

Appendix 4. Key to species of *Ceratapion* associated with *Centaurea solstitialis* and some allies (Boris Korotyaev unpubl.).

- 1 a. **Pronotum** very densely and coarsely punctate; punctures elongate, partly merging to form short, undulate striae; intervals between punctures less than 1/3 width of puncture. **Head** coarsely punctate behind eyes all way to anterior margin of pronotum. **Rostrum** (Fig. x) weakly curved, moderately long, and weakly (in female) or moderately (in male) dilated at antennal base. Frons flattened, matte, densely striated; posterior part of frons and the vertex coarsely and rugosely punctate. Elytra (Fig x) with a distinct metallic blue-green sheen; deeply striate, relatively short. Male **fore tibia** straight, neither flattened nor conspicuously dilated apically, without spine near apex on inner margin. **Tarsi** (Fig. x) short; claw-segment slightly protruding beyond hairy brushes of 3rd segment. First segment of **male hind tarsus** without denticle near ventral apex *C. onopordi* Kirby
- 1 b. Punctures on **pronotum** shallower, smaller, and less dense, distance between them nearly their diameter. Punctures on head behind eyes lacking, or fine and extending only short way to constriction, head thereafter finely transversely striate only. **Rostrum** (Fig. x) moderately to strongly curved; in females, rather long. **Elytra** (Fig. x) long, matte, often with scarcely distinguishable blue-green tint. Or elytra short and shining, finely and shallowly striate, and rostrum strongly angularly swollen at antennal base, and pronotum shining, sparsely punctate.....2
- 2 a. **Pronotum** shining, with sparse, medium-sized, shallow, round to weakly elongate punctures separated by about their width. **Elytra** short, finely striate, shiny dark blue or green. **Rostrum** strongly but not acutely dilated at antennal base, sparsely punctate and glossy distally. Frons flattened, smooth; frons and vertex with a few small elongate punctures. Apical 1/3 of **tarsal claw-segment** extending beyond lobes of 3rd segment. **Male fore tibia** straight, not conspicuously dilated apically. 1st segment of **male hind tarsus without** denticle on ventral surface near apex *C. orientale* Gerstaecker
- 2b. **Pronotum** matte; punctures dense, large, and moderately deep; intervals between punctures usually less than width of puncture. Elytra elongate, matte, at most inconspicuously blue or green. Apical portion of **male fore tibia** weakly incurved, with small denticle (=mucro); or lacking a denticle, and strongly flattened and sharply dilated. First segment of **male hind tarsus** with small spine or large tooth near apex ventrally 3
- 3a. **Rostrum** roundly dilated at antennal base. Apical third of **male fore tibia** strongly flattened and sharply dilated. Apical part of first segment of **male hind tarsus** produced in large tooth ventrally 4
- 3b. **Rostrum** abruptly dilated at antennal base. **Male fore tibia** weakly to moderately incurved and neither flattened nor dilated apically. First segment of **male hind tarsus** with only a small spine near apex ventrally 5

- 4a. **Frons** flattened or shallowly concave, finely striate; posterior part of frons and the vertex often smooth medially. **Temples of males**, when viewed from above, subparallel
 *C. basicorne* Illiger
- 4b. **Frons** weakly convex longitudinally, densely sulcate or striate throughout; vertex coarsely punctate. **Temples of males** noticeably diverging posteriorly
 *C. penetrans* Germar
- 5a. Basal dilation of **rostrum** obtuse, rounded, with convex anterior margin. Size larger, length from anterior margin to elytral apex 2.3-3.3 mm. **Rostrum** in female longer, 1.37-1.58 length of pronotum. **Male fore tibia** straight or slightly incurved apically, with minute mucro
 *C. carduorum* Kirby
- 5b. Basal dilation of **rostrum** acute-angled, with concave anterior margin. Size smaller, 2.04-2.88 mm. **Male fore tibia** noticeably incurved apically, with stronger mucro. **Female rostrum** shorter, 1.26-1.50 X length of pronotum..... *C. gibbirostre* Gyllenhal

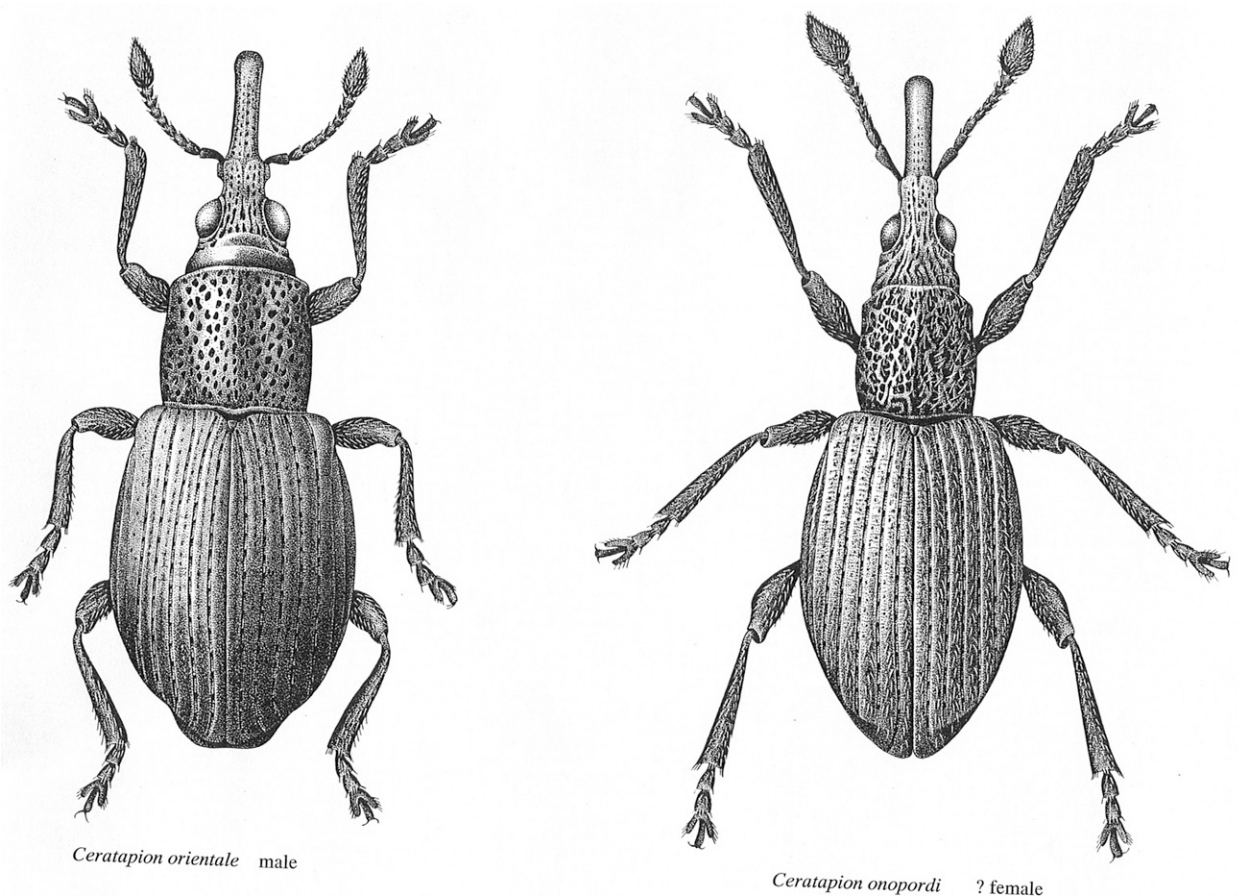


Figure 1. *Ceratapion orientale* and *Ceratapion onopordi*.

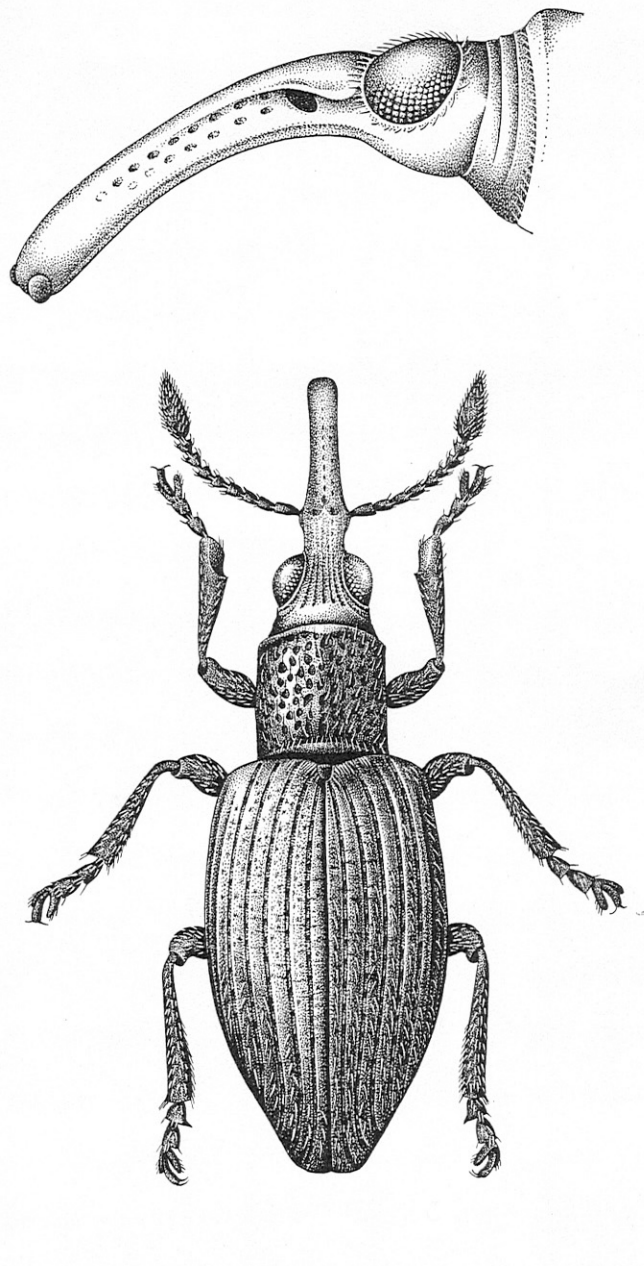


Figure 2. *Ceratapion basicorne*

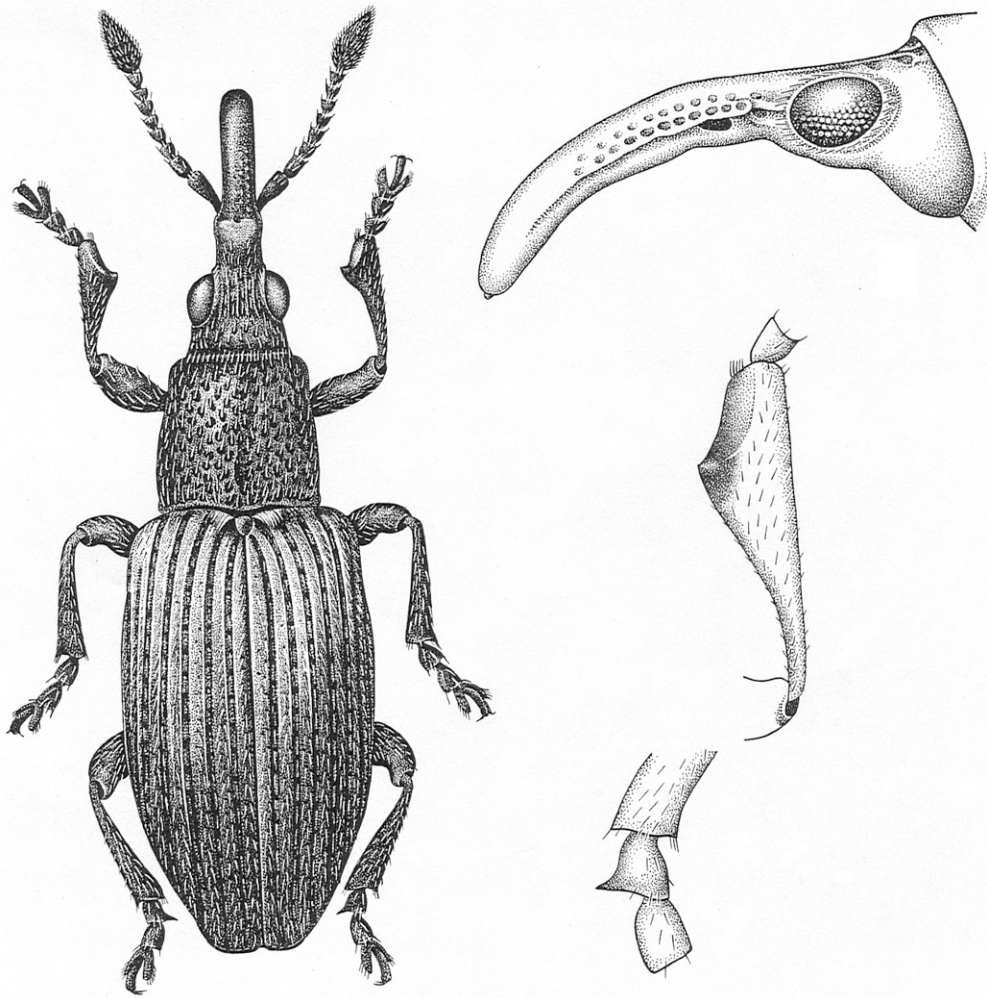


Figure 3. *Ceratapion penetrans* (male).

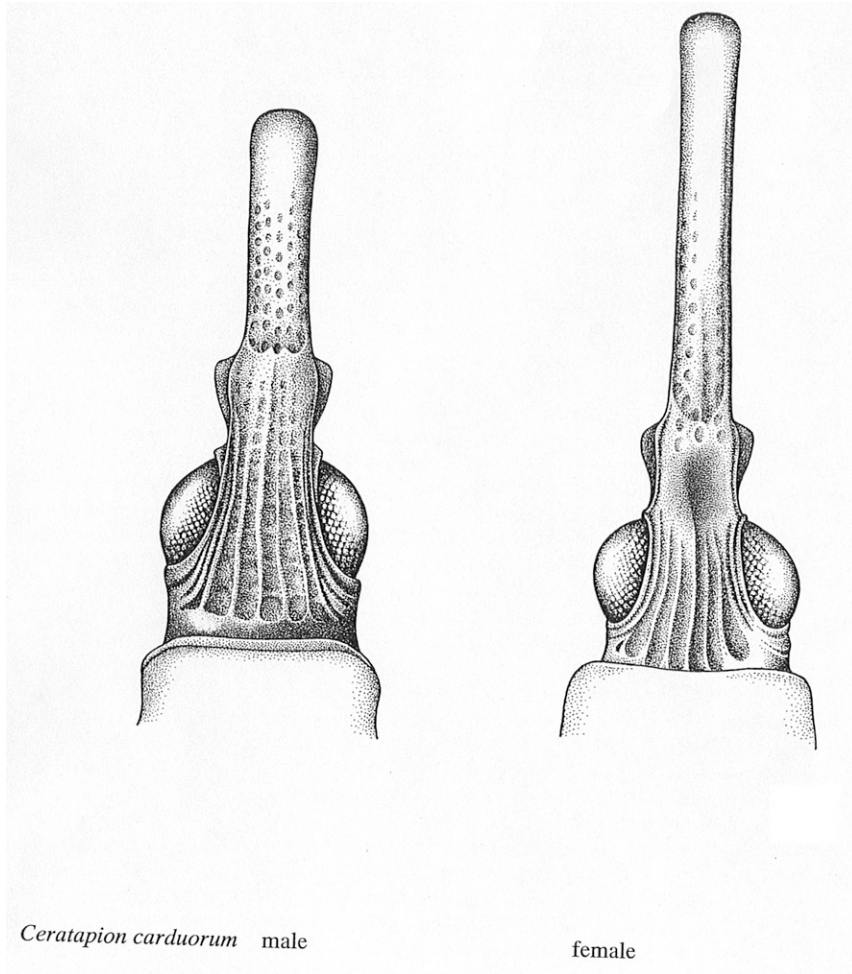
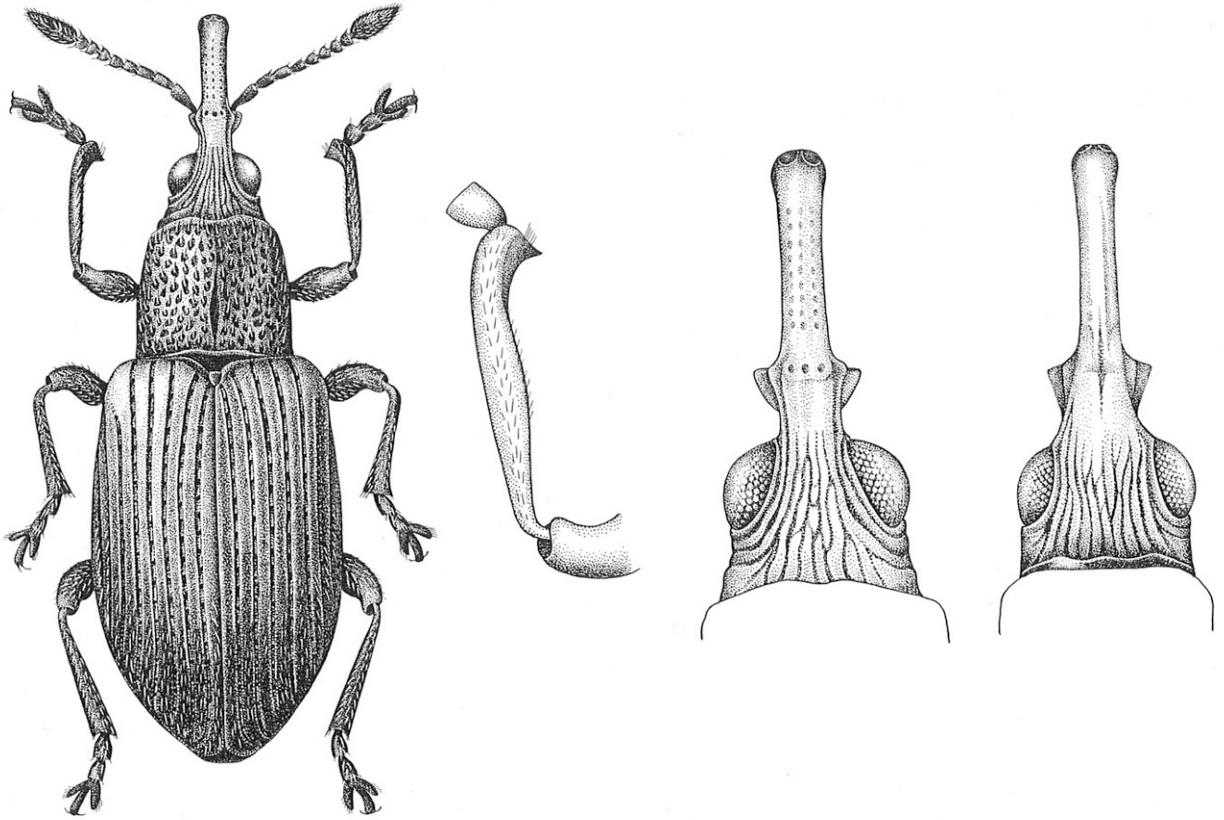


Figure 4. *Ceratapion carduorum*



Ceratapion gibbirostre male

Figure 5. *Ceratapion gibbirostre*

Appendix 5. Fecundity, development and behavior of *Ceratapion basicorne* (Coleoptera: Apionidae), a prospective biological control agent of yellow starthistle (Smith and Drew in press). Environmental Entomology.

(attached)

Appendix 6. Assessment of risk of attack to safflower by *Ceratapion basicorne* (Coleoptera: Apionidae), a prospective biological control agent of *Centaurea solstitialis* (Asteraceae) (Smith *et al.* 2006). Biological Control.

(attached)