidae and Curculionoidea (*P.*) Larvae with 6 pairs of lateral ocelli in Curculionoidea (*P.*) Antennae geniculate in Curculionidae (*D.*)

## Thorax

Elytra sculptured with scutellary striae in Cupedidae (= Cupesidae or Ommatidae) (*P.*) Groove on upper surface of prothorax in Rhyssodidae (*D.*) Antenna cleaning apparatus of front tibiae in Caraboidea (*D.*) Extension of inner apical angles of meso-episterna to reach middle coxal cavities in Caraboidea (*D.*) Reduction of tarsal claws from 2 to 1 in Caraboidea (*D.*) Open front coxal cavities in Caraboidea (*D.*) Bordered bases of elytra in Caraboidea (*D.*) Non-swimming legs in Amphizoidea (*P.*) Met-episternum reaching middle coxal cavities in Amphizoidea and Dytiscidae (= Hydroporidae or Hyphyridae) (*D.*) Movement of hind legs alternate in Hygrobiidae (*P.*) Tarsi with reduced number of segments, none of them lobed; prothorax with distinct notopleural sutures; hind wing with oblongum cell in Myxophaga (*D.*) Prothorax without notopleural sutures in Polyphaga (*P.*) Hind wing without oblongum cell in Polyphaga (*P.*) Hind wing without a *m-cu* loop in Hydraenidae (*D.*) Tarsi with large plurisetose empodium between claws - probably adapted for walking on under side of water surface film in Spercheidae (*D.*) Tarsi 4-4-4 segmented in Georssidae (*D.*) Front coxae very large, concealing sternum in Georssidae (*D.*) Larvae terrestrial and without legs in *Cercyon*, Hydrophilidae (*D.*) Met-endosternite or furca with distinct median stalk nearly as long as lateral arms, anterior tendons arising close together on a median projection in Sphaeritidae (*D.*) Tarsi 5-5-4 in some Histeridae (*D.*) Hind wing without a *m-cu* loop in Staphylinidae (*P.*) Elytra truncate in Ptiliidae (= Trichopterygidae) (*D.*) Open front coxal cavities in Leptinidae (? *D.*) *Hydnobius*, Anisotomidae (*D.*) Front tarsi dilated in male in Anisotomidae (*D.*) Tarsi 5-5-4, 5-4-4, 4-4-4, 4-3-3, 3-3-3 in Anisotomidae (*D.*) Tarsi 3-3-3 segmented in Dasyceridae (*D.*) Met-endosternite strongly sclerotized with a very long stalk in *Ozyorpus*, Staphylinidae (*D.*) Legs with hind coxae mobile and hind border of metasternum emarginate in Staphylinidae (*D.*) Hind coxae projecting and elytra without epipleural keel in Staphylininae and Paederinae, Staphylinidae (*D.*) Tarsi 4-5-5, 4-4-4, 5-4-4, 3-3-3 or 2-2-2 in Staphylinidae (*D.*) Tarsi 2-2-2 or apparently 1-1-1 in Pselaphidae (= Clavigeridae) (*D.*) Hind wings with 2 apical detached veins between *Cu* and first complete anal in Lucanidae, Trogidae and Geotrupidae (*P.*) Hind wings with *m-cu* loop distinct in Lucanidae and Trogidae (*P.*) Hind wings with 5 anal veins and an anal (= wedge) cell in Dascillidae (*P.*) Front and middle tibiae broad and spinose along their outer edges in Heteroceridae (*D.*) Elytra with a distinct scutellary striae in Callirhipidae and Buprestidae (= Schizopidae) (*P.*) Hind margin of pronotum crenulate in Callirhipidae and Buprestidae (*P.*) Mesosternum completely divided by prosternal process in Buprestidae (*D.*) Front coxae with exposed trochantins in Euryopogonidae (*P.*) Mesocoxal cavities closed outwardly by meeting of meso- and metasterna in *Cardiophorus*, Elateridae (*D.*) Hind coxae flat, without femoral plates in Cerophytidae (*D.*) Tarsal claws pectinate in Perothopidae (*D.*) Front coxae transverse in Brachysectridae (*P.*) Prosternum with a distinct anterior neck-piece in Brachysectridae (*P.*) Tarsi with segment IV not lobed in Brachysectridae (*P.*) Prosternal inter-coxal process well-developed and received into mesosternum in Brachysectridae and Homalidae (= Homalidae) (*P.*) Hind angles of prothorax acute, elaterid-like in Brachysectridae (*P.*) Hind wing without anal cell in Drilidae (*D.*) Wing folding absent or with 2 simple folds in Telegusidae (*D.*) Pronotum in male flattened and produced to cover head completely in Lampyridae (= Malacodermitidae) (*D.*) Metasternum with side borders markedly sinuate posteriorly, at outer edge of bend metasternum produced into a short keel fitting into a longitudinal slot of inner edge of episternum in Cantharidae (*D.*) Trochanters long in Lycidae (? *D.*) Tarsi 4-4-4; elytra with rows of large quadrate punctures in *Derodontus* and *Pellastica*, Derodontidae (*D.*) Elytra present in both sexes in Dermestidae (*P.*) Tarsal formula 3-3-3 in *Sarothrias*, Sarothriidae (= Jacobsoniidae) (*D.*) Front coxal cavities internally closed (although visibly open behind) in Bostrychidae (= Apalidae, Apatidae or Psoidae) (*D.*) Tarsal formula 4-4-4 in *Psoa*, Bostrychidae (*D.*) Bordered prothorax in Corynetinae, Cleridae (*P.*) Epipleura

welldeveloped in Corynetinae, Cleridae (*P.*). Tarsal claws simple in *Acanthocnemus*, Melyridae (*P.*). Tarsal formula 4-5-5 in male in Melyridae (*D.*). Transverse front coxae with exposed trochantins in Cucujoidea (*P.*). Middle coxae with exposed trochantins in Cucujoidea (*P.*). Mes-epimera reaching middle coxal cavities in Cucujoidea (*P.*). Hind coxae strongly transverse and nearly contiguous in Cucujoidea (*P.*). Tarsi with 5 normal segments, at least in female in Cucujoidea (*P.*). Met-endosternite of Hylecoetoid type with anterior tendons close together in Cucujoidea (*P.*). Hind wings with complete Cantharoid venation, with radial and anal cells and 5 anal veins in Cucujoidea (*P.*). Elytra completely covering abdomen, probably more or less striate and with a scutellary striae in Cucujoidea (*P.*). Larval legs of normal Polyphagan type in Cucujoidea (*P.*). Truncate elytra in Nitidulidae (? *D.*). Tarsi 4-4-4 in Nitidulidae and Corylophidae (= Orthoperidae) (*D.*). Front coxal cavities open in Hypocopridae (*P.*). Trochanters long in Cryptophagidae (*D.*). Coxae with only a rounded mesal part exposed, their outer prolongations completely enclosed by sterna in Discolomidae (= Aphaenocephalidae or Notiophygidae) (*D.*). Front coxae projecting in Heteromera (*D.*). Tarsal formula 5-5-4 or less in Heteromera (*D.*). Tarsal claws pectinate in Alleculidae (= Cistelidae or Gonoderidae) (*D.*). Tarsal claws simple in *Nematoplus*, Cephaloidea and *Protomeloe*, Meloidea (*P.*). Hind wings with radial and anal cells in Cephaloidea (*P.*). Tarsal claws appendiculate in Pyrochroidae (*P.*). Front coxal cavities completely (externally and internally) open as in Pedilinae and Steropinae of Anthicidae, also in Aderidae (= Euglenidae), Pyrochroidae, Meloidea and Cephaloidea (*P.*). Pronotum without an apical flange as in Pedilinae, Steropinae, Copobaeninae, Macratrinae, *Loubacantus* etc. of Anthicidae, also in Aderidae, Pyrochroidae, Meloidea and Cephaloidea (*P.*). Mes-episterna meeting or nearly so in front of mesosternum in Anthicidae (*P.*). Elytra with apices variously modified in male as in many *Pedilus*, *Notozus*, some *Anthicus* of Anthicidae and *Protomeloe* of Meloidea (*P.*). Hind wing with radial and anal cells present as in Pedilinae, Steropinae, Macratrinae, some Eurygeniinae of Anthicidae, also in some Pyrochroidae and Cephaloidea (*P.*). Hind coxae congeneric or nearly so in Anthicidae (*P.*). Internal keel of hind coxa reduced to a narrow-based apophysis in Anthicidae (*P.*). Tarsal claws appendiculate as in many *Pedilus*, *Steropis*, *Steriphodon* and many *Macratris* of Anthicidae, also in *Techemsa* and *Palaeopyrochroa* ABDULLAH of Pyrochroidae (*P.*). Legs without ctenidia in Anthicidae (= Pedilidae, Eurygeniidae and Lagriidae, partim) (*P.*). Metasternum not spinous in male in Anthicidae (*P.*). Met-endosternite with anterior tendons arising on arms in Anthicidae (*P.*). Met-endosternite Hylecoetoid in Chrysomeloidea (and other Cucujiformia) (*P.*). Met-endosternite with anterior tendons closely approximated in Curculionoidea (*P.*). Hind wing with anal cell and 5 anal veins in Chrysomeloidea (*P.*). Prothorax with distinct side margins in Bruchidae and Chrysomelidae (*D.*). Tarsi 5-5-5 in Curculionoidea (*P.*). Larvae with distinct thoracic legs in Curculionoidea (*P.*). Trochanters long in Apionidae and Curculionidae (*D.*).

## Abdomen

Urogomphi absent in larva in Rhysodidae (*D.*). Aedeagus without a basal piece in Hydraenidae (*D.*). 6 or 7 visible abdominal sternites in Hydraenidae (*P.*). First two visible abdominal sternites connate in Georyssidae (*D.*). Aedeagus with parameres not completely fused in Sphaeritidae and Histeridae (*P.*). Abdominal tergites sclerotized except first two in Sphaeritidae and Histeridae (*P.*). Larvae with articulated urogomphi in Staphyloidea (*P.*). Haplogastran abdomen with segment VIII exposed in Staphyloidea (*P.*). Spiracles on abdominal segment VIII exposed in Staphyloidea (*P.*). Aedeagus trilobe, parameres separate, basal-piece absent in Staphyloidea (*P.*). One or more basal abdominal tergites membranous in Staphyloidea (*P.*). Ninth sternite represented by a spiculum gastrale in Anisotomidae (*D.*). Abdomen with second tergite membranous in Omaliinae and Proteininae (Staphylinidae) (*P.*). Larva without urogomphi in Micropeplidae (*D.*). Larve with cribriform spiracles and without articulated articulated urogomphi in Scarabaeoidea (*D.*). Aedeagus with lateral lobes reduced or fused in Passalidae (*D.*). Aedeagus with lateral lobes large and free, median lobe fully sclerotized in Trogidae (*P.*). Abdomen with most tergites membranous in Trogidae (*P.*). Abdominal sternites connate in Lissominae, Trixagidae (*D.*). First and second morphological sternites present in larviform females in *Lampyris*, Cantharoidea (? *D.*). Spiracles on segment VIII in Sarothriidae (? *P.*). Long ovipositor in Bostrychoidea (*P.*). Aedeagus with lateral lobes separate in Lycidae (*P.*). Aedeagus with lateral lobes not really articulated at base in Cleroidea (*P.*). Pleural sclerites in second segments in *Melittomma* and *Lymexylon*, Lymexyloidea (*P.*). Five free and visible sternites in Cucujoidea (*P.*). Aedeagus of Cucujoid type in Cucujoidea (*P.*). Larvae with posterodorsal sclerotized outgrowths (urogomphi, cerci) present on 9th tergite in Cucujoidea (*P.*). Seventh segment forming a hard sclerotized unit with its tergite functioning as a pygidium in Nitidulidae (*P.*). Aedeagus with main part of median lobe short and attached to basal-piece and a long secondary sclerotization (siphon) developed inside it in Coccinellidae (*D.*). Aedeagus of inverted Heteromeran type in Heteromera (*D.*). First few visible sternites connate in Heteromera (*D.*). Larval tenth segment absent; if present not pygopod-like, position ventral, transverse and with sclerotized dorsal and ventral lips in Heteromera (*D.*). Appendages absent in male in Anthicidae (*P.*). Aedeagus with parameres (= lateral lobes) separate apically in Anthicidae, Pyrochroidae and Meloidea (*P.*). Ovipositor with 2-segmented coxite in Anthicidae and Pyrochroidae (*P.*). Ovipositor short and compact in *Neostereopalpus* ABDULLAH of Anthicidae and Meloidea (*D.*). Urogomphi on larva in Chrysomeloidea (*P.*). First four visible sternites connate in Anthribidae (= Platystomidae) and Attelabidae (*D.*).

## Miscellaneous Characters

Predacious mode of life in Adephaga (*D.*). Myrmecophilous mode of life in Paussidae (with antennae consolidated to act as handles by which ants carry them about) (*D.*). Black colour and nocturnal habit in Cicindelinae (*T.*). Gillrespiration of larva in Hygrobiidae (*D.*). Larval habit of tapping air-spaces in water plants for oxygen in Noteridae (*D.*). Life on still pools (*Gyrinus*) and running waters; adults large, broad, flat, smooth above, nocturnal (*Oreochilus*), Gyrinidae (*D.*). Dull green living on densely tree-shaded waters of Amazon basin (*Enhydrus*), Gyrinidae (*P.*). Larval food filamentous algae instead of moulds in Hydrophiloidea (*P.*). Antennae used to break surface film of water to establish contact between atmosphere and an air film held by hydrofuge pubescence over ventral body surface in Hydrophiloidea (*P.*). Larvae predacious in Hydrophiloidea (*D.*). Adult with dorsal surface very smooth and convex, and ventral surface flattened in Hydrophiloidea (*D.*). Living in an inverted position, walking on under side of water surface film with a special mode of respiration in Sphercheidae (*D.*). Four Malpighian tubules in Staphyloidea (*P.*). Ectoparasitic, flea-like (*Platyphylus*), Leptinidae (*D.*). Small size in Scarabaeoidea (*P.*). Larval legs with stridulatory mechanism in Lucanidae (= Sinodendronidae) (*D.*). Plastron respiration in Elmidae (= Helmiidae or Limnidae) (*D.*). Females larviform in Cantharoidea (*D.*). Luminous organs in Lampyridae and Phengodidae (*D.*). Antennae specialized for wind-direction-finding preparatory to flight rather than tactile in Cantharidae and Staphylinidae (*D.*). Highly distasteful, model for mimics, Lycidae (*D.*). Sexual dimorphism and larviform females in Lycidae (*D.*). Myrmecophilous mode of life in *Thorictus*, Thorictidae (*D.*). Myrmeco-

philous mode of life in *Gnostus*, Ptinidae (*D*). Predacious mode of life in Cleroidea (*P*). Sexual dimorphism in Lymexylidae (*D*). Cryptonephridic Malpighian tubules in Lymexylidae (*P*). Seven pairs of abdominal spiracles in Cucujoidea (*P*). Cryptonephridic Malpighian tubules in Cucujoidea (*P*). Larvae with thoracic and abdominal segments with well-marked sclerotized tergites in Cucujoidea (*P*). Larvae with 9 pairs of functional spiracles in Cucujoidea (*P*). Insects of loose bark and dead trees in Cucujoidea (*P*). Ectoparasitic degeneration of larvae in Passandridae (*D*). Larvae in fungal fruit bodies in Melandryidae, Erotylidae and Cisidae (*P*). Highly degenerate ectoparasitic larvae in Colydiidae (*D*). Advanced drought-resistant physiology in Tenebrionidae (*D*). Larvae hypermetamorphic in Rhipiphoridae and Meloidae (*D*). Seven pairs of abdominal spiracles in Chrysomeloidea (and other Cucujiformia) (*P*). Midgut entirely re-constituted in pupa in Chrysomeloidea (and other Cucujiformia) (*P*). Cryptonephridic Malpighian tubules in Chrysomeloidea (and other Cucujiformia) (*P*). Dead wood habitat for larvae in Chrysomeloidea and Curculionoidea (*P*). Proventriculus absent in Curculionoidea (*P*).

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#### Summary

Phylogenetic conclusions on the primitive or derivative alternative of the distinguishing morphological and other characters of the families and other groups of the Coleoptera are given.

#### Zusammenfassung

Es werden phylogenetische Schlußfolgerungen auf die ursprüngliche oder abgeleitete Alternative der morphologischen und anderen Unterscheidungsmerkmale der Familien und anderen Gruppen von Coleopteren gezogen.

#### Резюме

Даются филогенетические выводы о первоначальной или производной альтернативы морфологических и других отличительных признаков семейств и других групп жёсткокрылых.

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