

Agricultural insect pests in Order Coleoptera (Beetles and Weevils)

Minute to large insects, fore wings are elytra (hard, horny or leathery) which meet in straight med dorsal line on the abdomen. Hind wings membranous, folded beneath the elytra, or often reduced or wanting, mouth parts adapted for biting (chewing) Prothorax mobile, mesothorax much reduced, metamorphosis complete.

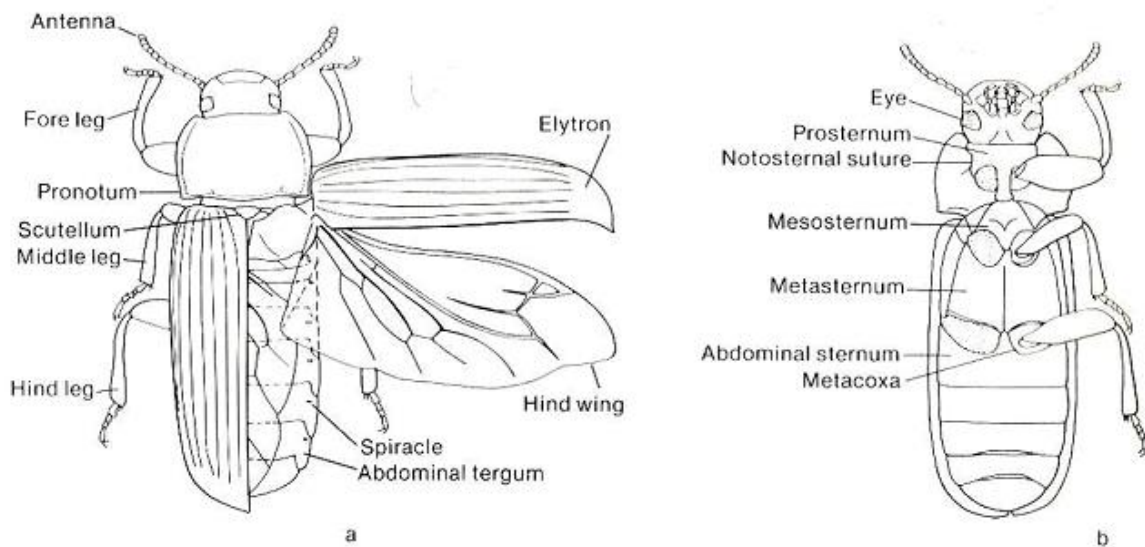


Figure 1 Anatomy of Coleoptera: a, dorsal aspect of *Tenebrio molitor* (Tenebrionidae), right elytron and hind wing extended; b, ventral aspect of same; (Adapted from Daly, H.V. et al. 1978)

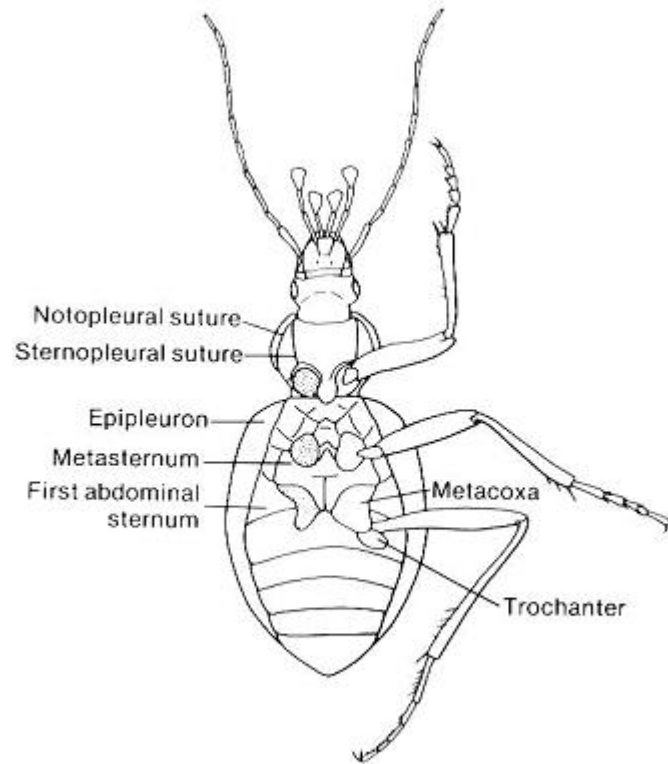


Figure 2 Ventral aspect of *Scaphinotus* (Carabidae);
 (Adapted from Daly, H.V. et al. 1978)

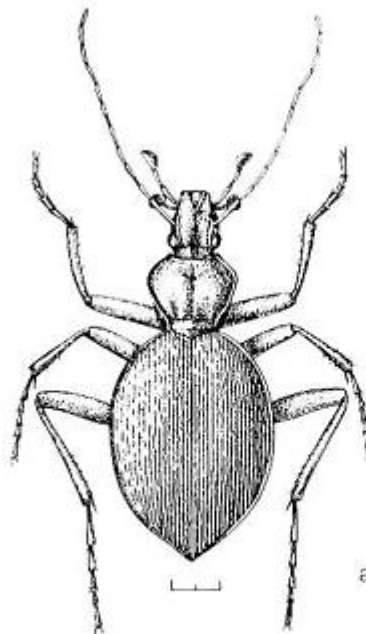


Figure 3 Representative Adepaga: a, Carabidae, adult (*Scaphinotus*);
 (Adapted from Daly, H.V. et al. 1978)

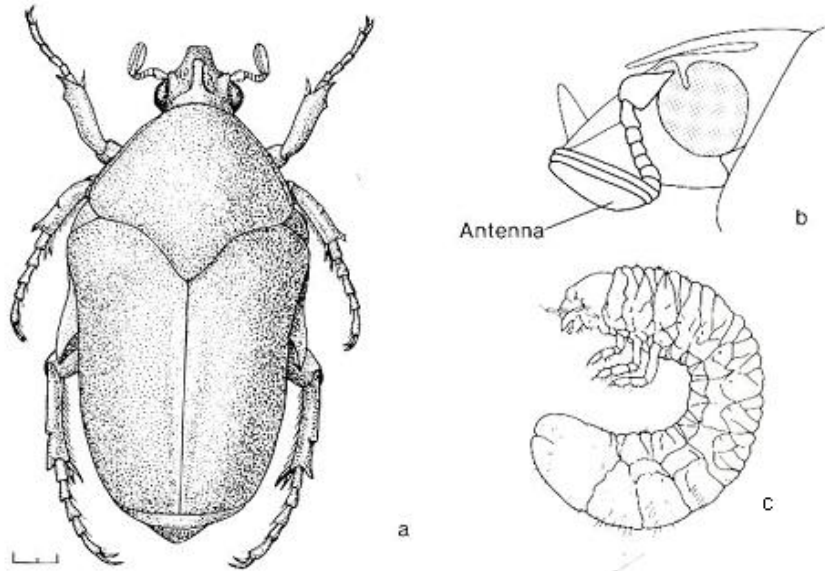


Figure 4 Scarabaeoidea, Scarabaeidae: a, adult *Cotinis nitida* (scale equals 2 mm); b, antenna and c. larva of *Popillia japonica* (Adapted from Daly, H.V. et al. 1978)

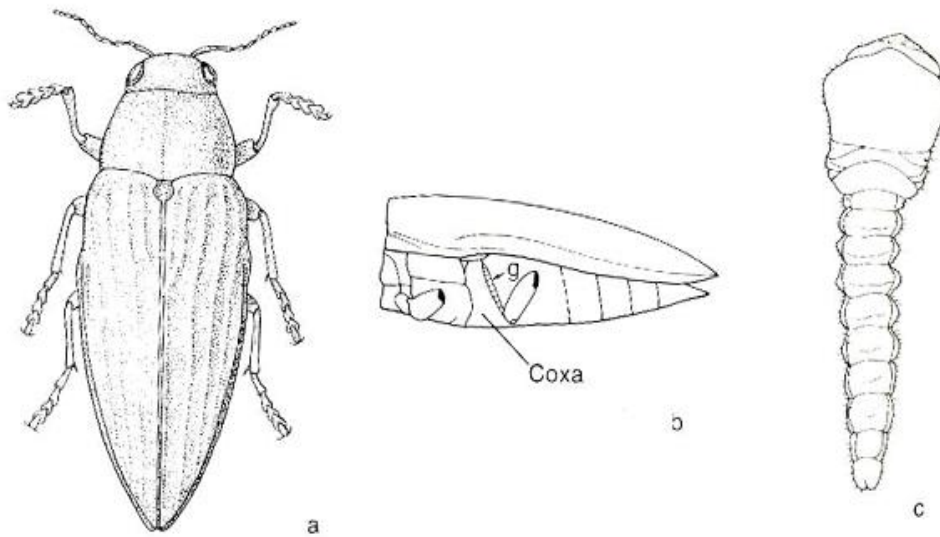


Figure 5. Buprestoidea, Buprestidae: a, *Buprestis aurulenta*; b, metacoxal region of *Buprestis*; c. dorsal aspect of larva of *Chrysobothris*. (Adapted from Daly, H.V. et al. 1978)

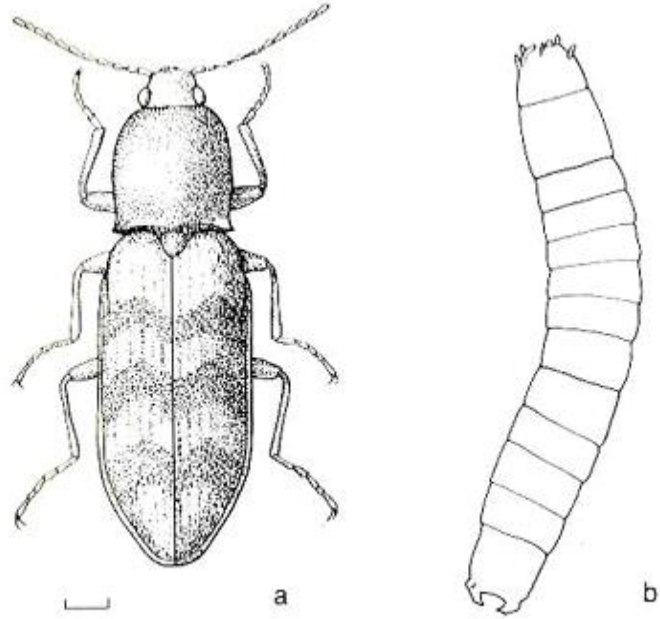


Figure 6. Elateroidea and Dascilloidea a, Elateridae (*Ctenicera tigrina*); b, Elateridae, larva (*Cryptohypnus*) (Adapted from Daly, H.V. et al. 1978)

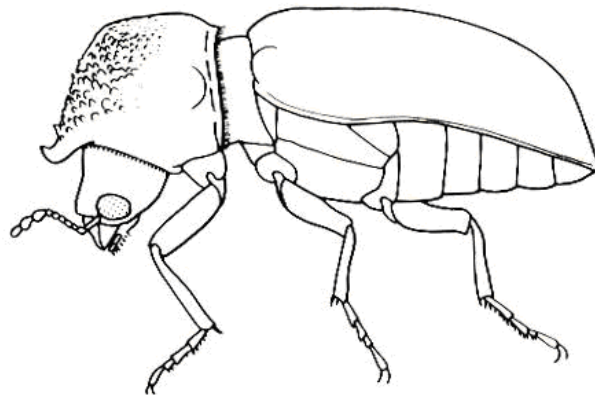


Figure 7 Bostrychoidea: Bostrychidae (*Apatides fortis*); (Adapted from Daly, H.V. et al. 1978)

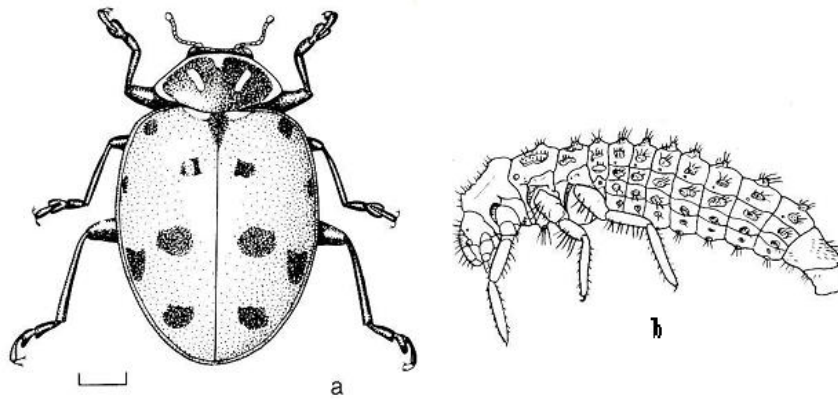


Figure 8 a, Coccinellidae (*Hippodamia convergens*);
 b larva of Coccinellidae (*Coccinella*); (Adapted from Daly, H.V. et al. 1978)

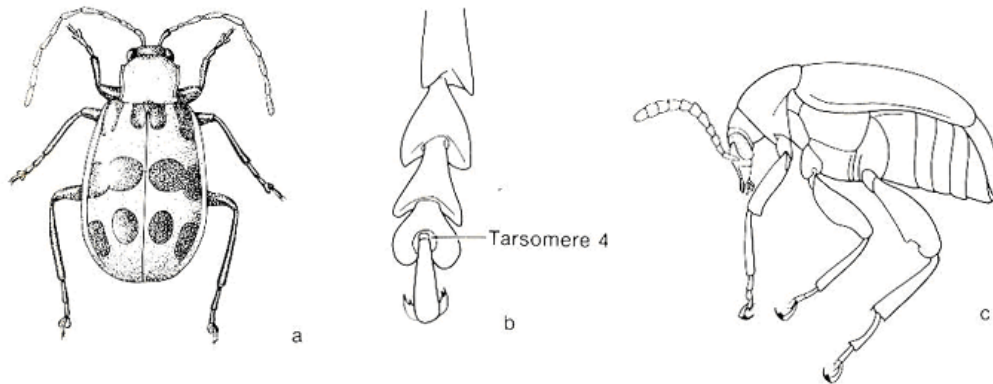


Figure 9 Chrysomeloidea: a, Chrysomelidae (*Diabrotica undecimpunctata*); b, tarsus of *Chrysochus* (Chrysomelidae); c, Bruchidae (*Bruchus rufimanus*); (Adapted from Daly, H.V. et al. 1978)

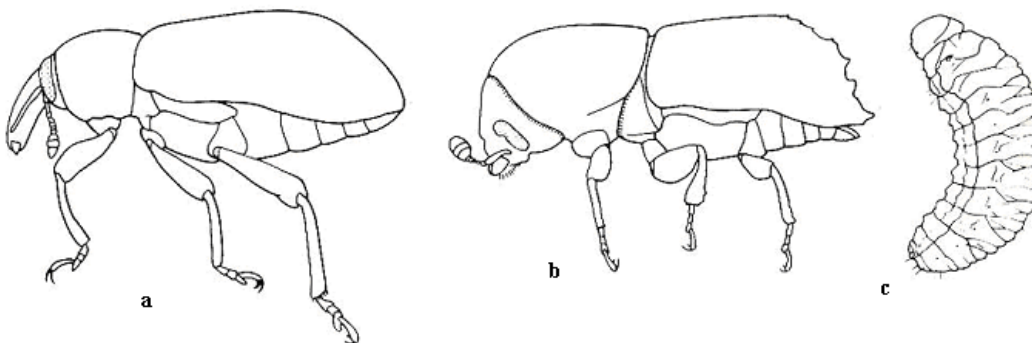
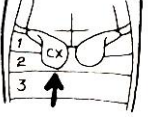

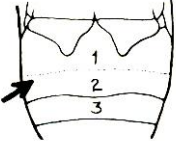



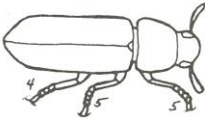

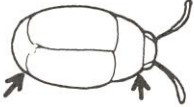
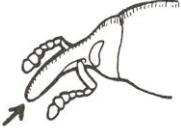



Figure 32 Curculionoidea: a, Curculionidae (*Hypera postica*); b Scolytidae (*Ips*); c larva of Curculionidae (*Naupactus*) (Adapted from Daly, H.V. et al. 1978)




 <p>Figure 11</p>	 <p>Figure 12</p>	 <p>Figure 13</p>	 <p>Figure 14</p>
 <p>Figure 15</p>	 <p>Figure 16</p>	 <p>Figure 17</p>	 <p>Figure 18</p>
 <p>Figure 19</p>	 <p>Figure 20</p>	 <p>Figure 21</p>	





Key to the major economic families.




- 1-- Head not prolonged to a snout, gular suture double -----2.
- Head usually prologed into a snout , gular suture fused or lacking---12
- 2—First abdominal divided by hind coxae antenna filiform--- Carabidae.
------(Figure 11)
- First abdominal sternum not divided by hind coxae .----- 3.
- 3-- Click mechanism present (Prosternal spine fitting into groove in Mesosternum antenna serrate-----
Elateridae-----Figure 12)
- Click mechanism not present.----- -4.
- 4-- First two abdominal segments fused body usually metallic. -----
-----Buprestidae. (Figure 13)
- First two abdominal segments not fused body not usually metallic-----5.

- 5-- Hind coxae dilated and grooved for the reception of femora, often small hairy or scaly beetles head concealed from above. ----- -Dermistidae. (Figure 14) -- Hind coxae not dilated and grooved, not hairy or scaly beetles.----- -6
- 6-- Tarsi apparently 3—segmented (Third segment minute and fused to the base of the fourth), Body almost hemi spherical----- Coccinellidae (Figure 15)
- Tarsi not 3-- segmented , body not almost hemi spherical -----7
- 7-- Body highly flattened and narrow----- Cucujidae (Figure 16)
- Body not highly flattened and narrow -----8.
- 8-- Tarsi formula 5, 5, 4. -----Tenbrionidae (Figure 17)
- Tarsal formula not 5, 5,4.-----9.
- 9-- Antennae with club formed from movable plates ----- scarabaeidae (Figure 18)
- Antennae without club formed from movable plates .-----10.
- 10--Elytra short, exposing tip of abdomen, Pronotum greatly narrowed anteriorly-----Bruchidae (Figure 19)
- Elytra not short , Pronotum not greatly narrowed anteriorly-----11.
- 11-Antennae usually less than 1/2 length of body, usually small, rounded and bright colored-----Chrysomelidae
- Antennae at least 1/2 length of body, often longer, small to large, elongate and with or without color patterns----- Cerambycidae.
- 12-- Head prolonged into a definite snout, small to large beetles of varying shapes - Curculionidae. (Figure 20)
- Head slightly prolonged into an obscure snout ,small, cylindrical beetles (usually less than 1 cm in length) -----Scolytidae (Figure 21)

Key to the major economic families.

<p>Fam. Carabidae <i>Calosoma chlorstictum</i> <i>Calosoma</i> sp.</p>	 <p><small>© - Josef Hlasek www.hlasek.com Calosoma chlorstictum</small></p> <p>www.hlasek.com</p>	
<p>Fam. Elateridae <i>Agrypnus notodonta</i> <i>Agrypnus</i> sp.</p>	 <p>www.kendall-bioresearch.co.uk</p>	
<p>Fam. Dermistidae <i>Trogoderma granarium</i></p>	 <p><small>10045120291</small></p> <p>www.forestryimages.org</p>	
<p>Fam. Coccinallidae.</p>		

<p><i>Epilachna chrysomelina</i></p>	 <p>www.cuencarural.com</p>	
<p><i>Coccinella undecimpunctata</i></p>	 <p>commons.wikimedia.org</p>	
<p>Fam. Tenebrionidae <i>Tribolium confused</i></p>	 <p>www.fjf.co.jp</p>	
<p>Fam .Scarbaeidae</p>		
<p><i>Oryctes elegans</i></p>		

	www.russellipm-agriculture.com	
<p><i>Tropinota squalida</i></p>	 <p>www.comune.pisa.it</p>	
<p>Fam. Bruchidae. <i>Bruchus rufimanus</i></p>	 <p>claude.schott.free.fr</p>	
<p>Fam. Chrysomelidae. <i>Aulacophora foveicollis</i></p>	 <p>www.psh.corp.ir www.alidarvishzadeh.blogfa.com</p>	

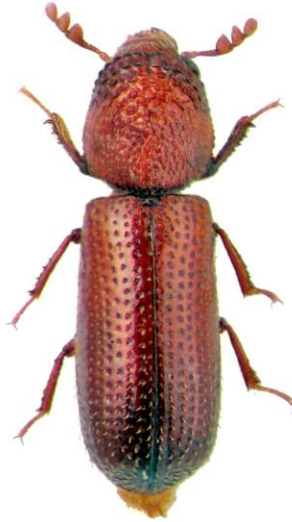
Fam. Curculionidae.
Rhynchophorus ferrugineus



www.salvolizzio.it

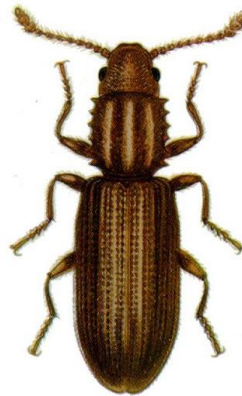
Fam, Bostrichidae.
Phenopathe frontalis

Bostrichidae.



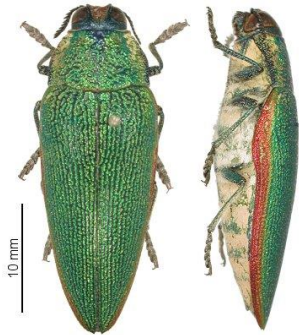


www.zin.ru

Fam. Cucujidae. (Silvanidae).
Oryzaephilus surinamensis



www.dpi.qld.gov.au

<p>Fam. Staphylinidae . <i>Paederus alfieri</i></p> <p><i>Paederus</i> sp.</p>	 <p>xespok.net</p>	
<p>Fam. Nitidulidae . <i>Carpophilus hemipterous</i></p> <p><i>Carpophilus</i> sp</p>	 <p>www.zin.ru</p>	
<p>Fam. Buprestidae. <i>Steraspis squamosa</i></p>	 <p>jcringenbach.free.fr</p>	

References

- Daly, H.V., J.T. Doyen, P.Q. Ehrlich. (1978) Introduction to Insect Biology and Diversity. McGraw-Hill. New York.
- Borror, D.J., D.M. DeLong, and C.A. Triplehorn, (1981) An Introduction to The Study of Insects. 5th ed. Saunders. Philadelphia
- Pfadt, R.E., (1985) Fundamentals of Applied Entomology. 4th Ed. McMillan Publishing Company. New York.

