Revision of Nearctic species of Cerodontha (Cerodontha) (Diptera: Agromyzidae)

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Revision of Nearctic species of *Cerodontha* (*Cerodontha*) (Diptera: Agromyzidae)

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Abstract—The Nearctic fauna of the subgenus *Cerodontha* (*Cerodontha*) Rondani is revised and contains 10 species: *C. adunca* **sp.nov.** (Mexico), *C. dorsalis* (Loew) (widespread Nearctic, eastern Palaearctic, Neotropical), *C. gracilis* Spencer (western Nearctic), *C. inflata* **sp.nov.** (Mexico), *C. occidentalis* Sehgal (northwestern Nearctic), *C. occidoparva* **sp.nov.** (western Nearctic), *C. toluca* **sp.nov.** (Mexico), *C. trispinata* Spencer (Mexico), *C. trispinella* Spencer (Mexico), and *C. trispinosa* Spencer (Mexico). All Nearctic species are described and illustrated and a key to species is provided. There are two colour forms of the widespread Nearctic species *C. dorsalis*: a pale eastern form and a dark western form, although there is overlap in the geographic distribution of the two forms and intermediates exist. The six Mexican species are known from a total of only nine specimens, suggesting that the diversity of this subgenus in Mexico and Central America may be higher than currently known.

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Résumé—La faune néarctique du sous-genre *Cerodontha* (*Cerodontha*) Rondani est révisée et contient 10 espèces : *C. adunca* **sp.nov.** (Mexique), *C. dorsalis* (Loew) (répandue dans la zone néarctique, palaéarctic est, néotropicale), *C. gracilis* Spencer (ouest néarctique), *C. inflata* **sp.nov.** (Mexique), *C. occidentalis* Sehgal (nord-ouest néarctique), *C. occidoparva* **sp.nov.** (ouest néarctique), *C. toluca* **sp.nov.** (Mexique), *C. trispinata* Spencer (Mexique), *C. trispinella* Spencer (Mexique) et *C. trispinosa* Spencer (Mexique). Toutes les espèces de la région néarctique sont décrites et illustrées, et une clé d'identification des espèces est donnée. *Cerodontha dorsalis*, l'espèce très répandue dans la zone néarctique, existe sous deux formes : une forme pâle de l'est et une forme foncée de l'ouest, mais il peut y avoir un chevauchement dans la distribution des deux formes, de plus, une forme intermédiaire existe. Jusqu'à maintenant, sur un total de seulement neuf spécimens, six espèces Mexicaines sont connues, ce qui porte à croire que la diversité de ce sous-genre au Mexique et en Amérique centrale est probablement plus élevée.

Introduction

Nearctic species in the subgenus *Cerodontha* (*Cerodontha*) Rondani (Diptera: Agromyzidae) are among the most easily recognized members of the family, based on the combination of the first flagellomere having a distinct projection or a spine at the upper corner (Fig. 1) and a single pair of scutellar bristles (Fig. 2). The genus *Cerodontha* was originally limited to species having this combination of characters; however, Nowakowski (1962) transferred the subgenera *Dizygomyza* Hendel, *Poemyza* Hendel, and *Icteromyza* Hendel from the genus *Phytobia* Lioy to the genus *Cerodontha*

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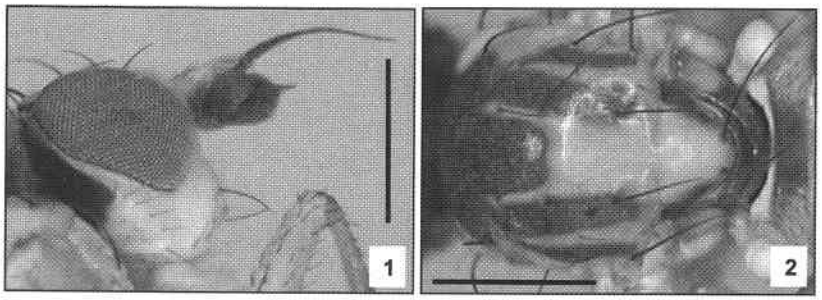


FIGURES 1–2. *Cerodontha dorsalis*: (1) head lateral, (2) thorax dorsal (pale form). Scale bars = 0.3 mm.

based on similarities in male genitalia, especially the possession of strong, L-shaped subepandrial sclerites within the epandrium.

Under Nowakowski's (1962) expanded concept, *Cerodontha* is now a cosmopolitan genus with over 260 species, divided into seven subgenera. The subgenus *Cerodontha* is found in all major zoogeographic realms, but the highest diversity is in the Palaearctic. In the Nearctic region, six species were previously recognized: the widespread and abundant *C. dorsalis* (Loew); the northwestern species *C. occidentalis* Sehgal and western species *C. gracilis* Spencer; and three species from northern Mexico: *C. trispinata* Spencer, *C. trispinella* Spencer, and *C. trispinosa* Spencer (Spencer 1969, 1977). Known larvae of *Cerodontha* (*Cerodontha*) are leaf miners, feeding in leaf sheaths of Poaceae, although host plants are known for only a few species (Spencer 1990). In the Nearctic, host plants have been recorded only for *C. dorsalis*, which is known to feed on at least 16 genera of Poaceae.

In this paper the Nearctic fauna of *Cerodontha* (*Cerodontha*) is revised and four new species are described: one from western Canada and the United States and three from Mexico.

Materials and methods

This study was based on a total of over 1660 specimens housed in the following collections:

CNC	Canadian National Collection of Insects, Ottawa, Ontario.
GCDG	GCD Griffiths' personal collection, Edmonton, Alberta.
LEM	Lyman Entomological Museum, McGill University, Ste-Anne-de-Bellevue, Quebec.
MCZ	Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, United States.
USNM	National Museum of Natural History, Washington, District of Columbia, United States.

Specimens collected in the course of this study were preserved in ethanol and subsequently dried using hexamethyldisilizane (HMDS). Air-dried specimens were relaxed in a high humidity chamber (this step was unnecessary for HMDS-dried specimens) and dissections of genitalia were made by removing the abdomen of specimens and clearing them in 85% lactic acid heated in a microwave oven for 2–3 intervals of 15–30 s each, separated by a cooling period of approximately 1 min. Abdomens were transferred to glycerin for dissection and drawing and stored in microvials pinned below each specimen.

Morphological terminology follows Boucher and Wheeler (2001). The division of the distiphallus into the terminal process (Fig. 3A) and distal tubule (Fig. 3B) follows Spencer (1969). The term hypophallus (also known as basal lobe) is defined in Spencer (1976*a*). The term subepandrial sclerite is used here to refer to the paired L-shaped structure present within the epandrium [processus longus of Sasakawa (1961), Langfortsatz of Nowakowski (1973)].

Measurements are as follows: head height = linear distance in lateral view from middle of ventral margin of gena to base of posterior ors; frons width to eye width ratio = width of frons in line with maximum width of the eye in dorsal view, divided by maximum width of eye (mean of both eyes) in dorsal view; gena height to eye height ratio = vertical distance from oral margin to eye at midpoint of gena in lateral view, divided by vertical height of the eye measured parallel to posterior margin of head in lateral view (often the specimen has to be repositioned after taking the gena height to get a full view of the eye); eye height to eye width ratio = maximum length of eye (usually vertical, sometimes oblique) divided by width of eye perpendicular to this measurement, in lateral view; wing length = distance from wing base to apex; second costal sector = distance between apices of R_1 and R_{2+3}; fourth costal sector = distance between apices of R_{4+5} and M_{1+2}; ratio of distal tubule to terminal process = length of distal tubule measured along the midline, divided by length of terminal process. In species descriptions, ratios are given as the range, with extreme values recorded for one or two specimens only, in parentheses.

Cerodontha (*Cerodontha*) Rondani

Odontocera Macquart, 1835: 614. (Preocc. Serville, 1833). Type species *Chlorops denticornis* Panzer.
Cerodontha Rondani, 1861: 10. (Replacement name for *Odontocera* Macquart).
Cerodontha (*Cerodontha*), Nowakowski, 1962: 100.
Cerodonta, unjustified emendation.

Diagnosis

Cerodontha (*Cerodontha*) can be differentiated from other subgenera of *Cerodontha* and genera of Agromyzidae by the combination of a distinct anterodorsal projection or spine on the first flagellomere (Fig. 1) and the presence of only one pair of scutellar bristles (Fig. 2). A closely related subgenus, *Xenophytomyza* Frey, also has only one pair of scutellar bristles, but the first flagellomere is at most only slightly angulate and the body is entirely black. Only a few non-Nearctic species in the subgenus *Cerodontha* have the first flagellomere only slighly angulate or gradually tapering to a point, but these are differentiated from the subgenus *Xenophytomyza* by their partly yellow coloration.

Comments

The subgenus *Cerodontha* is almost cosmopolitan and contains approximately 60 species. The highest diversity is in the Palaearctic realm with just over 20 species (Nowakowski 1973; Zlobin 1979; Spencer 1990). Ten species (including the widespread *C. dorsalis*) are known from the Neotropical realm (Spencer 1963, 1982, 1984; Sasakawa 1992) and 10 species from the Oriental realm (Zlobin 2001). Eleven species have been recorded from the Australasian and Oceanic realms (Spencer 1989) and five species are known from the Afrotropical realm (Spencer 1990).

Until recently only *C. dorsalis* was known to occur in both the Nearctic and Palaearctic regions (Spencer 1969), but other Nearctic species of the *denticornis* group (*C. gracilis*, *C. occidentalis*) are also present in the eastern Palaearctic (Zlobin 2002). The lack of acrostichal setulae is common to all Nearctic species in the *denticornis* group. This character is useful in differentiating these Nearctic species from other strictly Palaearctic species in the same group. Apparently, only three Palaearctic species lack acrostichals: *C. denticornis* (Panzer), *C. gorodkovi* Zlobin, and *C. pseudodorsalis* Zlobin. All of these species can be differentiated by other external or genitalic differences from the Nearctic species (Zlobin 1979).

Key to Nearctic species of *Cerodontha* (*Cerodontha*)

Although external characters are used as much as possible in this key, identity of species should be confirmed by examination of male genitalia. Females are often difficult to distinguish and are unknown for most of the Mexican species.

1. Acrostichal setulae absent, anterior postsutural dorsocentral bristle strong, 3 strong fronto-orbital bristles present, distal tubules of phallus separate (Fig. 4). (*denticornis* group) 2
– Acrostichal setulae present, anterior postsutural dorsocentral bristle short and weak, at least 4 strong fronto-orbital bristles present, distal tubules of phallus fused (Fig. 37). Mexico. 6
2. Notopleuron with 2 bristles; terminal process of phallus short and pale (Fig. 11) . . . . . *C. gracilis*
– Notopleuron with 1 bristle; terminal process of phallus well-sclerotized (Fig. 4) 3
3. Anepisternum completely yellow; scutum with banded greyish-black pattern and yellow rectangular prescutellar area, scutellum yellow medially, black laterally (Fig. 2); base of arista in dorsal view appearing conspicuously broadened for almost half its length or more (Fig. 9); distal processes of distiphallus long and cylindrical, distal tubules short, less than 2.5 times length of distal processes (Figs. 3, 4). Usually eastern North America (east of 110°W). . . . . *C. dorsalis* (in part)
– Anepisternum usually partly dark; scutum darker, without banded pattern. Prescutellar area at most narrowly yellow 4
4. Frons width usually 0.35 mm or wider, and usually more than 2.4 times eye width in males; gena deep in male, at least 0.36 times eye height; parafacial broad, ring around eye broad (Fig. 18); wing length greater than 2.4 mm; distiphallus with distal tubules long, 6.0–7.5 times length of distal processes (Figs. 16, 17). Northwestern North America (west of 100°W, north of 49°N) . . . . . *C. occidentalis*
– Not exactly as above; frons usually narrower than 0.36 mm and less than 2.4 times eye width in males; parafacial narrower (Fig. 29); wing length often less than 2.4 mm; distal tubules of distiphallus shorter, less than 5 times (rarely 5.5) length of distal processes 5
5. Base of arista in dorsal view usually appearing conspicuously broadened for almost half its length or more (Fig. 9); fore femur often with dark markings; distal processes of distiphallus long and cylindrical, distal tubules short, less than 2.5 times length of distal processes (Figs. 3, 4). . . . *C. dorsalis* (in part)
– Arista more slender, base of arista not conspicuously broad, narrowing evenly (Fig. 31); fore femur completely yellow; distal processes of distiphallus short and rectangular, distal tubules 4–5 (rarely 5.5) times length of distal processes (Figs. 23, 24). . . . . *C. occidoparva*
6. Gena height less than 0.25 times eye height; distal tubules of distiphallus elongate (Figs. 50, 55), without distinct bend at midpoint in lateral view 7
– Gena height greater than 0.25 times eye height; distiphallus stouter (Figs. 43, 59, 62) with distal end enlarged; if distiphallus elongate, then sharp bend present at midpoint (Fig. 36) 8
7. Prescutellar area yellow (Fig. 57), anepisternum mostly yellow; distiphallus in lateral view narrowing abruptly near midpoint (Fig. 55) . . . . . *C. trispinata*
– Scutum completely dark brown, anepisternum mostly dark brown; distiphallus in lateral view with distinct bend near base (Fig. 50) . . . . . *C. toluca*
8. Thoracic pleurites almost completely yellow; scutum with longitudinal brown lateral stripe (Fig. 65); distiphallus in ventral view distinctly enlarged past midpoint, with angular margins (Fig. 63). . . . . *C. trispinosa*

– Katepisternum and at least part of anepisternum brown; scutum without longitudinal lateral stripe; distiphallus not fitting above description 9

9. Orbital setulae numerous, about 8–10 on each side; upper half of first flagellomere dark brown; yellow prescutellar area rectangular, almost reaching second postsutural dorsocentral; distiphallus in lateral view slightly enlarged for half its length (Fig. 59), distiphallus in ventral view with undulating margins (Fig. 60) . . . . . *C. trispinella*

– Less than five orbital setulae on each side; first flagellomere yellow with at most spine dark; distiphallus not fitting the above description 10

10. Head height 0.45 mm; 3 ori; orbital setulae long (about 0.33 times length of posterior ori); frons width less than 0.40 mm; long axis of eye oblique; distiphallus in lateral view bent downward at midpoint, distal tubules of phallus not broadened (Figs. 36, 37) . . . . . *C. adunca*

– Head height 0.75 mm; 2 ori; orbital setulae short; frons width 0.45 mm; long axis of eye nearly vertical; end of distiphallus greatly enlarged (Fig. 43); enlarged section largely open in ventral view (Fig. 42) . . . . . *C. inflata*

Nearctic species of the *denticornis* group

Cerodontha (*Cerodontha*) *dorsalis* (Loew)

(Figs. 1–9)

Odontocera dorsalis Loew, 1863: 54.

Cerodontha dorsalis, Melander, 1913: 249; Frick, 1952: 399; 1959: 396; Spencer 1969: 143; 1981: 174; Spencer and Steyskal 1986: 91.

Type material

Holotype ♀. Labelled "51; D.C.; Loew Coll; dorsalis" (Type #13433, MCZ) (not examined).

Specimens examined

Pale form. A total of 675 specimens (♂ and ♀) were examined from the following localities. **CANADA. Manitoba:** Aweme, 5 km N Gardenton, Brokenhead R., LaSalle, Spruce Woods Prov. Pk., Whitewater Lake, Winnipeg (St-Charles Rifle Range); **New Brunswick:** St-Andrews; **Nova Scotia:** Caribou Provincial Park, Moser River; **Ontario:** Algonquin Park, Brockville, Coniston, Dundas, Fort Frances, Grand Bend, Manitoulin Island (Campbell Bay; W of Gore Bay), Moose Factory, North Bay, Normandale, Ottawa, Point Pelee, St-Lawrence Island Nat. Pk., 4 km E Thedford, Thessalon, Thornhill, Waubamik, Windsor (Ojibway Prairie); **Quebec:** Gatineau Park (Harrington Lake), Great Whale River, Hemmingford, Indian House Lake, Laval, Mistassini Post, Montreal, Mont St-Hilaire, Ste-Anne-de-Bellevue, Thunder River; **Saskatchewan:** Cypress Hills Prov. Park, 5 km S Maple Creek. **UNITED STATES. Arizona:** Patagonia, Saguaro N. Mon., Tucson; **California:** Jenks Lk., Thousand Palms; **Colorado:** Denver, Estes Pk, Fort Collins; **Connecticut:** Candlewood Lk., Putnam, Redding, Westport; **Delaware:** Dewey Beach, Rehoboth; **District of Colombia:** Washington; **Florida:** Belle Glade, Elfers, Green Cove Springs, Lakeland, Orange Park, Orlando; **Idaho:** Plummer; **Kansas:** Manhattan; **Illinois:** Champaign, Chicago, River Forest; **Indiana:** Lafayette, Mitchell; **Iowa:** Ames, Mason city; **Louisiana:** Avery Is., Opelousas; **Maine:** Pittston, Weld; **Maryland:** Colesville, Montgomery Co.; **Massachusetts:** Greenfield, Lexington, New Bedford, Woods Hole; **Minnesota:** International falls, St. Cloud; **Missouri:** Atherton, St-Louis; **Montana:** Glacier Natl. Pk.; **New Hampshire:** Mt. Washington; **New Jersey:** Haddon Heights; **New Mexico:** 8 mi NE Portales; **New York:** Alleghany State Pk, Bear Mt., Cold Spring Harbor, Ithaca, Lake

Placid, Oswego, Riverhead, Saranac Lk., Sinclairville; **Ohio:** Maumee; **Oklahoma:** Ryan; **South Dakota:** Elk Point; **Texas:** Austin, NW of Blanco, Granite Mt., Hempstead, Kerrville, Rio Frio, San Antonio, Uvalde Co; **Tennessee:** Great Smoky Mt. Nat. Pk, Nashville; **Vermont:** Lynden; **Virginia:** Drummond Lk., Falls Church, Portsmouth; **Wisconsin:** Milwaukee, Potato Lk., Washburn; **Wyoming:** Yellowstone Pk. (Lewis Lk). **MEXICO. Durango:** 10 mi W El Salto, 23 mi W Durango; **Guerrero:** Chilpancingo, Ixtapa; **Jalisco:** Puente Grande; **Mexico:** Teotihuacan. **ECUADOR.** Galapagos Islands. **JAMAICA.** Blue Mountain. **PERU.** Lima (CNC, LEM, USNM) (Fig. 66).

Dark form. A total of 709 specimens (♂ and ♀) were examined from the following localities. **CANADA. Alberta:** Banff, Blackfoot Hills, Elkwater, Lethbridge, Norquay Mt. (Banff), Onefour, 15 NE Onefour, SE Fortress Mt., Waterton Nat. Pk (Cameron Lake); **British Columbia:** Bowser, Cranbrook, Creston, Crowsnest, Cultus Lk, Keremeos, Nelson, Oliver, Osoyoos, Qualicum, Revelstoke Mt. (Eva Lake Trail), Robson, Saanich, Salmon Arm, Shuswap Lake, Summerland, Vernon; **District of Colombia:** Washington; **Manitoba:** Aweme, Treesbank, Whitewater Lake, Winnipeg (St-Charles Rifle Range); **Nova Scotia:** Moser River; **Saskatchewan:** Saskatoon, Willows. **UNITED STATES. Arizona:** Apache Co. (20 mi S Springerville), Oak Creek, Portal, Tucson; **California:** (several localities); **Colorado:** Boulder, Echo Lake (Mt. Evans), Estes Park, Fort Collins, Monarch Pass; **Idaho:** Bovill, Chatcolet, Craig Mt., Glengary, Harrison, Juliaetta, Lewiston, McCammon, Moscow, Pend Oreille Lake, Potlatch, Priest Lk., Sandpoint, Troy, Viola, Waha; **Indiana:** Lafayette; **Iowa:** Sioux City; **Montana:** Arlee, Dayton, Glacier National Park (Logan Pass), Great Falls, Libby, Missoula, Three Forks, Thompson; **Nevada:** Angel Lake, Reno; **North Dakota:** Bismarck; **Oregon:** Coos Bay, Corvallis, Deschutes County, Hood Riv., Joseph, Seal Rock; **South Dakota:** Aberdeen, Elk Point; **Utah:** Big Brush Cr., Daniels Pass, Emigration Canyon, Guardsman Pass (near Brighton), Logan, Salt Lake City, Strawberry Valley, Timpanogos Mt., Vernal Canyon; **Washington:** Almota, Asotin, Bellingham, Blyn, Centralia, Chelan Lake (Stehekin), Clarkston, Deer Park, Friday Harbor, Glenwood, Hudson Creek, Ilwaco, Kettle Falls, Mica, Mt. Rainier, Mt. Vernon, Nahcotta, Orcas Island, Palouse, Pateros, Port Gamble, Roche Harbor, Shelton, Spokane, Stanwood, Pullman, Tacoma, Union Flat, Valleyford, Wawawai, Woodland, Yakima; **Wyoming:** Teton Pass, Togwotee Pass (Teton Co.), Union Pass Road, Yellowstone Park (Biscuit Basin, Dunraven Pass, Yellowstone Lk). **MEXICO. Durango:** 10 mi W Durango; **Mexico:** 10 mi E Toluca, W side Cortes Pass. **COLOMBIA.** Bogata, Madrid (CNC, GCDG, LEM, USNM) (Fig. 66).

Diagnosis

This species can be distinguished from other Palaearctic and Nearctic species of the subgenus by the absence of acrostichal setulae, the broad arista (Fig. 9) (less pronounced in some specimens of the dark form), and the phallus having short distal tubules combined with long cylindrical distal processes. The dark form of *C. dorsalis* can also be distinguished by dark markings on the fore femur, although this character is variable. The pale form of *C. dorsalis* can be distinguished from other Nearctic or Palaearctic species in the subgenus by the color pattern on the scutum (Fig. 2). The Palaearctic species *C. denticornis* is externally similar to *C. dorsalis*, but the distal tubules of the distiphallus in *C. denticornis* are more elongated and the distal processes shorter (Spencer 1976*a*).

Description

Head. Frons width 0.25–0.35 mm; ratio of frons width to eye width 1.6–2.2; frons projecting above eye in profile, parafacial narrow below antennae, ring around eye narrow (as in *C. occidoparva*, Fig. 29), not forming an obvious genal groove (compared with *C. occidentalis*); one strong inclinate ori with usually one weak hair anteriorly, two equal reclinate ors; orbital setulae sparse, proclinate and erect in front but reclinate between ors; first flagellomere covered with short white pubescence, longer pubescence at apex; base of arista in dorsal view conspicuously broadened for almost half its length (Fig. 9) (more pronounced in pale specimens but still noticeable in most specimens of *dorsalis* dark form), arista stout in lateral or dorsal view; gena height 0.27–0.38 (0.39) times eye height; ratio of eye height to eye width 1.2–1.3. **Thorax.** One strong presutural and three postsutural dorsocentrals; acrostichal setulae absent; one postsutural intra-alar, just posterior to level of second postsutural dorsocentral, one presutural and two postsutural supra-alar, one weak intrapostalar; notopleuron with one posteroventral bristle; anepisternum with one strong bristle, three to five setulae. Wing length 2.0–2.4 mm in males, up to 2.9 mm in females; second costal sector 4.5–5.4 times length of fourth; last section of CuA_1 0.8–1.1 times length of penultimate. **Male genitalia.** Distiphallus short; terminal process elongated and cylindrical, always long relative to distal tubule (Figs. 3–4), ratio of distal tubule to terminal process 2.2–2.5. **Colour (see Variation below).** Frons yellow; orbit narrowly dark on outer margin from vertex to lower ors, sometimes dark markings only at base of ors; outer vertical bristle on dark background; face, palpus, scape and pedicel yellow, first flagellomere dark brown; gena yellow; posterior margin of eye yellow except for upper margin pale brown. Notopleuron yellow; dark marking on junction between notopleuron and anepisternum; postpronotum yellow with brown marking centrally. Fringe of calypter yellowish-brown to brown. Tibia and tarsi yellowish-brown to brown.

Variation

Pale form. Inner vertical bristle on yellow background. Scutum with distinctive dark grey pattern and extensive yellow prescutellar area (Fig. 2); scutellum yellow except for dark grey lateral margins; anepisternum usually completely yellow, sometimes with ventral side narrowly darker. Katepisternum variable, from completely yellow to darker grey, with upper margin yellow. Femora completely yellow. **Dark form.** Inner vertical bristle on yellow or dark background. Scutum, scutellum, and anepisternum completely dark grey, a few specimens with scutellum yellowish-brown medially; katepisternum dark grey with yellow dorsal margin. Femora yellow, often with dark markings (sometimes only at base) especially on fore femur. **Intermediate form.** Some specimens lack the distinctive dark grey pattern on the scutum (see pale form) but have the anepisternum, scutellum, and sometimes the prescutellar area partly yellow (see Comments).

Life history

Cerodontha dorsalis is the only Nearctic species with known host plants. It has been recorded from 16 genera of Poaceae: *Avena*, *Bromus*, *Dactylis*, *Eleusine*, *Elymus*, *Eragrostis*, *Hordeum*, *Lolium*, *Panicum*, *Phalaris*, *Phleum*, *Poa*, *Secale*, *Sorghum*, *Triticum*, and *Zea* (Spencer 1981, 1990). The larvae mine and pupate inside the leaf sheath. In California, where *C. dorsalis* is active throughout the year, as many as eight generations a year were observed (Spencer 1973).

Comments

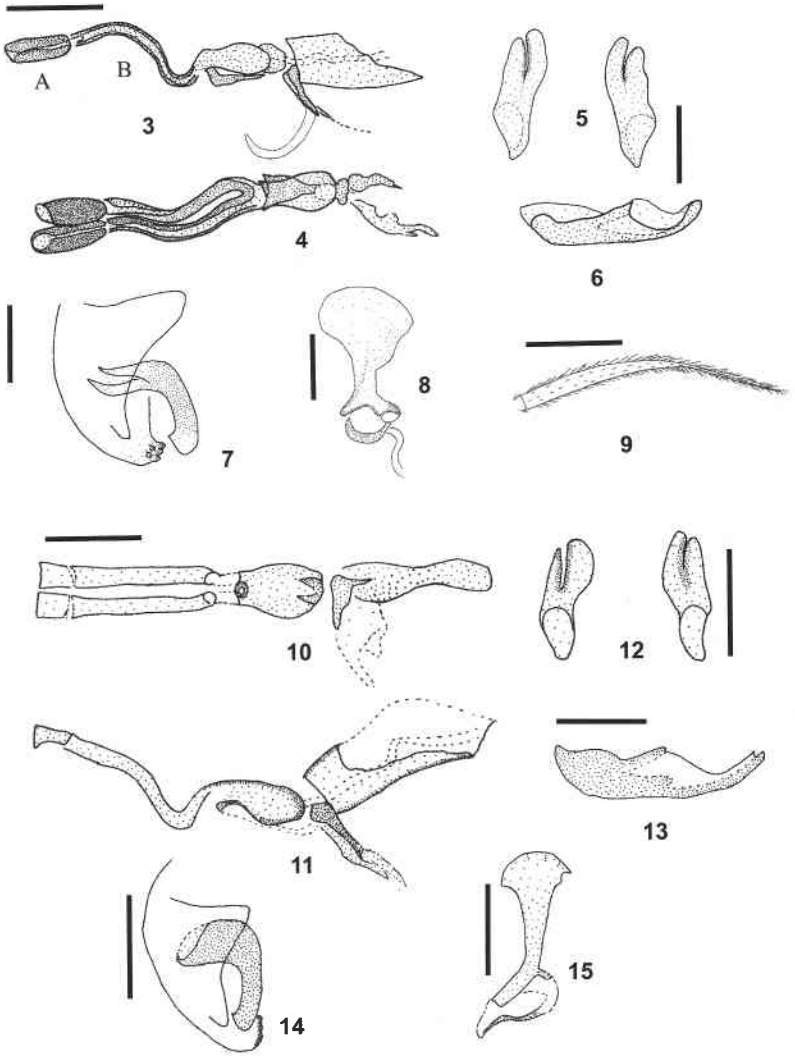
This species is widespread in the New World, including the Caribbean, Central America, and South America (Spencer 1983). It has also been recorded from Mongolia (Spencer 1969), East Siberia, and Middle Asia (Zlobin 2002).

The dark markings on the fore femur and (or) the stout arista in many specimens of the dark form of *C. dorsalis* help to distinguish this species from *C. occidoparva*. Dark form *C. dorsalis* females are distinguishable from *C. occidoparva* only when the fore femora have the dark markings or when the arista is obviously much enlarged at the base.

In the specimens examined, the pale form is usually collected east of the Rocky Mountains; the dark form is usually collected in the Rocky Mountains and farther west. Many previous authors (Aldrich 1918; Spencer 1969, 1981, 1990; Spencer and Steyskal 1986) noted that the colour of the anepisternum, scutum, and scutellum vary greatly in *Cerodontha dorsalis*, with usually an eastern yellow form and a western darker form. It was previously believed that these two forms represented two distinct species: *C. dorsalis* and the European species *C. femoralis* (Meigen) [now *C. fulvipes* (Meigen)] (Melander 1913). Aldrich (1918) initially thought that there were two distinct species isolated by the Rocky Mountains but changed his mind when he found some dark forms east of the mountains. Frick (1952) found no differences in the genitalia of the dark and pale forms and the colour difference is now considered only a variation within the same species. Aldrich (1918) thought that the colour variation in *C. dorsalis* was associated with temperature differences: pale for warmer nights in the east and dark for cooler nights in the west.

Spencer (1981) rejected Aldrich's explanation for colour variation in *C. dorsalis* and pointed out that only the dark form of *C. dorsalis* occurred in California where temperatures vary greatly at different altitudes and different seasons. Although the pale form of *C. dorsalis* has now been recorded from California (Fig. 66), specimens of the pale form or intermediates in the west are not as common as specimens of the dark form or intermediates in the east (Fig. 66). Aldrich (1918) suggested that the dark form is the primitive type because populations of the pale form of *C. dorsalis* can be made dark by cold temperatures, but the dark form cannot be made pale by warm temperatures. Some intermediate forms have been collected west of the Rocky Mountains (*e.g.*, San Diego, California), but these are rare. Completely pale forms of *C. dorsalis* were also collected west of the Rockies (*e.g.*, Jenks Lake, California; Tucson, Arizona), but again these records are rare, which makes it difficult to explain the colour variation west of the mountains. Aldrich's conclusion about the colour variation in *C. dorsalis* seems to apply to the eastern specimens. Many intermediate forms have been collected east of the Rocky Mountains (*e.g.*, Manitoba, Quebec, Indiana, Massachusetts, South Dakota, Virginia) and most of these specimens were collected late in the season (September and October). Dark forms were also collected east of the mountains (Manitoba, Nova Scotia, Indiana, North Dakota, South Dakota) and again most of these specimens were collected early (May) or late in the season (October, November). Often both pale and dark forms have been collected in the same series; for example, both forms were collected at Moser River, Nova Scotia, on 18 August 1996.

Specimens of *C. dorsalis* collected from Ste-Anne-de-Bellevue, Quebec, from early May until early September 2000 were pale yellow early in the season, but some specimens collected in September were intermediate. No specimens have been collected later in the fall, but it would be interesting to see if the dark form emerges at the end of the season. The same phenomenon can be seen in other eastern localities such as Lafayette, Indiana, where specimens collected in July were pale, whereas specimens collected in November were dark.



FIGURES 3–15. ***Cerodontha dorsalis*****: phallus, (3) lateral and (4) ventral; (5) postgonite ventral; (6) postgonites lateral (apex on left); (7) subepandrial sclerite (ventral, left), (8) sperm pump, (9) arista (dorsal).** ***Cerodontha gracilis*****: (10) phallus ventral, (11) phallus lateral, (12) postgonites ventral, (13) postgonite lateral (apex on left), (14) subepandrial sclerite (ventral, left), (15) sperm pump. Note the terminal process (3A) and distal tubule (3B) of distiphallus. Scale bars = 0.1 mm except 0.05 mm for Figs. 5, 6, 7, 13.**

In conclusion, it appears that individuals of the eastern population of *C. dorsalis* are darker in cold temperatures. Generally, eastern specimens collected very early or very late in the season will be darker than specimens collected in mid-summer. For the western specimens of *C. dorsalis*, although a few paler specimens were collected, it would be difficult to determine if the temperature is involved in the colour differences until more specimens of the pale form are collected at different elevations and times of the year.

Other species in the *denticornis* group have similar patterns of colour variation. For example the Palaearctic species *C. denticornis* has dark, yellow, and intermediate forms, originally described as different species by Strobl (1900, 1909). In addition, one specimen of the Nearctic species *C. occidoparva* from Ninette, Manitoba (easternmost limit for this species), has the scutellum, part of the prescutellar area, and part of the anepisternum yellow; western specimens of this species are much darker.

Cerodontha gracilis Spencer

(Figs. 10–15)

Cerodontha (*Cerodontha*) *gracilis* Spencer, 1969: 143.

Type material

Holotype ♂. **CANADA. Yukon Territory:** Swim Lakes, 133°N, 62°13′W, 3200 ft, 19.vi.1960, JEH Martin (CNC).

Other specimens examined

Six specimens were examined from the following localities. **CANADA. Yukon Territory:** North Fork Crossing (1♂, 2♀). **UNITED STATES. Alaska:** Anchorage (1♀), Healy (1♂); **Colorado:** Tennessee Pass (1♂) (CNC, USNM) (Fig. 67).

Diagnosis

This species can be differentiated from other Nearctic or Palaearctic species in the subgenus by the presence of two notopleural bristles, absence of acrostichal setulae, and the phallus having weakly sclerotized distal processes and short distal tubules.

Description

Same as *C. dorsalis* except for the following features. **Head.** Frons width 0.29–0.32 mm; ratio of frons width to eye width 2.2–2.5; frons strongly projecting above eye in profile; parafacial broad, forming a broad ring around eye; head in lateral view similar to *C. occidentalis* (Fig. 18) except for Colorado specimen, which resembles *C. occidoparva* (Fig. 30); orbital bristles weaker than in other North American species; orbital setulae sparse and erect; base of arista not conspicuously broadened in dorsal view, arista slender in general appearance; gena height 0.35–0.45 times eye height. **Thorax.** Intrapostalar absent; notopleuron with two bristles; anepisternum with one strong bristle, one weaker bristle underneath and sometimes one extra setula. Wing length 2.1–2.2 mm in males, 2.4 mm in females; second costal sector 4.1–5.3 times length of fourth; last section of CuA_1 0.9–1.0 times length of penultimate. **Male genitalia.** Distiphallus short; terminal process short and pale (Figs. 10–11), ratio of distal tubule to terminal process 5.0–5.25; subepandrial sclerites stout (Fig. 14); hyaline projection on hypophallus present in the other Nearctic species of the *denticornis* group is apparently absent in this species. **Colour.** Same as *C. dorsalis* except for the following: frons yellow; orbit yellow with dark marking at bases and often between ors; inner vertical bristle on yellow background with sometimes small dark spot underneath bristle, or inner vertical bristle completely on dark background, outer vertical bristle on dark background. Scutum dark greyish-brown; postpronotum yellow with brown marking centrally; scutellum dark; anepisternum almost completely dark except for narrow yellow margin posterodorsally; katepisternum completely dark. Femora yellow with

brown markings usually at the base, sometimes on most of the femora (Colorado specimen), tibia and tarsi brown or dark brown.

Comments

This species was previously known only from Swim Lakes, Yukon Territory. New localities include Colorado and Alaska, which are the first American records of the species and expand the known range considerably. The species is also present in the eastern Palaearctic (Zlobin 2002).

Cerodontha occidentalis Sehgal

(Figs. 16–22)

Cerodontha (Cerodontha) occidentalis Sehgal, 1968: 64; Spencer 1969: 144.

Type material

Holotype ♂. **CANADA. Alberta:** Banff, 28.vi.1966, VK Sehgal (CNC). **Paratypes.** same data as holotype (5♂, CNC, including 1♂ paratype of *C. occidoparva*); same data except KA Spencer (1♂, CNC, paratype of *C. occidoparva*; 1♀, CNC) (see Comments).

Other specimens examined

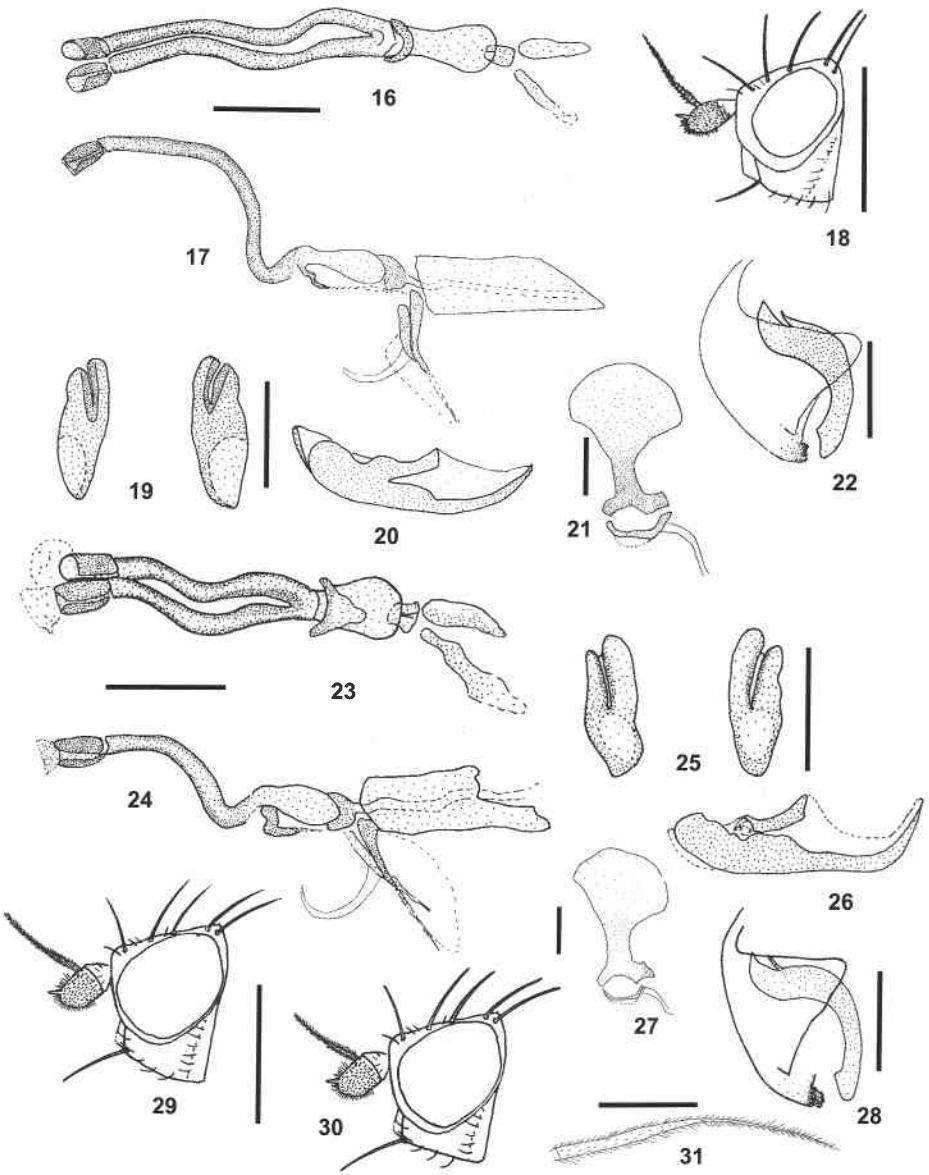
A total of 212 specimens (♂ and ♀) were examined from the following localities. **CANADA. Alberta:** Banff, Elkwater Lake, Waterton Lakes; **British Colombia:** Atlin, Ketchum Lake, Summit Lake, Warm Spring (23 km S Atlin); **Saskatchewan:** Cypress Hills Prov. Park; **Yukon Territory:** Alaska Hwy at Yukon River, Alaska Hwy at Marshall Creek, Carcross Dunes (1 km N Carcross), Conglomerate Mt (8.8 km S Twin Lakes on Klondike Hwy), Dawson, Emerald Lake (near Carcross), Nares Lake (4 km E Carcross), Snafu Creek Govt. Campground (Atlin Rd), Rampart House, Tagish, Whitehorse, Miles Canyon. **UNITED STATES. Alaska:** Healy, Tok, Big Delta (CNC, USNM, LEM) (Fig. 67).

Diagnosis

The head of this species is distinct in lateral view (Fig. 18). This, combined with the absence of acrostichal setulae and the phallus with long distal tubules and relatively short to medium-sized rectangular distal processes, distinguish this species from other Nearctic or Palaearctic species in the subgenus. The Palaearctic species *C. denticornis* has also long distal tubules, but the distal processes are funnel-shaped, not rectangular (Spencer 1976*a*).

Description

Same as *C. dorsalis* except for the following features. **Head.** Frons width 0.35–0.45 mm (one Cypress Hills specimen 0.30 mm); ratio of frons width to eye width 2.4–3.0 in males (2.1–2.7 in females and Cypress Hills specimens; 2.3–2.6 in Banff specimens); frons strongly projecting, parafacial broad, forming a broad ring around eye (Fig. 18); obvious genal groove posteriorly; base of arista not conspicuously broadened in dorsal view; arista slender in general appearance; gena height 0.36–0.50 times eye height in males (0.30–0.44 times in females and Cypress Hills specimens; 0.32–0.36 times in Banff specimens); eye usually small, oval, with long axis oblique; ratio of eye height to eye width 1.25–1.4. **Thorax.** Anepisternum with one strong bristle and usually



FIGURES 16–31. *Cerodontha occidentalis*: **phallus, (16) ventral and (17) lateral; (18) head lateral; (19) postgonites ventral; (20) postgonite lateral (apex on left); (21) sperm pump; (22) subepandrial sclerite (ventral, left).** *Cerodontha occidoparva*: **phallus, (23) ventral and (24) lateral; (25) postgonites ventral; (26) postgonites lateral (apex on left); (27) sperm pump; (28) subepandrial sclerite (ventral, left); head (29) lateral and (30) lateral (variation); (31) arista (dorsal). Scale bars = 0.1 mm except 0.5 mm for Figs. 18, 29, 30.**

three setulae (rarely two or four). Wing length (2.3) 2.4–2.8 mm in males (2.2–2.4 mm in males from Cypress Hills), up to 3.2 mm in females; second costal sector 4.2–6 times length of fourth; last section of CuA_1 0.9–1.1 times length of penultimate. **Male genitalia.** Distiphallus with long distal tubule, terminal process relatively short (Figs. 16, 17)

or slightly more elongated, rectangular, ratio of distal tubule to terminal process 6–7.5. **Colour.** Same as *C. dorsalis* except for the following: frons including orbits completely yellow with at most dark marking at base of ors; inner vertical bristle on yellow background, outer vertical bristle on dark or yellow background; scutum completely dark greyish-brown for most specimens, few specimens with prescutellum narrowly yellow; scutellum variable, from almost completely yellow to (rarely) completely dark; anepisternum variably yellow (rarely completely dark), often paler in Yukon and Cypress Hill specimens with anepisternum over 50% yellow. Femora completely yellow, tibia and tarsi yellowish-brown.

Comments

Some females of *C. occidentalis* have distinctly larger eyes and smaller gena height than males. Some male specimens from the Cypress Hills and Banff also show external morphometric differences (but no genitalic differences) with specimens found farther north. These differences may be evidence for long-term isolation between these populations and more northwestern populations. The southern population may have survived the Wisconsinan glaciation south of the ice sheet, either in a Cypress Hills refugium or moist habitats farther south. *Cerodontha occidentalis* is primarily associated with moist habitats such as forest clearings and wetlands and very few specimens of *C. occidentalis* have been collected in the dry grasslands that surround the Cypress Hills today. The northern populations may have survived the Wisconsinan in Beringia and dispersed southward post-glacially. Similar bicentric distributions have been documented in other taxa, including grassland Hemiptera (Scudder 1993). Spencer (1969) and Sehgal (1971) both stated that *C. occidentalis* was present in the western United States, but Spencer and Steyskal (1986) did not record this species there, and I identified no specimens from south of Canada in this study. Sehgal (1968) designated 34 paratypes of *C. occidentalis*, but only 7 were deposited in the CNC. This species is also present in the eastern Palaearctic (Zlobin 2002).

Cerodontha occidoparva Boucher, sp.nov.

(Figs. 23–31)

Type material

Holotype ♂. **CANADA. Yukon Territory:** Alaska Hwy at Yukon River Crossing, sweep sedges and grasses along river, 02.vii.1997, S Boucher (LEM). **Paratypes. CANADA. Alberta:** Banff, 28.vi.1966, VK Sehgal (1♂, CNC) (paratype of *C. occidentalis*), same except KA Spencer (1♂, CNC) (paratype of *C. occidentalis*); 8 mi E Morley, 26.vi.1962, KC Hermann (2♂, CNC); **British Columbia:** Atlin, 2200 ft, 14.vii.1955, BA Gibbard (2♂, CNC); **Manitoba:** Ninette, 15.vii.1958, JG Chillcott, *ex Betula glandulosa* (1♂, CNC); **Yukon Territory:** Alaska Hwy at Yukon River Crossing, sweep sedges and grasses along river, 02.vii.1997, S Boucher (2♂, 3♀, LEM); Alaska Hwy at Marshall Creek (60°50.1′N, 137°19.9′W), sweep grass/veg. at turnout, 18.vii.1998, TA Wheeler (7♂, 3♀, LEM); Alaska Hwy at M'Clintock R. sweep sedges at river edge, 04.vii.1997, TA Wheeler (1♀, LEM). **UNITED STATES. Alaska:** Big Delta, 24.vi.1951, JR McGillis (3♂, 2♀, CNC); same data except 30.vi.1951, Mason (1♂, CNC); same data except 13.vii.1951 (1♀, CNC); **Colorado:** Echo L. 10 600 ft, Mt. Evans, 13.vii.1961, CH Mann, along grassy lakeshore (1♂, CNC); same data except 12.viii.1961 (1♂, USNM); Golden, 17.vi.1940, AL Melander (1♂, USNM); Grant, 21.vii.1921, EC Jackson (1♂, USNM); Lake City, 8.viii.1936, CL Fluke (1♂, USNM); Loveland Pass, W slope 9850 ft, 8.viii.1961, CH Mann (1♂, CNC); Monarch Pass, 8000 ft,

21.vi.1940, AL Melander (1♂, USNM); Tennessee Pass, 23.vii.1917, JMA (2♂, USNM); same data except 24,vii.1917 (1♂, UNSM); **Utah:** Big Brush Creek, 22 mi N Vernal, 8000 ft, 8.vii.1961, JG Chillcott, marshy meadow (1♂, CNC); **Wyoming:** Togwotee Pass, Teton Co., 16.viii.1961, BH Poole (2♂, CNC); same data except 17.vii.1961, JG Chillcott, shrubby vegetation along stream (2♂, CNC); same data except E side, 900 ft, shrubby meadow (1♂, CNC); Union Pass Road, Fremont Co., 17.vii.1961, JG Chillcott, along rocky stream, 8300 ft (4♂, CNC); Yellowstone Park, Continental Divide, 8200 ft, 8.viii.1918, AL Melander (1♂, USNM); Yellowstone Park, S entrance, 24.vii.1934, AL Melander (2♂, USNM); Yellowstone Park, Crescent Hill, 5.vii.1923, AL Melander (1♂, USNM); Yellowstone Park, Lewis Lake, 28.vii.1934, AL Melander (3♂, USNM) (Fig. 68).

Etymology

The species name is derived from the Latin word *parvus* (small), combined with *occido-* referring to *C. occidentalis*, a similar species from western Canada.

Diagnosis

This species can be differentiated from other Nearctic or Palaearctic species of *Cerodontha* (*Cerodontha*) by the absence of acrostichal setulae, gena height almost always less than 0.4 times eye height, completely yellow femora, base of arista not conspicuously broadened, and by the short distal tubules of the phallus combined with relatively short, rectangular and well-sclerotized distal processes. This species is most similar externally to *C. dorsalis* but also shows some overlap externally with *C. occidentalis*.

Description

Same as *C. dorsalis* except for the following features. **Head.** Frons width 0.30–0.36 (0.38) mm; ratio frons width to eye width 1.7–2.4 (2.5); frons strongly projecting, projection anteroventrally and ring below eye not as pronounced as *C. occidentalis*, head in lateral view as Fig. 29 or Fig. 30; base of arista not conspicuously broadened in dorsal view (Fig. 31), narrowing more quickly than in *C. dorsalis*; arista slender in general appearance; gena height 0.25–0.38 (0.42 times in two males from Morley and Banff, Alberta) times eye height; ratio of eye height to eye width 1.1–1.3 (1.4). **Thorax.** One (rarely two) postsutural intra-alar, just posterior to level of second postsutural dorsocentral. Wing length 2.2–2.6 mm in males (most males below 2.4 mm), up to 2.8 mm in females; second costal sector 4.5–5.6 times length of fourth. **Male genitalia.** Distal tubules short, intermediate in length between *C. dorsalis* and *C. occidentalis*; terminal process short, rectangular (Figs. 23–24), ratio of distal tubule to terminal process 4–5 (5.4 in 1♂ from Union Pass Road, Wyoming, 2♂ from 8 mi E Morley, Alberta). **Colour.** Same as *C. dorsalis* except for the following: frons yellow; orbit yellow often with dark marking at base of ors; inner vertical bristle on yellow background, outer vertical bristle on dark background (sometimes both on yellow); scutum dark greyish-brown, one specimen (Manitoba) with prescutellum narrowly yellow, some specimens with junction between scutum and scutellum paler; scutellum usually dark, sometimes variably yellowish-brown centrally, two specimens (Manitoba, Yukon) with scutellum yellow with lateral margin brown; anepisternum usually almost completely dark with posterodorsal corner yellow, only a few specimens with anepisternum paler yellowish-brown centrally, one specimen (Manitoba) with anepisternum mostly yellow. Femora completely yellow, tibia and tarsi yellowish-brown.

Comments

The specimen from Ninette, Manitoba, is at the easternmost limit of its range and is much paler than specimens from other localities (see Comments under *C. dorsalis*). Owing to the overlapping range of *C. occidoparva* with both *C. dorsalis* (mostly dark form) and *C. occidentalis*, and to their external similarities, the correct identification of this species often requires dissection of male genitalia. Specimens collected around Banff, Alberta, are especially difficult to identify without dissection of male genitalia, mainly owing to the morphometric differences in *C. occidentalis* from this region. Because of external and genitalic similarities between *C. occidoparva* and both *C. dorsalis* and *C. occidentalis*, this species was previously confused with one or the other. Two males from Banff, Alberta, are paratypes of *C. occidentalis*. Females are not easily distinguished from females of *C. dorsalis* (dark form). However, because *C. dorsalis* has not been recorded in the Yukon or Alaska, female specimens of *C. occidoparva* from these localities have been designated as paratypes. Some females from southern localities (Alberta, Wyoming, California) that appear to be *C. occidoparva* have been left unidentified until better taxonomic characters can be found.

Spencer (1969) mentioned that a third species indistinguishable externally from *C. occidentalis* but with small yet distinctive differences in genitalia may have been present in the Alberta material examined by Sehgal (1968). It does not appear that this species is *C. occidoparva* as the genitalic difference is in the mesophallus, not the distiphallus (Sehgal 1971). No other specimens showing this difference in the mesophallus were seen in the material examined for this study. The phallus of this species is similar to that of *C. caucasica* Zlobin from Russia, but the absence of acrostichals, the presence of two ors, and the small but distinct differences in the genitalia confirm the new status of this species.

Cerodontha (Cerodontha) sp. A

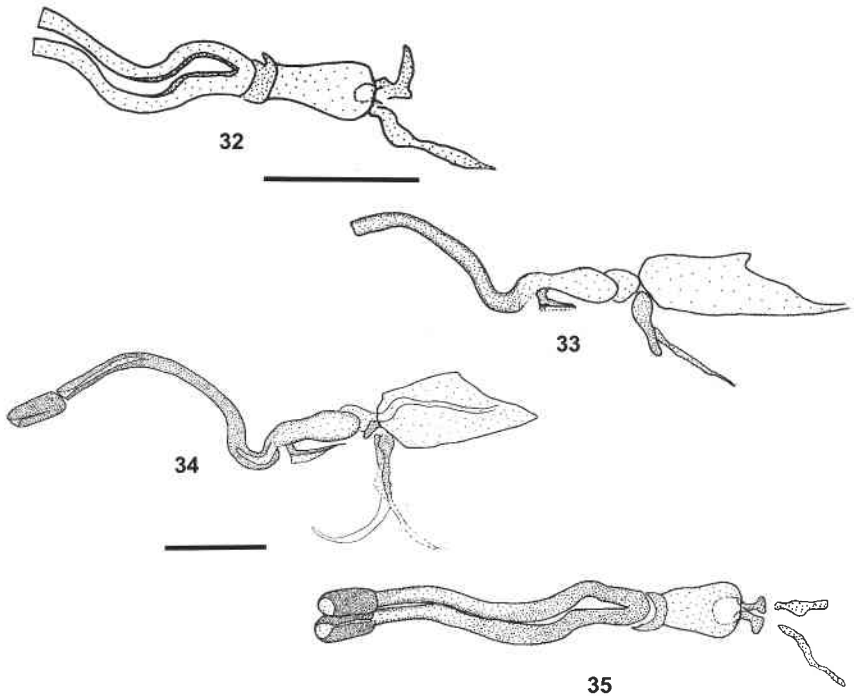
Comments

One male specimen [CANADA. Alberta: McMurray, 27.vi.1953, GE Ball (CNC)] is similar externally to *C. occidoparva* with the head as in Fig. 29, but with the long axis of the eye more oblique. The terminal process of the distiphallus is absent (Figs. 32–33). This does not appear to be a damaged specimen because the abdomen of the dissected specimen is still complete. Because of the external similarity to *C. occidoparva*, more specimens are needed to confirm the status of this species.

Cerodontha (Cerodontha) sp. B

Comments

One male [UNITED STATES. Alaska: Valdez, 7.vii.1948, tidal flats, RI Sailer (USNM)] has genitalia (Figs. 34–35) most similar to *C. gorodkovi* from Russia and Mongolia, except for the hyaline projection on the hypophallus which is apparently absent in *C. gorodkovi*. *Cerodontha* sp. B also shows some external differences with *C. gorodkovi* such as longer wing length, lower eye eight to eye width ratio, completely dark scutellum, and dark prescutellar area. Among Nearctic species, the phallus of this species is most similar to *C. occidentalis*, but the terminal process of the distiphallus is longer (distal tubule/terminal process ratio = 4.9 *versus* 6.0–7.5 in *C. occidentalis*) and more oval, as in *C. dorsalis*. Also the shape of the head and the ratios of frons width to eye width and gena height to eye height are most similar to *C. occidoparva* (Fig. 29).



FIGURES 32–35. ***Cerodontha*** **sp. A: phallus, (32) ventral and (33) lateral.** ***Cerodontha*** **sp. B: phallus, (34) lateral and (35) ventral. Scale bars = 0.1 mm.**

Although *Cerodontha* (*Cerodontha*) sp. B is most similar to *C. gorodkovi*, comparison with the type series would be necessary before any conclusion can be made on the status of this specimen.

Mexican species of subgenus *Cerodontha*

Cerodontha aduncа Boucher, sp.nov.

(Figs. 36–41)

Type material

Holotype ♂. **MEXICO. Durango:** 24 mi W La Ciudad, 7000 ft, 8.viii.1964, WRM Mason (CNC).

Etymology

The species name is derived from the Latin word *aduncus* (bent inward), referring to the shape of the phallus.

Diagnosis

This species can be distinguished from other Nearctic or Palaearctic species in the subgenus by the reduced anterior postsutural dorsocentral bristle, presence of about four

rows of acrostichal setulae, three ori, long orbital setulae, and the distinctive bend at the midpoint of the distiphallus.

Description

Head. Small; head height 0.45 mm; frons width 0.37 mm; ratio of frons width to eye width 2.6; frons strongly projecting above and parafacial broad in front of eye in profile forming broad ring below eye (Fig. 41); three inclinate ori (anterior one shorter but still more than twice the length of orbital setulae), two reclinate ors on one side (anterior one smaller), and one reclinate ors on the other side; four orbital setulae, long (about 0.33 times the length of posterior ori) erect, present anteriorly only, not past lower ors; first flagellomere with white pubescence, longer at apex; gena height 0.36 times eye height; ratio of eye height to eye width 1.3; long axis of eye oblique (Fig. 41). **Thorax.** One strong presutural and three postsutural dorsocentrals, anterior postsutural weak, 0.3 times the length of second postsutural; acrostichal setulae irregular in about four rows, present mostly anteriorly, past second postsutural but not reaching posterior postsutural dorsocentral; one postsutural intra-alar, midway between posterior and second postsutural dorsocentral, one presutural and two postsutural supra-alar, one weak intrapostalar; notopleuron with two strong bristles. Wing length 2.5 mm; second costal sector 5.6 times length of fourth; last section of CuA_1 1.1 times length of penultimate. **Male genitalia.** Distiphallus in lateral view bent down at midpoint (Fig. 36), in ventral view, distal tubules slightly and evenly broadened, with sclerotized part of distal tubules pointed (Fig. 37). **Colour.** Entire head yellow including most of antennae, lateral surface of first flagellomere pale brown basally. Scutum brown except for yellow junction between scutum and scutellum; notopleuron yellow; postpronotum yellow with brown marking centrally; scutellum shiny pale yellow with brown lateral sides; anepisternum mostly brown except for yellow posterodorsal margin; katepisternum completely brown. Fringe of calypter yellowish-brown. Femora yellow, tibia and tarsi darker yellow.

Comments

The holotype is one of the paratypes of *C. trispinata* Spencer (see Comments under *C. trispinata*), but dissection of the genitalia confirmed the status of this species.

Cerodontha inflata Boucher, sp.nov.

(Figs. 42–48)

Type material

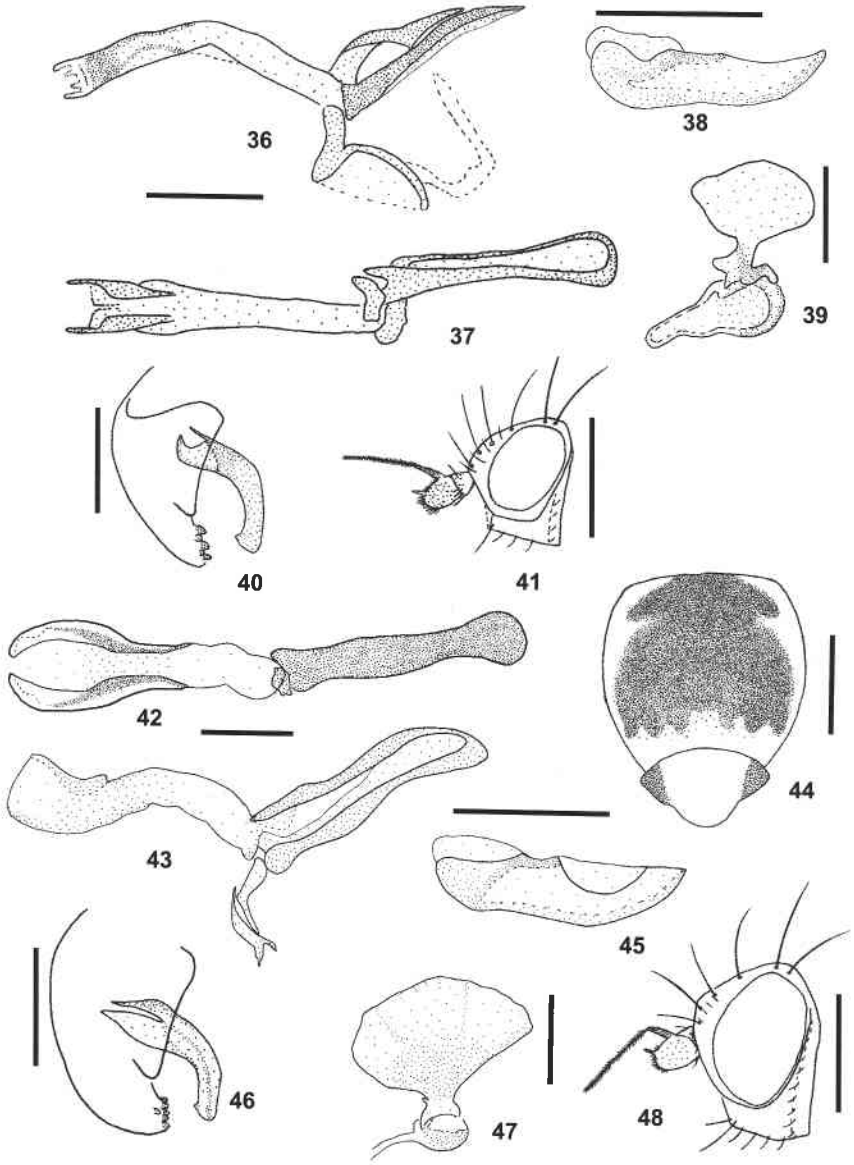
Holotype ♂. **MEXICO. Durango:** 11 mi E El Salto, 8000 ft, 13.vi.1964, JF McAlpine (CNC).

Etymology

The species name is derived from the Latin word *inflatus* (swollen), referring to the enlarged phallus and large sperm pump.

Diagnosis

This species can be distinguished from other Nearctic or Palaearctic species in the subgenus by the larger head (head height 0.75 mm), the reduced anterior postsutural dorsocentral bristle, presence of four to five rows of acrostichal setulae, wing length 3.2 mm in male, and the enlarged distiphallus.



FIGURES 36–48. ***Cerodontha adunca*****: phallus, (36) lateral and (37) ventral; (38) postgonite lateral; (39) sperm pump; (40) subepandrial sclerite (ventral, left); (41) head lateral.** ***Cerodontha inflata*****: phallus, (42) lateral and (43) ventral; (44) thorax dorsal; (45) postgonite lateral (apex on left); (46) subepandrial sclerite (ventral, left); (47) sperm pump; (48) head lateral. Scale bars = 0.1 mm except 0.5 mm for Figs. 41, 44, 48, and 0.2 mm for Fig. 47.**

Description

Same as *C. adunca* except for the following features. **Head.** Larger; head height 0.75 mm; frons width 0.45 mm. Ratio of frons width to eye width 2.35; frons projecting above and in front of eye in profile, forming only narrow ring below eye (Fig. 48); two inclinate ori, two reclinate ors; anterior ori and ors a little shorter; four to five orbital

setulae, small, slightly proclinate, present mostly anteriorly except one orbital setulae between ors on one side only; gena height 0.30 times eye height; ratio of eye height to eye width 1.36; long axis of eye almost vertical (Fig. 48). **Thorax.** One strong presutural and three postsutural dorsocentrals, anterior postsutural weak, 0.42 times the length of the second postsutural; acrostichal setulae in four to five irregular rows, present on most of scutum as far as posterior postsutural dorsocentral; one postsutural intra-alar, closer to posterior postsutural dorsocentral. Wing length 3.2 mm; second costal sector 4.7 times length of fourth; last section of CuA_1 0.95 times length of penultimate. **Male genitalia.** End of distiphallus greatly enlarged with enlarged section largely open in ventral view (Figs. 42, 43); sperm pump very large (Fig. 47). **Colour.** Entire head yellow including antennae except spine on first flagellomere brown; scutum dark brown with prescutellar area yellowish (Fig. 44); notopleuron yellow; postpronotum yellow with very small brown marking centrally; scutellum shiny pale yellow, with brown lateral margins; anepisternum mostly yellow with anteroventral side brown; katepisternum brown with yellow stripe dorsally. Fringe of calypter pale brown. Femora yellow, tibia and tarsi darker yellow.

Comments

The holotype is one of the paratypes of *C. trispinata* (see Comments under *C. trispinata*), but dissection of the genitalia confirmed the status of the species.

Cerodontha toluca Boucher, sp.nov.

(Figs. 49–54)

Type material

Holotype ♂. **MEXICO. Mexico:** 10 mi E Toluca, 8900 ft, 31.vii.1954, JG Chillcott (CNC).

Etymology

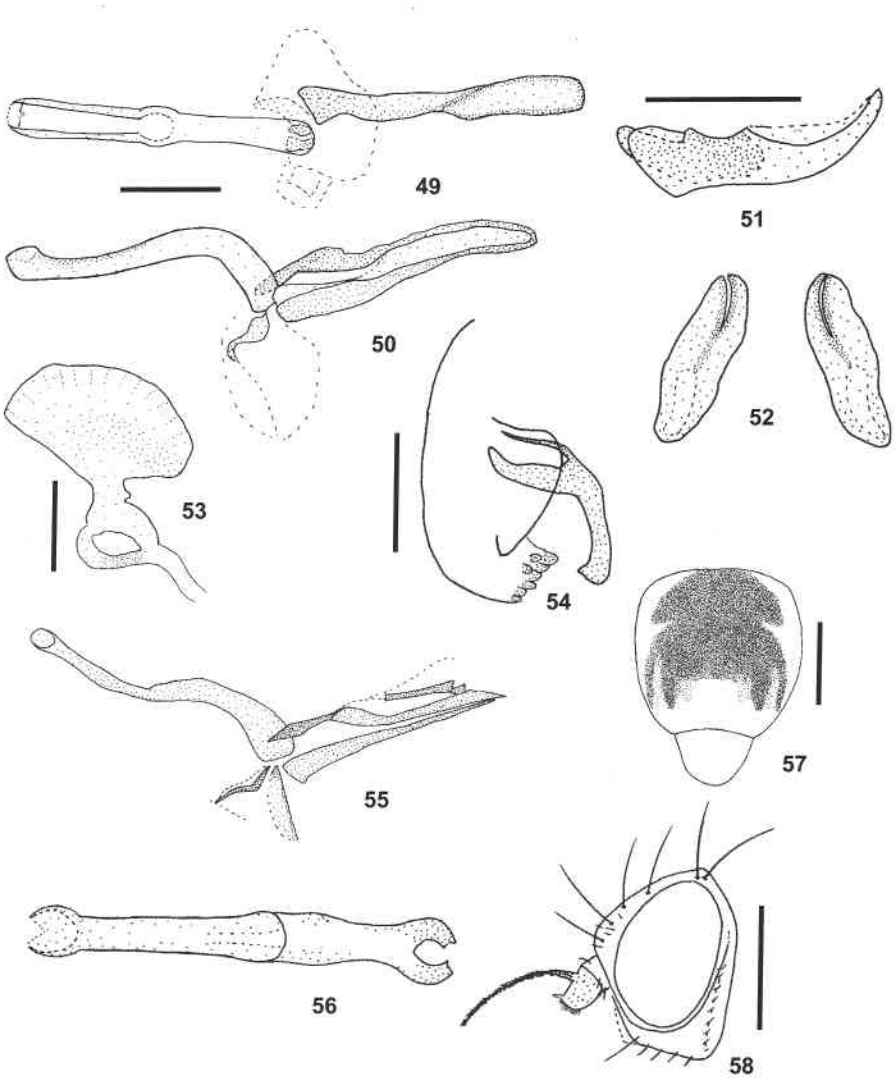
The species name is a noun in apposition derived from the type locality.

Diagnosis

This species can be distinguished from other Nearctic or Palaearctic species in the subgenus by the reduced anterior postsutural dorsocentral bristle, presence of four to five rows of acrostichal setulae, completely dark scutum (except for yellow junction between scutum and scutellum) and the slightly narrowing distiphallus with a sharp bend near the base.

Description

Same as *C. adunca* except for the following features. **Head.** Most similar to *C. trispinata* (Fig. 58); head height 0.63 mm; frons width 0.45 mm; ratio of frons width to eye width 2.1; frons projecting above and in front of eye (below antennae) in profile, forming only narrow ring below eye; apparently three inclinate ori, anterior one a little shorter and one reclinate ors, but orbital bristles damaged on one side; four to five orbital setulae, small, slightly proclinate, present anteriorly only, not past lower ors; gena height 0.21 times eye height; ratio of eye height to eye width 1.35; long axis of eye almost vertical. **Thorax.** One strong presutural and three postsutural dorsocentrals, anterior postsutural 0.5 times length of second postsutural, acrostichal setulae in four to five irregular rows, present on most of scutum as far as posterior dorsocentral; one



FIGURES 49–58. ***Cerodontha toluca*****: phallus, (49) ventral and (50) lateral; (51) postgonite lateral (apex on left); (52) postgonite ventral; (53) sperm pump; (54) subepandrial sclerite (ventral, left).** ***Cerodontha trispinata*****: phallus, (55) lateral and (56) ventral; (57) thorax dorsal; (58) head lateral. Scale bars = 0.1 mm except 0.5 mm for Figs. 57, 58 (Figs. 55, 56 after Spencer 1977).**

postsutural intra-alar, but closer to level of posterior postsutural dorsocentral. Wing length 3.2 mm; last section of CuA_1 equal to length of penultimate. **Male genitalia.** Distiphallus in lateral view only slightly and uniformly narrowing and with distinct bend near base (Fig. 50); in ventral view, distiphallus slightly enlarged near midpoint only, and continuing parallel sided to the end (Fig. 49). **Colour.** Entire head yellow except tip of first flagellomere and spine darker; outer vertical bristle on pale brown background. Scutum completely black except for yellow junction between scutum and scutellum; notopleuron yellow with dark marking on junction between notopleuron and anepisternum; postpronotum yellow with larger brown marking centrally; scutellum

also pale yellow, but lateral sides pale brown; anepisternum dark brown except for posterodorsal side yellow; katepisternum completely dark brown. Fringe of calypter brown. Femora yellow, tibia and tarsi brown.

Comments

The holotype is one of the paratypes of *C. trispinata* (see Comments under *C. trispinata*), but dissection of the genitalia confirmed the status of this species. Although the distiphallus of *C. toluca* is similar to that of *C. trispinata*, there are small but distinct differences.

Cerodontha trispinata Spencer

(Figs. 55–58)

Cerodontha (*Cerodontha*) *trispinata* Spencer, 1977: 245.

Type material

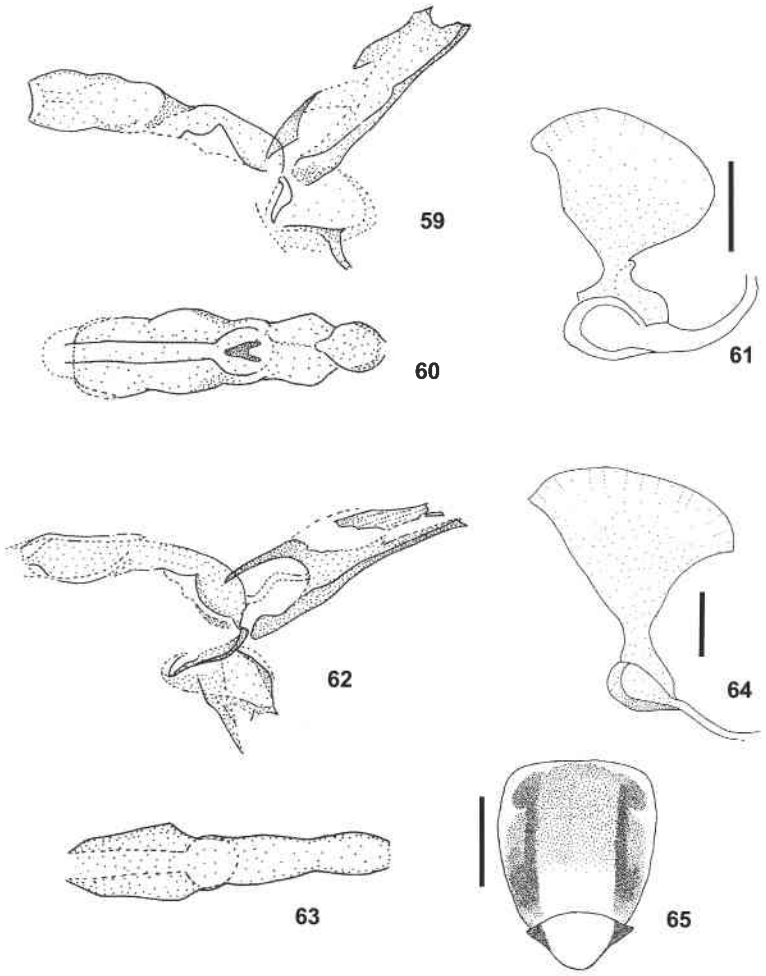
Holotype ♂. **MEXICO. Durango:** 28 mi W Durango, 7500 ft, 8.vi.1964, JF McAlpine (CNC). **Paratypes.** (See Comments.)

Diagnosis

This species can be distinguished from other Nearctic or Palaearctic species in the subgenus by the completely yellow antennae, reduced anterior postsutural dorsocentral bristle, acrostichal setulae in four to five rows, shape of dark pattern on scutum, and the distiphallus narrowing abruptly near the midpoint in lateral view.

Description

Same as *C. adunca* except for the following features. **Head.** Bigger; head height 0.63 mm; frons projecting above and in front of eye in profile, forming only narrow ring below eye (Fig. 58); two inclinate ori, two reclinate ors; anterior ori and ors a little shorter; four to five orbital setulae, small, slightly proclinate, present anteriorly only, not past the lower ors; first flagellomere with short white pubescence, not extending farther than antennal margin, dorsal to the spine; gena height 0.21 times eye height; ratio of eye height to eye width 1.4; long axis of eye almost vertical. **Thorax.** One strong presutural and three postsutural dorsocentrals, anterior postsutural weak, 0.40 times length of second postsutural; acrostichal setulae in four to five irregular rows, almost reaching posterior postsutural dorsocentral; wing length 3.0 mm; second costal sector 5.3 times length of fourth; last section of CuA_1 1.25 times length of penultimate. **Male genitalia.** Distiphallus in lateral view narrowing abruptly near midpoint (Fig. 55); in ventral view distal end with small circular enlargement (Fig. 56). **Colour.** Entire head yellow including antennae. Scutum with a distinctive dark brown pattern, leaving prescutellum area extensively bright yellow (Fig. 57); notopleuron yellow; postpronotum yellow with very small brown marking centrally; scutellum completely shiny pale yellow except for small brown spot on lateroventral sides; anepisternum yellow except for small dark marking ventrally and anteriorly; katepisternum dark brown with large yellow stripe dorsally. Fringe of calypter pale brown. Femora yellow, tibia and tarsi darker yellow.



FIGURES 59–65. *Cerodontha trispinella*: phallus, (59) lateral and (60) ventral; (61) sperm pump. *Cerodontha trispinosa*: phallus, (62) lateral and (63) ventral; (64) sperm pump; (65) thorax dorsal. Scale bars = 0.1 mm except 0.5 mm for Figs. 65 (Figs. 59, 60, 62, 63 after Spencer 1977).

Comments

None of the three male paratypes in the CNC had been dissected by KA Spencer prior to describing the species (Spencer 1977) and each actually belongs to a different species; they have been designated as holotypes of *C. adunca*, *C. inflata*, and *C. toluca*. One additional male paratype in KA Spencer's personal collection (now deposited in the Natural History Museum, London, England) was not examined in this study; it comes from the same locality and has a similar colour pattern as the holotype of *C. trispinata* (see Spencer 1977).

Cerodontha trispinella Spencer

(Figs. 59–61)

Cerodontha (*Cerodontha*) *trispinella* Spencer, 1977: 247.

Type material

Holotype ♂. **MEXICO. Durango:** 30 mi W Durango, 8000 ft, 6.vi.1964, JF McAlpine (CNC).

Diagnosis

This species can be distinguished from other Nearctic or Palaearctic species in the subgenus by the reduced anterior postsutural dorsocentral bristle, acrostichal setulae in about four rows, rectangular yellowish-brown prescutellar area, and the enlarged distiphallus with undulating margins in ventral view.

Description

Same as *C. adunca* except for the following features. **Head.** Bigger; head height 0.71 mm; frons width 0.45 mm; ratio of frons width to eye width 2.1; frons strongly projecting forming distinct ring below eye (similar to *C. adunca*, Fig. 41); two inclinate ori, two reclinate ors; anterior ori and ors a little shorter; distance between upper ori and lower ors as long as distance between upper ors and inner vertical bristle; orbital setulae more numerous, 8–10 proclinate and erect, not as long as *C. adunca* (0.25 time length of posteror ori) present anteriorly mostly except one orbital setulae between ors; gena height 0.30 times eye height; long axis of eye oblique. **Thorax.** Anterior postsutural dorsocentral weak, 0.30 times length of second postsutural; acrostical setulae in about four irregular rows, present mostly anteriorly just past second postsutural dorsocentral; intrapostalar absent. Wing length 3.3 mm; last section of CuA_1 equal to length of penultimate. **Male genitalia.** Distiphallus in lateral view slightly enlarged for half its length (Fig. 59); distiphallus in ventral view with undulating margins (Figs. 60). **Colour.** Entire head yellow except for first flagellomere dark brown (medial surface yellow at base). Scutum dark brown with rectangular yellow prescutellar area, almost reaching second postsutural dorsocentral (but rectangle narrower than in Fig. 65); notopleuron yellow; postpronotum with yellow–brown marking centrally; scutellum shiny pale yellow, with brown lateral sides; anepisternum brown anteroventrally, yellow posterodorsally in about same proportions; katepisternum almost completely brown except for middle part of dorsal margin. Fringe of calypter yellowish-brown. Femora yellow, tibia and tarsi brown.

Cerodontha trispinosa Spencer

(Fig. 62–65)

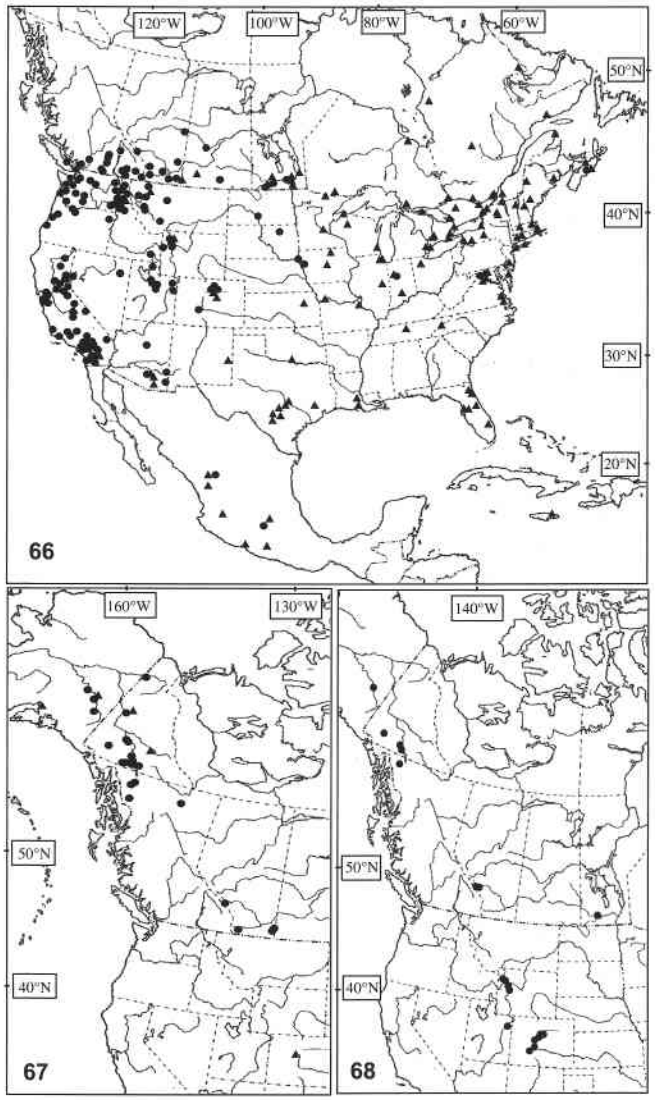
Cerodontha (*Cerodontha*) *trispinosa* Spencer, 1977: 247.

Type material

Holotype ♂. **MEXICO. Durango:** Buenos Aires, 10 mi W of La Ciudad, 9000 ft, 16.vi.1964, JF McAlpine (CNC). **Paratypes.** Same data except 24 mi W of la Ciudad, 7000 ft, 8.vii.1964 (1♀, CNC). One ♀ paratype (same data as holotype) in KA Spencer's personal collection (now deposited in Natural History Museum, London, England).

Diagnosis

This species can be distinguished from other Nearctic or Palaearctic species in the subgenus by having the pleura almost entirely yellow, reduced anterior postsutural



FIGURES 66–68. Geographic distribution of (66) *Cerodontha dorsalis* [dark (●) and pale (▲) forms], (67) *Cerodontha gracilis* (▲) and *Cerodontha occidentalis* (●), and (68) *Cerodontha occidoparva*.

dorsocentral bristle, acrostichal setulae in five to six rows, and by the enlarged distal end of the distiphallus with angular margins in ventral view.

Description

Same as *C. adunca* except for the following features. **Head.** Larger; height 0.72 mm; frons width 0.45 mm; ratio of frons width to eye width 1.85; frons strongly projecting above eye, projection reduced below eye (head shape similar to *C. adunca*, Fig. 41, but ring below eye narrower); orbital bristles strong; three (four on one side in holotype) inclinate ori, anterior ori a little shorter than others, one reclinate ors; 8–10 long orbital setulae, slightly proclinate or erect, present as far as ors; gena height 0.26

times eye height; ratio of eye height to eye width 1.37; long axis of eye oblique. **Thorax.** Anterior postsutural dorsocentral 0.4 times length of second postsutural; acrostichal setulae in five to six irregular rows, reaching midway between second and third postsutural dorsocentrals; intrapostalar absent; wing length 3.2 mm in male (3.6 mm in female); second costal sector 5 times length of fourth (5.6 in female); last section of CuA_1 equal to length of penultimate in male (0.95 times length of penultimate in female). **Male genitalia.** Distiphallus in ventral view distinctly enlarged past midpoint, with angular margins (Fig. 63); in lateral view distiphallus only slightly enlarged (Fig. 62). **Colour.** Head mostly yellow except for anterior part of frons and upper lateral side of first flagellomere yellowish-brown. Scutum with distinctive pattern (Fig. 65): long dark brown stripe on each lateral side of scutum and pale yellow rectangular prescutellar area and darker brown anterior section of scutum (the female is teneral and is paler, with the dark lateral stripes present posteriorly only, not reaching second dorsocentral); notopleuron and postpronotum yellow; scutellum yellow with brown lateral margins; anepisternum yellow; katepisternum yellow (with anterior brown marking in the male). Fringe of calypter yellowish-brown. Femora yellow, tibia and tarsi darker yellow to pale brown.

Comments

In addition to the holotype and paratype examined, there is an additional female paratype in KA Spencer's personal collection (now deposited in Natural History Museum, London, England) (not examined).

Potential diversity in the Mexican fauna of the genus *Cerodontha* (*Cerodontha*)

The Mexican species of the subgenus *Cerodontha* are of particular interest, partly because they are morphologically distinct from most other species in the subgenus and partly because of their apparent diversity. Spencer (1977) described three species from high elevations in the Sierra Madre Occidental. These species all have acrostichal setulae in four to six rows, the anterior postsutural dorsocentral bristle much reduced, the distal tubules of the phallus fused, and sometimes the distiphallus is enlarged. Other species in the subgenus with fused distal tubules include *C. angustipennis* Harrison from New Zealand (Spencer 1976*b*), species in the *affinis* group from Europe (Nowakowski 1973), and three species from Chile [*C. chilensis* Spencer, *C. magellani* Spencer, and *C. patagonica* Spencer (all three species with distiphallus fused at apex only) (Spencer 1982)]. Species in the closely related subgenus *Xenophytomyza* also have the distal tubules of the phallus fused or partly fused. This fusion is apparently subject to homoplasy in subgenus *Cerodontha* and other subgenera.

The diversity of the Mexican species is apparently much higher than previously believed. Spencer's three species were based on a total of nine specimens; however, after dissection of male genitalia, three new species were found among Spencer's paratypes. This doubles the number of known Mexican species to six, all from a few localities near Durango. Further collecting in these Mexican mountains will almost certainly increase the number of *Cerodontha* (*Cerodontha*) species known from the region. High elevations in the southern Nearctic and northern Neotropics should be a priority area for future collecting.

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