

Key to adults of Chinese water beetle families (Coleoptera)

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Abstract

A key to Chinese water beetle families (True Water Beetles and Phytophilous Water Beetles), based on adults, is presented. All distinguishing characters mentioned in the key are illustrated. A check list of families of True Water Beetles, Phytophilous Water Beetles, and False Water Beetles occurring in China is included. Habitus paintings representing all Chinese families of True Water Beetles, Phytophilous Water Beetles, and some families of Shore Beetles are provided.

Key words: Coleoptera, True Water Beetles, Phytophilous Water Beetles, Facultative Water Beetles, Shore Beetles, False Water Beetles, key, China.

Introduction

An annotated check list of aquatic and riparian beetle families of the world, including brief descriptions of their preferred habitats, was published by JÄCH (1998). A total of 24 families of True Water Beetles, Phytophilous Water Beetles and False Water Beetles presently is known to occur in China (see check list below). Of these 24 families, four recently were recorded for the first time: Aspidytidae (see BALKE et al. 2003), Epimetopidae (see Ji & JÄCH 1998), Spercheidae (see JIA 1996), and Torridincolidae (see JÄCH 1998). As for Shore Beetles and Facultative Water Beetles, most of the families listed by JÄCH (1998) can be encountered in China. However, the occurrence of Parasitic Water Beetles has not been confirmed so far.

The key to families presented herein includes True Water Beetles and Phytophilous Water Beetles known from China. Facultative Water Beetles, False Water Beetles, and Shore Beetles are not included in the key. However, habitus illustrations of some representatives of the most common families of Chinese Shore Beetles (Carabidae, Georissidae, Heteroceridae, Limnichidae, Sphaeriusidae, Staphylinidae) are provided to enable their easy recognition (see Figs. 50 - 55).

A world-wide key for the identification of water beetle families has not been published so far. A small selection of regional keys is listed in the references (AMANN et al. 1994, HUIJBREGTS 1992, DUDGEON 1999, KLAUSNITZER 1996, MCCAFFERTY 1981, NILSSON 1996, RICHOUX 1982, WATTS 1998, WHITE & BRIGHAM 1996, WHITE et al. 1984).

Check list of families of True Water Beetles, Phytophilous Water Beetles, and False Water Beetles occurring in China

A) True Water Beetles (adults usually partly or totally submerged, larvae aquatic or riparian):

Myxophaga: Hydrosaphidae (Fig. 18), Torridincolidae (Fig. 19)

Adephaga: Amphizoidae (Fig. 22), Aspidytidae (Fig. 23), Dytiscidae (Figs. 26 - 29), Gyridinidae (Figs. 20, 21), Haliplidae (Fig. 30), Hygrobiidae (Fig. 25), Noteridae (Fig. 24)

Polyphaga: Dryopidae (Figs. 41 - 43), Elmidae (Figs. 44 - 46), Epimetopidae (Fig. 40), Helophoridae (Fig. 39), Hydraenidae (Figs. 31 - 33), Hydrochidae (Fig. 34), Hydrophilidae (Figs. 35 - 37), Spercheidae (Fig. 38)

B) Phytophilous Water Beetles (adults and larvae always closely associated with water plants):

Polyphaga: Chrysomelidae (Figs. 47, 48), Curculionidae (Fig. 49)

C) False Water Beetles (adults terrestrial, larvae aquatic):

Polyphaga: Eulichadidae, Lampyridae, Psephenidae, Ptilodactylidae, Scirtidae

Key to Chinese water beetle families (adults only)

The key to families presented herein includes True Water Beetles and Phytophilous Water Beetles known from China. Besides morphological distinguishing characters this key also includes data about habitat preference, abundance and regional distribution in China. The characters and size ranges given for each family (or genus) are referring exclusively to the Chinese fauna.

All morphological characters used for identification in this key are easy to recognize, even for inexperienced students and ecologists. Almost all morphological characters are figured. Accurate habitus paintings in colour are provided for each family; these paintings may enable quick recognition of at least some of the more characteristic representatives.

The beginner may find it very useful to know, that the most common water beetles collected in stagnant water are Dytiscidae and Hydrophilidae. Larger specimens usually always belong to one of these two families. For inexperienced students the distinction between Hydrophilidae and Dytiscidae is normally the very first hurdle on their way to becoming a specialist. A short glance at the ventral surface, which is always densely pubescent in Hydrophilidae and glabrous in Dytiscidae, is usually sufficient to ensure successful determination. In contrast to samples taken from stagnant water, the beetle fauna of running waters often is dominated by Elmidae.

Important notice: Very often, limnological samples include Shore Beetles (see Figs. 50 - 55) or even strictly terrestrial species. Although aquatic and riparian beetles usually exhibit morphological adaptations (e.g. oar-like legs, swimming hairs, stream-lined body shape, burrowing legs) these are often very cryptic and not readily detectable for students. A general and unambiguous distinction between aquatic, riparian and fully terrestrial beetles often is impossible in preserved specimens.

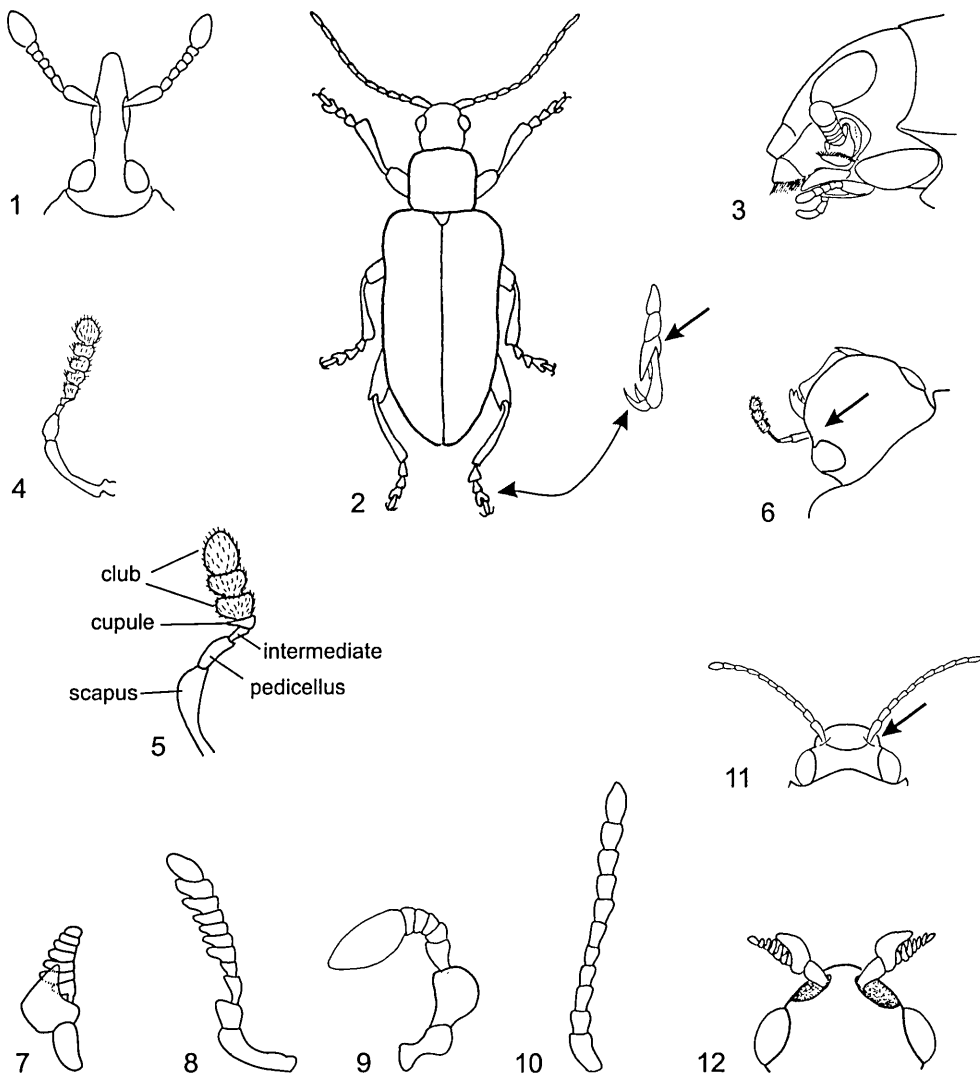
- 1 Head prolonged in front of eyes to form distinct rostrum (snout), which is always much longer than wide (Fig. 1). Antenna inserted on rostrum, geniculate between first and second segment (Fig. 1). Length: ca. 1.5 - 7.5 mm. Habitus (Fig. 49). Stagnant water, wide-spread, not commonly collected **Curculionidae**
- Head anteriorly not prolonged into distinct rostrum. Antenna not geniculate between first and second segment 2
- 2 Elytron with outer apical angle produced into a long spine (Fig. 47). Length: ca. 6 - 7 mm. Habitus (Fig. 47). Stagnant water, very rare (Gansu) **Chrysomelidae** (genus *Macrolepa*)
- Elytron without spine on outer apical angle; if elytron produced apically (e.g. hydrophilid genus *Berosus* or some elmid genera) – then general habitus totally different and antenna much shorter 3
- 3 Third tarsal segment of all legs bilobed (Figs. 2, 48). Length: ca. 3 - 11 mm. Habitus (Fig. 48). Stagnant water, wide-spread, not common **Chrysomelidae** (excl. genus *Macrolepa*)
- Third tarsal segment never bilobed in hind legs 4

- 4 Middle and hind legs strongly modified (flat, oar-like), much shorter than forelegs (Figs. 20, 21). Head with two pairs of well-developed eyes, one on dorsal side and one on ventral side (Fig. 3). Length: ca. 4 – 27 mm. Habitus (Figs. 20, 21). Stagnant and running water, wide-spread, quite common **Gyrinidae**
- All legs approximately equally long. Head usually with one pair of eyes (very rarely, e.g. in the hydrophilid genus *Amphiops* with two pairs)..... 5
- 5 Hind femur and basal abdominal ventrites concealed by conspicuous "coxal plates" (Fig. 14). Length: ca. 2.0 – 4.6 mm. Habitus (Fig. 30). Stagnant or slowly flowing water, wide-spread, not uncommon. **Haliplidae**
- Hind femur and basal abdominal ventrites never concealed..... 6
- 6 Antenna straight, club-shaped, with continuous outline (Fig. 19), very short, not reaching anterior margin of head (Fig. 19). Length: ca. 1.5 mm. Habitus (Fig. 19). Running water, hygropetric habitats, rare (Anhui, Fujian)..... **Torridincolidae**
- Antenna variously shaped (see Figs. 7 - 10), long or short, always surpassing anterior margin of head (Figs. 18, 22 - 46)..... 7
- 7 Metacoxae forming very large plate, with conspicuous midcoxal area (Figs. 13, 15, 16): Dytiscoidea. 8
- Metacoxae distinctly smaller, never forming very large plate (Figs. 17). 12
- 8 Legs modified for swimming, usually with dense fringes of long swimming hairs (Figs. 13, 15, 16, 24 - 29); tarsomeres of hind leg flattened (Figs. 13, 15, 16, 24 - 29)..... 9
- Legs more or less unmodified (Figs. 22, 23), without dense fringes of long swimming hairs; tarsomeres of hind leg long and slender, cylindrical, not flattened..... 11
- 9 Metacoxal plate with anterior paramedian angle (Fig. 15). Body dorsally strongly convex, ventral surface almost flat. Posterior metacoxal process very large (Fig. 15). Suture between first two ventrites partly or completely obsolete (Fig. 15). Length: ca. 2 - 5 mm. Habitus (Fig. 24). Mainly in stagnant water, wide-spread, not uncommon..... **Noteridae**
- Metacoxal plate without anterior paramedian angle (Figs. 13, 16). Body dorsally and ventrally convex. Metacoxal process small (Figs. 13, 16). Suture between first two ventrites well-developed (Figs. 13, 16)..... 10
- 10 Lateral parts of metaventrite characteristically arcuately acuminate, resembling falcon wings (Fig. 13). Metaventrite without transverse suture (Fig. 13). Length: 1 - 50 mm. Habitus (Figs. 26 - 29). Very common in stagnant water, less common in running water, wide-spread. . **Dytiscidae**
- Lateral parts of metaventrite not arcuately acuminate (Fig. 16) and thus not resembling falcon wings. Metaventrite with transverse suture (Fig. 16). Length: ca. 10 mm. Habitus (Fig. 25). Stagnant water, very rare (Jiangxi), might be extinct in China..... **Hygrobiidae**
- 11 Body outline discontinuous, with pronoto-elytral angle (Fig. 22). Surface structure rugulose. Length: ca. 10 – 14 mm. Habitus (Fig. 22). Mountain streams, rare (Sichuan, Jilin)... **Amphizoidea**
- Body outline more or less continuous, without pronoto-elytral angle (Fig. 23). Surface structure smooth. Length: ca. 5 mm. Habitus (Fig. 23). Wet cliffs, very rare (Shaanxi)..... **Aspidytidae**
- 12 Pronotum with pronounced anteromedian projection forming shelf above head (Fig. 40). First ventrite very short and inconspicuous, abdomen therefore apparently with four visible sternites (ventrites). Length: ca. 3 mm. Habitus (Fig. 40). Margins of streams, very rare (Hainan)..... **Epimetopidae**
- Pronotum without pronounced anteromedian projection. Abdomen with four to seven visible sternites (ventrites)..... 13
- 13 Labrum strongly deflected, not seen from above (Fig. 38). Anterior margin of clypeus distinctly emarginate with anterior corners upturned (Fig. 38). Length: ca. 6 mm. Habitus (Fig. 38). Stagnant water, very rare (Heilongjiang)..... **Spercheidae**
- Labrum usually visible from above, rarely strongly deflected. Anterior margin of clypeus not distinctly emarginate 14

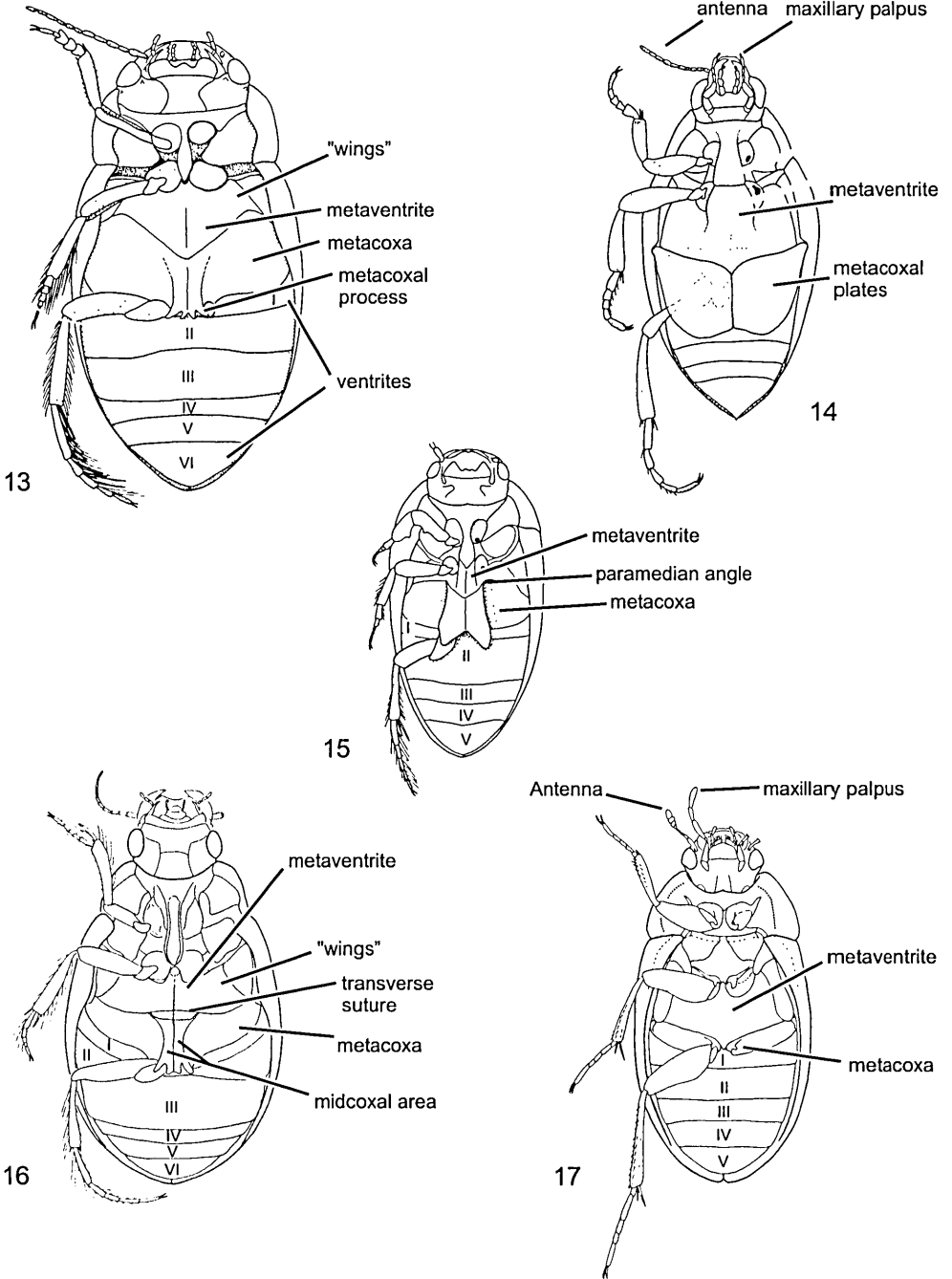
- 14 General appearance as in Fig. 34. Middle of pronotum with three shallow impressions (Fig. 34). Length: ca. 2 - 4 mm. Habitus (Fig. 34). Stagnant water, wide-spread, not very common..... **Hydrochidae**
- General appearance not as in Fig. 34..... 15
- 15 General appearance as in Fig. 39. Pronotum with five longitudinal grooves (Fig. 39). Length: ca. 2 - 6 mm. Habitus (Fig. 39). Stagnant water, common in N China, rare or absent in S China..... **Helophoridae**
- General appearance not as in Fig. 39..... 16
- 16 Elytra distinctly abbreviated and truncate, thus posterior abdominal segments exposed and visible from dorsal view (Figs. 18, 31). Terminal abdominal segment triangular (Figs. 18, 31) 17
- Elytra not abbreviated and truncate as in Figs. 18, 31. Terminal abdominal segment usually not visible from dorsal view, rarely long and triangular..... 18
- 17 Maxillary palpi very short, about half as long as distance between eyes (Fig. 18). Antenna straight (Fig. 18); antennal insertion exposed, visible from above (Fig. 18). Length: < 2 mm. Habitus (Fig. 18). Gravelly margins of running water, very rarely collected (SE China)..... **Hydroscaphidae**
- Maxillary palpi rather long, about as long as distance between eyes (Fig. 31). Antenna of hydrophiloid type (first segment usually long and curved, club pubescent, Fig. 4); antennal insertion dorsally obstructed by lateral extension of frons and clypeus, therefore not visible from dorsal view (Fig. 6). Length: ca. 0.9 - 2.5 mm. Habitus (Fig. 31). Stagnant and running water, wide-spread, not uncommon..... **Hydraenidae** (genus *Limnebius*)
- 18 Antenna typically hydrophiloid (first segment usually long and curved, club pubescent, Figs. 4 - 6); antennal insertion dorsally obstructed by lateral extension of head, therefore not visible from dorsal view (Fig. 6)..... 19
- Antenna of varying appearance (see Figs. 8 - 12, 41 - 46), if vaguely resembling hydrophiloid type (e.g. Elmidae: Larainae, Fig. 8) then entirely pubescent; antennal insertion exposed, visible from dorsal view (Figs. 12, 41 - 46)..... 20
- 19 Pubescent antennal club with five segments (Fig. 4). Length: ca. 1 - 3 mm. Habitus (Figs. 32, 33). Stagnant and running water, wide-spread, common..... **Hydraenidae** (excl. genus *Limnebius*)
- Pubescent antennal club with three segments (Fig. 5). Length: ca. 2 - 40 mm. Habitus (Fig. 35 - 37). Very common in stagnant water, less common in running water, wide-spread..... **Hydrophilidae**
- 20 Antenna very short (Fig. 7); second segment (pedicel) greatly enlarged and strongly produced to form distinct subtriangular plate (Figs. 7, 12, 41, 43). Frontoclypeal suture absent (Fig. 12). Length: 3 - 8 mm. Habitus (Figs. 41, 43). Quite common in running water, less common in stagnant water, wide-spread..... **Dryopidae** (excl. genus *Ceradryops*)
- Antenna short or long (Figs. 8 - 10, 42, 44 - 46), second segment (pedicel) never produced to form subtriangular plate. Frontoclypeal suture usually present (Fig. 11)..... 21
- 21 Eyes covered with numerous interfacetal setae (Fig. 42). Antenna short, 6-segmented; however, last four segments closely jointed and therefore antenna seemingly 3-segmented (Fig. 42). Frontoclypeal suture absent. Length: ca. 1.5 - 2.0 mm. Habitus (Figs. 42). Hygropetric habitats, very rare (Hong Kong)..... **Dryopidae** (genus *Ceradryops*)
- Eyes naked, without interfacetal setae (Figs. 44 - 46). Antenna short or long, with 7 - 11 segments (Figs. 8 - 10). Frontoclypeal suture usually present (Fig. 11). Length: ca. 1 - 6 mm. Habitus (Figs. 44 - 46). Very common in running water, wide-spread..... **Elmidae**

Acknowledgements

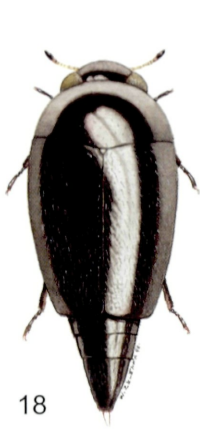
We thank D. Paramonov (Riga) and W. Zelenka (Vienna) for the habitus illustrations (Paramonov: Figs. 26 - 29, 35 - 37, Zelenka: remaining Figs.). We are very much obliged to J. Kodada (Bratislava), A. Komarek (Vienna), A.S. Konstantinov (Washington), P. Mazzoldi (Brescia), and I. Ribera (London) for valuable comments.



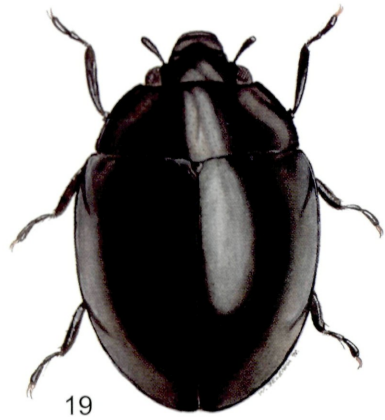
Figs. 1 - 12: 1) Head of Curculionidae, dorsal view; 2) habitus of leaf beetle; arrow points at bilobed tarsomere of hind leg; 3) head of Gyrinidae, lateral view; 4) antenna of Hydraenidae; 5) antenna of Hydrophilidae; 6) head of Hydrophilidae, dorsolateral view, arrow points at obtected antennal base; 7) antenna of Dryopidae; 8 - 10) various types of antennae of Elmidae; 11) head of Elmidae, dorsal view, arrow points at free antennal base; 12) head of Dryopidae, dorsal view.



Figs. 13 – 17: Ventral side of 13) Dytiscidae, 14) Haliplidae, 15) Noteridae, 16) Hygrobiidae, 17) Hydrophilidae



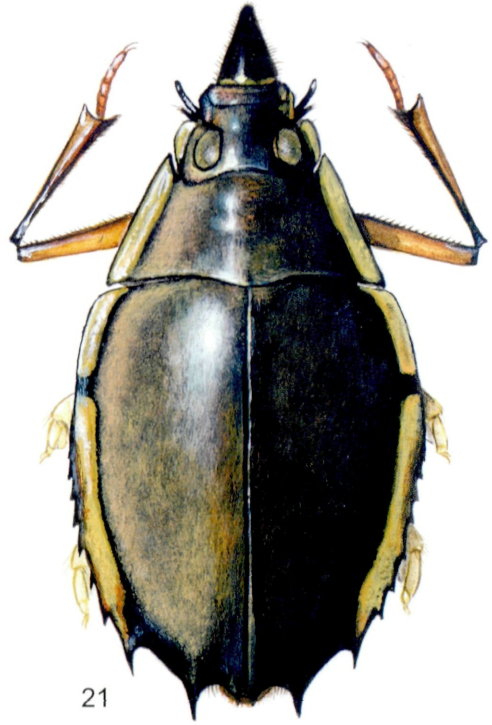
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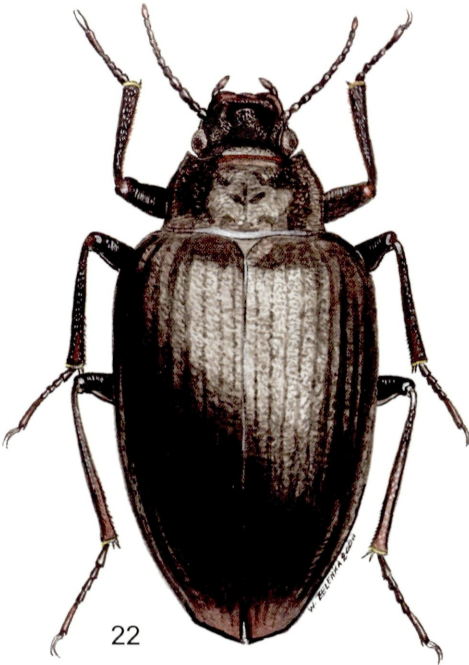


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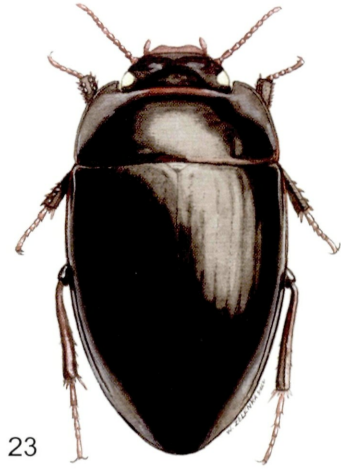


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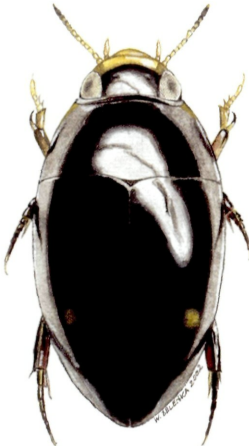
Figs. 18 - 21: Habitus of 18) Hydroscaphidae (*Hydroscapha*), 19) Torridincolidae (*Satonius*), 20) Gyrinidae (*Metagyrinus*), 21) Gyrinidae (*Porrorhynchus*).



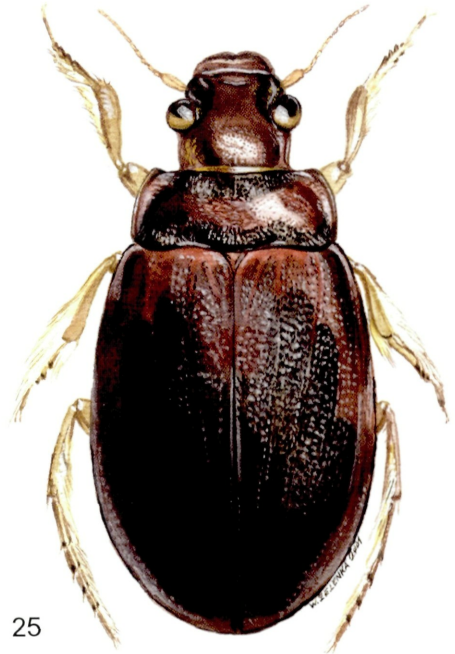
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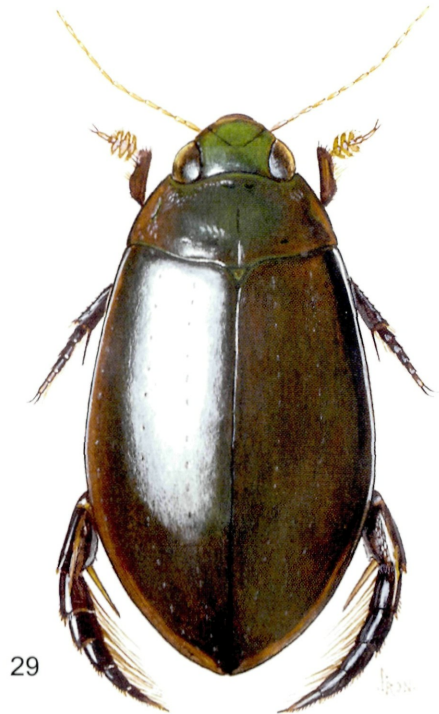
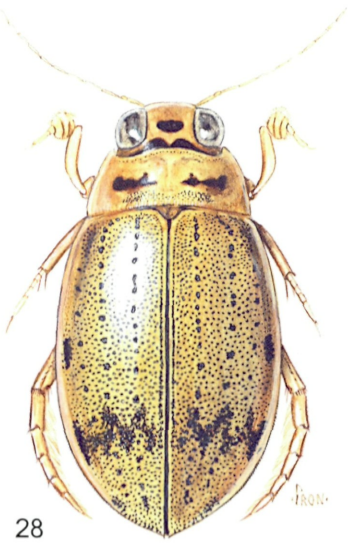
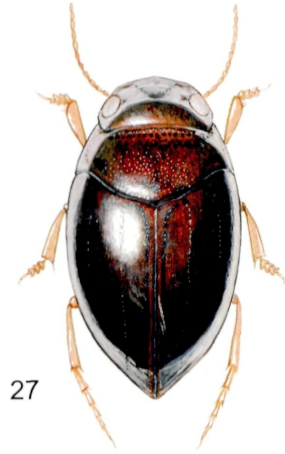


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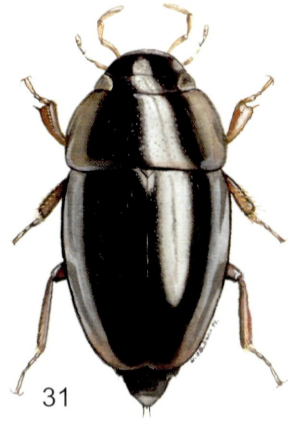
Figs. 22 – 25: Habitus of 22) Amphizoidae (*Amphizoa*), 23) Aspidytidae (*Aspidytes*), 24) Noteridae (*Canthydrus*), 25) Hygrobiidae (*Hygrobia*).



Figs. 26 – 29: Habitus of 26) Dytiscidae (*Copelatus*), 27) Dytiscidae (*Hydrovatus*), 28) Dytiscidae (*Eretes*), 29) Dytiscidae (*Cybister*).



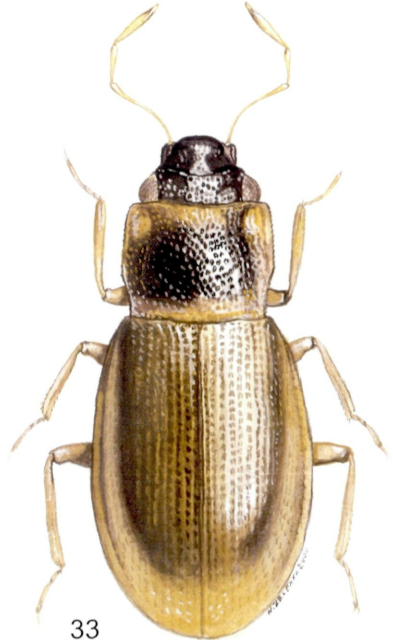
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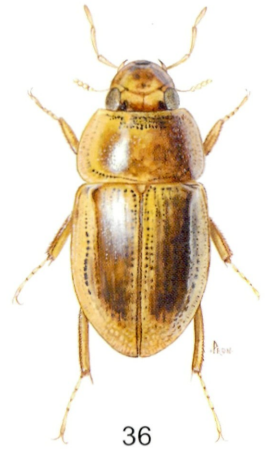
Figs. 30 – 33: Habitus of 30) Haliplidae (*Peltodytes*), 31) Hydraenidae (*Limnebius*), 32) Hydraenidae (*Aulacochthebius*), 33) Hydraenidae (*Hydraena*).



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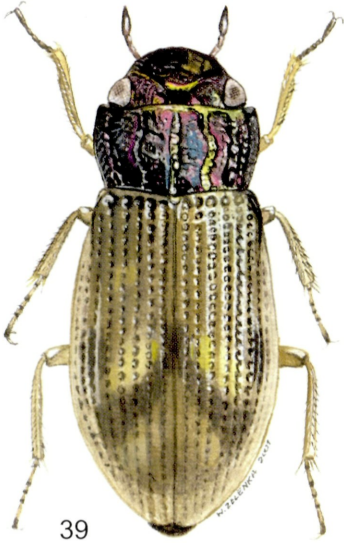


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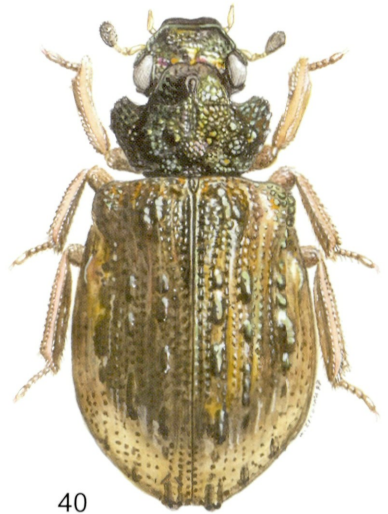


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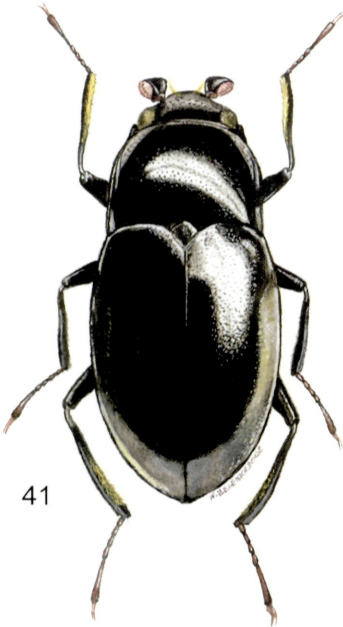
Figs. 34 – 38: Habitus of 34) Hydrochidae (*Hydrochus*), 35) Hydrophilidae (*Berosus*), 36) Hydrophilidae (*Helochaeres*), 37) Hydrophilidae (*Hydrophilus*), 38) Spercheidae (*Spercheus*).



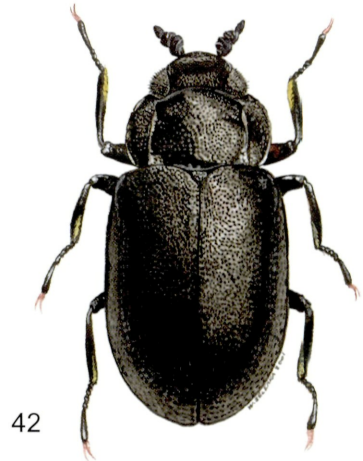
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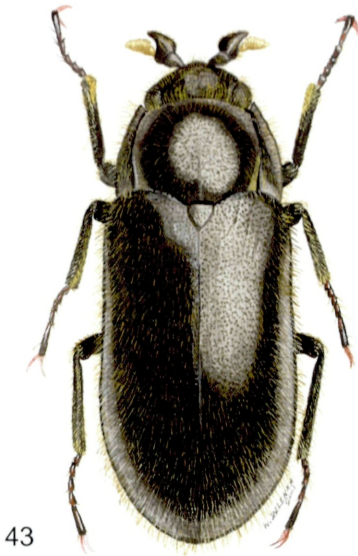


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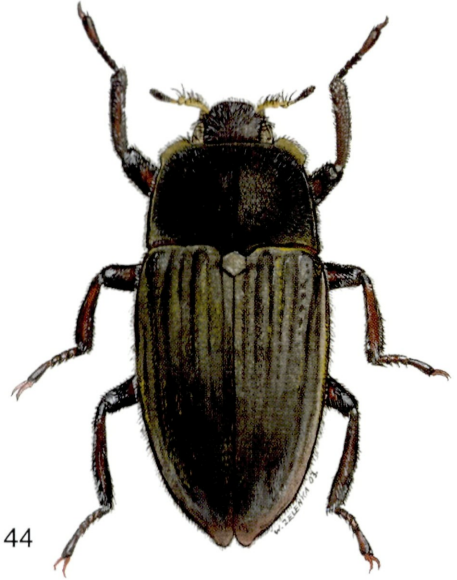


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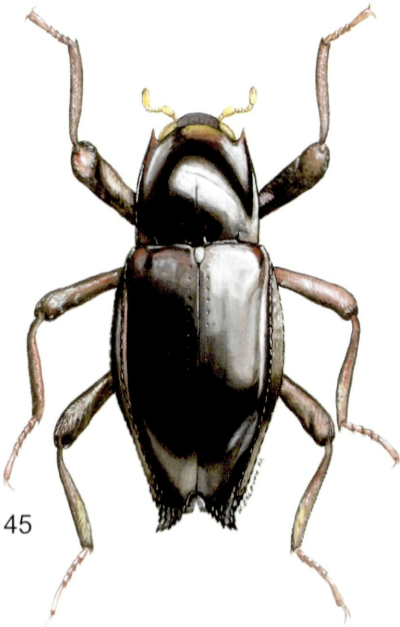
Figs. 39 – 42: Habitus of 39) Helophoridae (*Helophorus*), 40) Epimetopidae (*Eumetopus*), 41) Dryopidae (*Stenomystax*), 42) Dryopidae (*Ceradryops*).



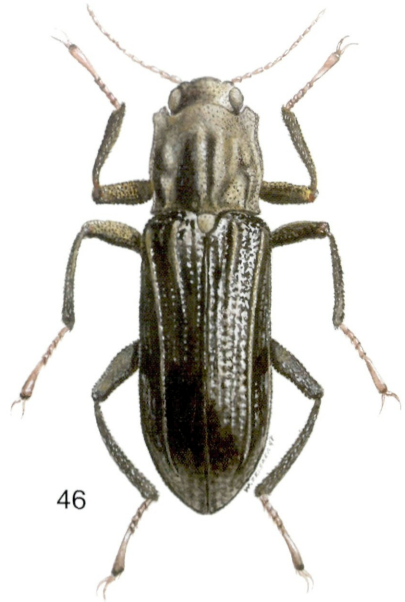
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Figs. 43 – 46: Habitus of 43) Dryopidae (*Dryops*), 44) Elmidae (*Dryopomorphus*), 45) Elmidae (*Cuspidevia*), 46) Elmidae (*Stenelmis*).



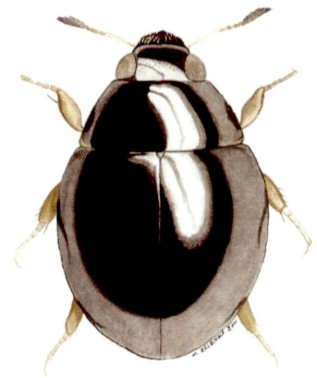
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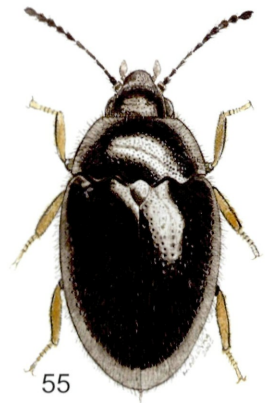
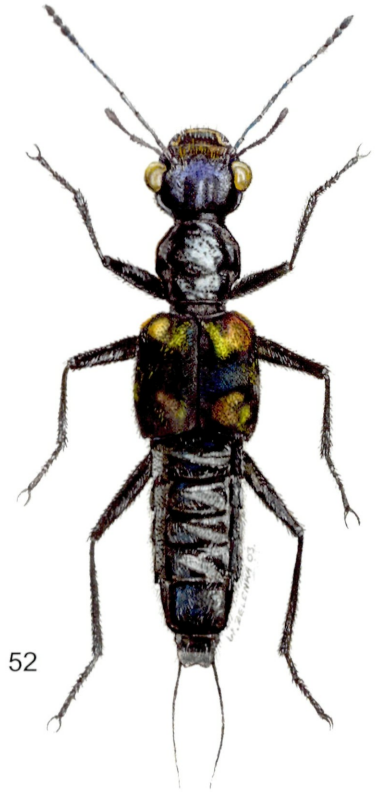
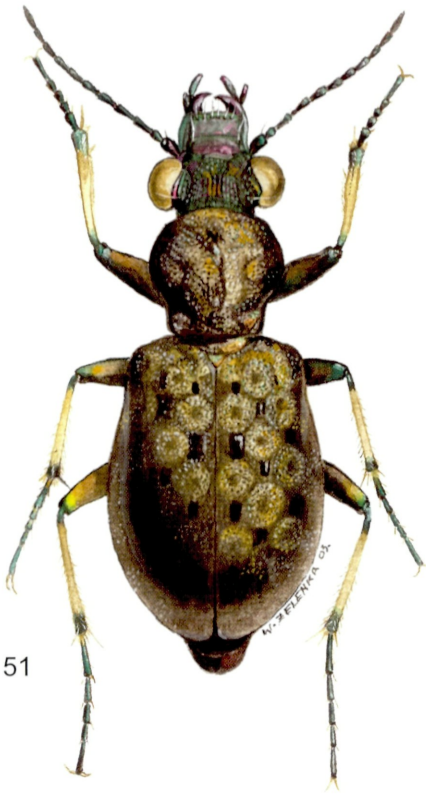


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Figs. 47 – 50: Habitus of 47) Chrysomelidae (*Macroplea*), 48) Chrysomelidae (*Prasocuris*), 49) Curculionidae (*Bagous*), 50) Sphaeriidae (*Sphaerius*).



Figs. 51 – 55: Habitus of 51) Carabidae (*Elaphrus*), 52) Staphylinidae (*Dianous*), 53) Georissidae (*Georissus*), 54) Heteroceridae (*Heterocerus*), 55) Limmichidae (*Byrrhinus*).

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