The Systematics and Biology of the Flea Beetle Genus Crepidodera Chevrolat (Coleoptera: Chrysomelidae) in America North of Mexico

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INTRODUCTION*

Crepidodera Chevrolat is a genus of small metallic-coloured flea beetles belonging to the family Chrysomelidae. Although these insects are quite common in the field and numerous in museum collections, the members of the genus in North America are, until now, poorly known. Heikertinger (1948-1950) recognized 4 taxa and recently, Lazorko (1974) described 3 additional species. These 7 species were recognized primarily on the basis of genital differences and were otherwise difficult to identify.

Examination of a large accumulation of museum material and investigations in the field have indicated the presence of several additional species in the North American fauna. A detailed study of external characters, male genitalia and female spermathecae has revealed, in material previously referred to the Palaearctic species, C. **fulvicornis** (F.), a complex of closely related species.

Essentially nothing was known about the biology of the North American species. General information on host plants was available and the general seasonal occurrence and habits of adults were described by Loan (1967b). However, the immature stages and life histories of all members of the genus were unknown. This has now been remedied with the discovery, during the course of this study, of the larvae of two species.

The main purpose of this paper, therefore, is to consolidate the existing information on the genus in North America, describe 8 new species, redefine the previously described species, provide a key and illustrations to aid in their identification, and to describe the immature stages for 2 species. A discussion of the host plant relationships and the general life history of members of the genus is also presented.

BIOLOGY

Members of the genus **Crepidodera** in both North America and the Palaearctic Region have been well known to feed as adults on the leaves of various species of willow **(Salix)**, poplar **(Populus)** and, in North America, on certain members of the Family Rosaceae such as hawthorn **(Crataegus)**, wild cherry, wild plum **(Prunus** spp.) and apple **(Pyrus)**. The most comprehensive source of information on the biology of the European species is Heikertinger (1925) who listed, for each of five species, the known food plants, the type of habitat in which it is found, the seasonal occurrence and, in a few cases, provided brief notes on adult feeding habits and time of oviposition. None of the species of **Crepidodera** are definitely known to be monophagous, i.e. restricted to one species of plant. Most appear to be oligophagous, feeding on a few species of a single genus or, in some cases, on plants of two or three genera.

Some of these species are further restricted within a host genus to a single host or a "compact group of host species" (Allen, 1972). For example, C. **plutus** is restricted to narrow-leafed tree willows such as **Salix alba** and **S. fragilis.** In contrast, C. **fulvicornis, C. lamina** Bedel and **C. aurea** (when it feeds on **Salix)** strongly favour low-growing shrubby broad-leafed willows (sallows) such as **Salix caprea** L. The main species of **Populus** reported to be hosts of Palaearctic **Crepidodera** are **P. alba** L., **P. nigra** L. and **P. tremula** L. **Crepidodera aurata** apparently occurs on all three of these (Heikertinger, 1925, 1948-1950) with no preference indicated. **Crepidodera aurea, C. lamina** and **C. nitidula** have been recorded from both **P. tremula** and **P.**

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nigra but are most common on **P. tremula** (Heikertinger, 1925), while **C. gemmata**, however, is known to occur only on **P. alba.**

A similar situation seems to exist with regard to the host plant relationships of the North American species of **Crepidodera.** The known and probable host plants of the genus in North America are listed in Table 1.

At least one-half of the North American species appear to be restricted entirely to **Salix** spp. These include longula, **spenceri, browni, opulenta, luminosa, bella, aereola** and **sculpturata.** Three of these are recorded only from Salix **and the remainder** each have only a few other host records which are either so unlikely or so few as to be almost certainly adventitious.

Two species may be either restricted to or mainly confined to **Populus** spp. **Crepidodera vaga** is known only from Populus **deltoides.** However, this record comes only from a single series of specimens taken in the same locality on the same date. The majority (76%) of the host plant records for **C. populivora** are Populus **spp., but 18%** of the records are from **Salix** spp. It is possible that C. **populivora** utilizes both **Populus** and Salix **although strongly** preferring Populus. **In field studies,** however, populivora **was rarely found** on **Salix,** even in habitats where it was abundant on Populus, **and seemed to be** restricted to the latter group of plants.

Five species **(solita, decora, heikertingeri, digna** and **nana)** have been taken in considerable numbers on both **Salix** and **Populus,** but in all of these, 90% or more of the host records are **Salix** spp. Therefore, if they do feed on both genera of plants, they all show a very strong preference for **Salix** spp. Only one of these species, **solita,** was actually observed to feed on leaves of **Populus.** This occurred in the laboratory.

LIFE HISTORY

Species of **Crepidodera** overwintering as adults, do so generally in the surface litter below their host plants (Loan, 1967b). North American specimens have been recorded during winter months in different parts of the range overwintering in leaves, grasses, rotting wood, and "trash". A number of adults of 3 different species have been found overwintering in the lichen, **Usnea plicata** (Old Man's Beard), growing on oak trees in Oregon.

Overwintered adults emerge early in the season and are found on their host plants soon after the leaves appear. At this time, if warm temperatures prevail, the flea beetles are quite active and abundant. They begin feeding on the leaves of the host and, shortly after, commence mating. Adults feed on either the upper or lower surfaces of leaves. Feeding damage is of a type typical of flea beetles in general. The beetles produce small holes or pits in the leaf by eating through the epidermis and underlying tissues, leaving the opposite epidermal layer intact. The tissue below the injury eventually dries up and falls out, giving a shot-hole appearance. The pits are irregular in outline and range from about 1 to 3 mm in diameter. Occasionally, larger pits run together to form larger areas of damage.

In the Ottawa area, mating occurs during a period of close to 2 months, from the latter half of May through the early part of July. Copulation takes place usually on the leaves or branches of the host shrubs or trees. The male mounts the female from the rear and, clinging to her posterior dorsum, extends the curved aedeagus down and forward into the female's vagina at the tip of the abdomen.

Loan (1967b) reported that females of **Crepidodera** collected on **Salix** near Belleville, Ontario were nongravid in early May and that nearly all females were gravid by mid-June. He also found that the proportion of gravid females decreased from early July to about mid August as old females died from senescence or parasitism and new ones emerged from the soil. In the present study, eggs were produced in the laboratory by field-collected females of **C. heikertingeri** (Lazorko) from late May until August 25. Oviposition in the field has not been observed in **Crepidodera** but it seems probable that eggs are placed in the soil or litter beneath the host plant.

Immature stages of **Crepidodera** are known only for 2 species, **C. solita** n. sp. and **C. heikertingeri** (Lazorko) and are described for the first time in the species descriptions.

Eggs of the two species observed had an incubation period ranging from 10 to 16 days in the laboratory at 22-24°C. The first instar larva emerges through a slit across the apex of the egg. The larvae resemble the root-feeding larvae of other genera such as **Epitrix** Foudras and **Phyllotreta** Stephens. They are long, slender and

subcylindrical in shape and whitish in colour except for the head, prothorax and 9th abdominal tergum (anal plate) which are brown. There are 3 larval instars, all of which occur below the soil surface.

At least the first and second instar larvae feed by mining inside the smallest tender roots of the host plant. Mines extend along the roots beneath the epidermis and the larvae consume the tissues of the cortex and the soft tissues surrounding the vascular bundle. This is the first record of root-mining, particularly of woody plants, in the Alticinae. Larvae of other genera of flea beetles also feed on the roots of their host (usually an herbaceous plant), but in a different manner. For example, the larvae of **Hornaltica atriventris** (Melsh.) occur in the soil around the plant roots and feed on the small rootlets, often cutting them off (Balduf, 1926). Similarly, the larvae of some species of **Phyllotreta** feed on the root hairs or small tap roots of plants, occasionally tunnelling into the stem near the juncture of stem and roots (Chittenden and Marsh, 1920; Westdal and Romanow, 1972). **Epitrix cucumeris** (Harris), a member of a genus closely related to **Crepidodera**, feeds during the larval stages on potatoes, making surface tracks or tunnels in the tubers (Jones, 1944). Full grown larvae of this species have been found feeding with the head in the potato tuber and the rest of the body supported by the soil (Anderson and Walker, 1934). This type of feeding does not seem to occur in **Crepidodera**. Since exuviae are found inside mines, it appears likely that larvae remain inside the roots, perhaps occasionally leaving an old mine to start a new one in another root. The mining behavior may be an adaptation to avoid the wet soil conditions in which the host willows grow and which are often prevalent well into the summer. It is probable that mature third instar lavae leave the mines to pupate in the soil.

The durations of each larval instar and the pupal stage are not known. In laboratory rearing of 2 species, the first new adults emerged within 48 to 50 days (7 weeks) after old adults had been confined in cages. Allowing for the incubation time of eggs, the larval and pupal stages require, perhaps, 32 to 40 days for development. The above time periods are very similar to the development times observed in species of other flea beetle genera by Chittenden and Marsh (1920), Jones (1944) and Westdal and Romanow (1972).

There is only one generation per year in Ontario. New-generation adults have been found near the beginning of August in both laboratory rearing (present study) and in the field (Loan, 1967b). The population of new adults increases during August and remains on the host plants until the onset of cold weather or until the leaves have fallen in late October.

SYSTEMATICS

Genus **Crepidodera** Chevrolat 1.

Crepidodera Chevrolat 1837, p. 415; 1844 p. 334; Stephens 1839, p. 294; Kuster 1847-1848, VIII p. 94, IX p. 83-87, XV p. 91-93; Kutschera 1860, p. 68; Allard 1860, p. 47; 1866a, p. 178; Thomson 1866, p. 215; Crotch 1873, p. 57, 71; Redtenbacher 1874, p. 496; Harold 1875, p. 3, 33; Chapuis 1875, p. 52, 53; Seidlitz 1875, p. 494; Leesberg 1881, p. 173; 1882, p. 137; Jacoby 1885, p. 342; 1891, p. 283; Horn 1889, p. 236, 238, 316; Fowler 1890, p. 334, 379; Blatchley 1910, p. 1206, 1212; Duckett 1920, p. 116, 148; Leng 1920, p. 300 (in part); Maulik 1926, p. 175, 234 (designation of type species); Hincks 1952, p. 113, 114; Gressitt and Kimoto 1963, p. 744, 773; Hatch 1971, p. 219; Balsbaugh and Hays 1972, p. 123, 155; Samuelson 1973, p. 13, 112.

Chalcoides Foudras 1859 (1860), p. 147; 1860a, p. 56; 1860b, p. 35, 312; Weise 1886, p. 676, 713; 1888-1891 (1891), p. 800; Bedel 1889-1901 (1897), p. 168, 176; 1900, p. 289; Heikertinger 1911, p. 8-11, 19; 1924-1925, p. 43, 52, 67, 69; 1948-1950, p. 34, 106-116, 133, 135; Schaufuss 1907-1916 (1913), p. 981, 985; Leng 1920, p. 300; Schaeffer 1924, p. 145; Chittenden 1925, p. 120; Beller and Hatch 1932, p. 106, 128; Schaeffer 1932, p. 243; Rapp 1934, p. 395; Heikertinger and Csiki 1939, p. 313-325; Wilcox 1954, p. 436, 454; Dillon and Dillon 1961, p. 712; Chagnon et Robert 1962, p. 317; Mohr 1966, p. 247; Lazorko 1974, p. 146-154.

Foudrasia des Grozis 1882, p. 134 (new name for **Chalcoides** Foudras).

1. For additional references see Heikertinger and Csiki, 1939.

Type Species: Chrysomela nitidula L., designated by Maulik 1926, p. 234.

DIAGNOSIS: shape broadly oval and slightly elongate to elongate-oval, moderately convex; dorsum shining metallic with pronotum and elytra essentially unicolorous; pronotum generally strongly punctate and with a distinct prebasal transverse impression limited on each side by a sharp longitudinal impression extending from base; space between transverse groove and base not

TABLE 1. Known and probable host plants of North American **Crepidodera** spp.

(* indicates species records suspected to be adventitious)

Host Plant	Habitat	**Crepidodera** spp. Recorded
Family Rosaceae		
Crataegus L.	disturbed sites, thickets along streams	***nana**, ***populivora**, **violacea**
Prunus americana Marsh.	moist woods, roadsides, fence-rows	***browni**, ***nana**, **violacea**
P. angustifolia Marsh.	sandy or sterile soil, open woods, thickets, fence-rows	**violacea**
P. pensylvanica L.	dry or moist woods and forest clearings	**violacea**
P. persica (L.) Patsch	introduced	***browni**, ***nana**, **violacea**
P. serotina Ehrh.	roadsides, waste land, forest margins	***browni**, **violacea**
P. virginiana L.	rich moist soils, fence-rows, streams, forest margins	**violacea**
? **Pyrus** L.	in cultivation	**violacea**
Family Salicaceae		
Populus balsamifera L. (=**P. tacamahacca** Mill.)	wet woods, river banks, lake shores	***decora**, ***digna**, ***nana**, **populivora**, ***solita**
P. deltoides Marsh. (=**P. virginiana** Fourg.)	low woods and moist prairies	***nana**, ***solita**, **vaga**
P. grandidentata Michx.	dry woods, slopes, recent burns	**populivora**, ***solita**
P. tremuloides Michx.	dry or moist soil, dry open woods, recent	***decora**, ***digna**, ***heikertingeri**, **populivora**, ***solita**, ***spenceri**
P. trichocarpa Torr. & Gray	low-lying damp areas, sandy or gravelly soils	***heikertingeri**, **populivora**
Salix alba L.	introduced, escaped along rivers	**solita**

Host Plant	Habitat	**Crepidodera** spp. Recorded
S. alba x **fragilis** (hybrid)	low areas, river banks	**decora, heikertingeri, solita**
S. bebbiana Sarg.	moist or wet places	**decora, heikertingeri**
S. cordata Michx.	sandy and alluvial shores	**sculpturata, solita**
S. discolor Muhl.	swamps and wet ground	**decora, heikertingeri, *populivora, solita**
S. exigua Nutt.	sandbars, streambanks	**nana, sculpturata**
S. fragilis L.	introduced, escaped in low areas, along river banks, lake shores	**browni, decora, heikertingeri, nana, solita, *populivora,**
S. humilis Marsh. (=**S. tristis** Ait.)	dry, often sandy uplands, roadsides	**nana**
S. interior Rowlee	sandbars, mudbars, moist alluvial soil	**nana, solita**
S. lasiolepis Benth.	along rocky streams at lower elevations (S. B.C. to Baja California) and arroyos	**aereola**
S. lucida Muhl.	moist low ground, swamps, bogs, wet meadows	**decora, digna, heikertingeri, nana, *populivora**
S. melanopsis Nutt.	stream banks	**sculpturata**
S. nigra Marsh.	alluvial soils along streams, and in meadows	**nana, solita**
S. patula		**nana**
S. petiolaris Smith (=**S. gracilis** Anderss.)	moist meadows, streambanks, lake shores, bogs	**decora, digna, heikertingeri, nana, *populivora, sculpturata, solita**

Host Plant	Habitat	**Crepidodera** spp. Recorded
S. purpurea L.	introduced, escaped along river banks, lake shores, roadsides	**nana**
S. pyrifolia Anderss.	moist to wet or swampy ground, bogs	**digna**
S. repens L.	introduced from Europe (arboretum)	**nana**
S. sericea Marsh.	moist rocky ground, often near running water	**nana**

Key to the United States and Canadian Species of **Crepidodera** Chevrolat

1. Colour entirely reddish-yellow to light reddish-brown except sutural region of elytra darker and with a faint greenish reflection as in head and pronotum; east-central United States; on **Salix** ..... 1 **longula** Horn
   Colour of dorsal surface metallic green, brassy-green, coppery, bronze, blue, violet, purplish, black or a combination of some of these colours; ventral surface black 2
2. Dorsal surface violet or dark purple, dark blue, blue-green, greenish, all with violet reflections; pronotal ante-basal transverse impression shallow, feebly pronounced (Fig. 1); pronotal disc with major punctures fine to moderate in size (Fig. 1); eastern United States and Canada; on **Prunus** or **Crataegus** .... 2 **violacea** Melsheimer
   Dorsal surface not violet and without violet reflections; pronotal ante-basal transverse impression deeper, strongly pronounced (as in Figs. 2, 3, 4); pronotal disc with major punctures moderate to coarse in size 3
3. Elytral disc strongly, distinctly depressed behind basal one-quarter (Figs. 5, 6); vertex of head along anterior edge of pronotum strongly, distinctly punctate (Fig. 2); southeastern United States; on **Salix** ..... 13 **bella** n. sp.
   Elytral disc at most only feebly depressed behind basal one-quarter (Fig. 7); vertex of head along anterior edge of pronotum smooth, occasionally with a few scattered fine punctures (as in Figs. 3, 4)..... 4
4. Elytron at declivity bulging laterally, overhanging and hiding part of lateral margin (Fig. 8); dorsal surface metallic green, brassy-green, coppery-green, pure coppery, coppery-bronze or dark bronze; southern Ontario and eastern United states; on **Salix** ..... 6 **browni** n. sp.
   Elytron at declivity evenly rounded, not overhanging lateral margin (as in Fig. 9) or, if slightly bulging, dorsal surface not coloured as above or range differing from above 5
5. Median setae of first abdominal sternum in both sexes short, sparse and inconspicuous (as in Fig. 16); major punctures of pronotum dense, very uniformly distributed, moderate to slightly coarse in size; elytral margins very narrow in dorsal view; dorsal surface black; California to British Columbia, Montana and Utah. ..... 3 **spenceri** (Lazorko)
   Median setae of first abdominal sternum in males longer and more conspicuous than in females (as in Fig. 11) or, in females, usually moderately dense; major punctures of pronotum sparse to dense, irregularly distributed, moderate to very coarse in size; elytral margins narrow or relatively broad in dorsal view; colour of dorsal surface variable 6
6. Major pronotal punctures very coarse, equal to or greater than size of basal serial punctures of elytra, closely placed (Fig. 3); anterior pronotal angles strongly,

acutely produced laterally (Fig. 3); median setae of first abdominal sternum in males uniformly dense, not forming a brush; California to Washington, Wyoming and Utah ..... 14 **aereola** (LeConte)

Major pronotal punctures moderate to coarse, less or not greater than size of basal serial punctures of elytra, sparse to closely placed; anterior pronotal angles feebly produced; median setae of first abdominal sternum in males variable, uniformly dense or denser apically forming a brush 7

7. Middle and hind trochanters each with a distinct posterior marginal brush of setae (as in Figs. 13, 15); metasternum medially almost entirely covered with setae almost as long and conspicuous as those of first abdominal sternum which is, especially in males, conspicuously hirsute from base to apex; dorsal surface dark bronze, dark greenish, purplish or black 8

Middle and hind trochanters with a few inconspicuous setae as in adjacent parts of femora; metasternum inconspicuously to conspicuously setose medially but glabrous near midline in posterior two-thirds (as in Figs. 14, 16) 9

8. Elytral margins strongly broadened in dorsal view (Fig. 9); male with median setae of first abdominal sternum slightly denser apically, forming a loose, poorly-defined brush (Fig. 15); major pronotal punctures dense, coarse in size; dorsal surface dark bronze, purplish or greenish ..... 10 **heikertingeri** (Lazorko)

Elytral margins moderately broad in dorsal view; male with median setae of first abdominal sternum not forming a brush (Fig. 13); major pronotal punctures sparse, moderate in size; dorsal surface black..... 11. **digna** n. sp.

9. Apical margin of last abdominal sternum emarginate, with an inflected median lobe (Fig. 11) ..... (males) 10

Apical margin of last abdominal sternum rounded or almost truncate, without a median lobe (Fig. 12) ..... (females) 20

MALES

10. Median pubescence of first abdominal sternum not or barely denser apically, not forming a brush (Fig. 11) 11

Median pubescence of first abdominal sternum denser apically forming a distinct brush near hind margin. (Fig. 14) 13

11. Shape oval, slightly elongate; dorsum dark purple to black, rarely blue or blue-green; on **Populus** ..... 12 **populivora** n. sp.

Shape elongate; dorsum bright green, blue-green, brassy-green, coppery-green, pure coppery to dark bronze; on **Salix** 12

12. Pronotum appearing strongly convex or slightly swollen anteriorly (Fig. 4); elytral margins narrow in dorsal view; median lobe of genitalia evenly arcuate in lateral view (Fig. 31) ..... 15 **sculpturata** (Lazorko)

Pronotum moderately convex, not appearing swollen anteriorly (as in Figs. 1, 2, 3); elytral margins narrow to moderately broad in dorsal view; median lobe of genitalia in lateral view, bent at basal one-third, straight in apical two-thirds (Fig. 32) ..... 16 **nana** (Say) (in part)

13. Colour of dorsum dark bronze or coppery bronze to purplish 14

Colour of dorsum bright green, blue-green, brassy-green, bronze-green or coppery-green 17

14. Elytral margins moderately to strongly broadened in dorsal view (as in Fig. 9); brush of setae on first abdominal sternum very distinct, well-defined (Fig. 14) ..... 4 **solita** n. sp.

Elytral margins narrow in dorsal view (as in Fig. 10); brush of setae on first abdominal sternum distinct, well-defined or poorly developed to obsolete 15

15. Median lobe of genitalia, in lateral view, bent at basal one-third, straight in apical two-thirds (Fig. 32) .....16 **nana** (Say) (in part)

Median lobe of genitalia, in lateral view, evenly arcuate 16

16. Median lobe of genitalia, in dorsal view, strongly narrowed in apical one-third (Fig. 25) .....9 **vaga** n. sp.

Median lobe of genitalia, in dorsal view, of almost even thickness or only slightly tapered in apical two-thirds (Fig. 23) ..... 7 **opulenta** (LeConte) (in part)

17. Median lobe of genitalia, in lateral view, bent at basal one-third, straight in apical two-thirds (Fig. 32) ..... 16 **nana** (Say) (in part)

Median lobe of genitalia, in lateral view, evenly arcuate 18

18. Range in southwestern United States; elytral margins narrow in dorsal view (as in Fig. 10) ..... 7 **opulenta** (LeConte) (in part)
Range in eastern United States and Canada; elytral margins narrow to moderately broad in dorsal view 19
19. Elytral margins moderately broad in dorsal view; major pronotal punctures sparse to moderately dense; ventral side of median lobe of genitalia without distinct longitudinal impressions at middle (Fig. 21) ... . 5 **decora** n. sp.
Elytral margins relatively narrow in dorsal view; major pronotal punctures dense; ventral side of median lobe of genitalia with a distinct longitudinal impression on each side at middle. (Fig. 24) ..... 8 **luminosa** n. sp.

FEMALES

20. Dorsal surface dark bronze, coppery-bronze, dark blue, dark purple to black 21
Dorsal surface green, blue-green, brassy-green, bronze-green or coppery-green 25
21. Elytral margins moderately to strongly broadened in dorsal view (as in Fig. 9); first abdominal sternum with a median patch of very crowded setiferous punctures near hind margin (as in Fig. 16) ..... 4 **solita** n. sp.
Elytral margins narrow in dorsal view; first abdominal sternum with setiferous punctures uniformly placed or only slightly crowded medially near hind margin. 22
22. First abdominal sternum with setiferous punctures uniformly distributed medially, not more crowded near hind margin; shape more broadly oval; dorsal surface dark purple to black; on **Populus** spp ..... 12 **populivora** n. sp.
First abdominal sternum with a median patch of slightly crowded punctures near hind margin; shape elongate-oval 23
23. Range in Arizona, California and Utah ..... 7 **opulenta** (LeConte) (in part)
Range other than above 24
24. Spermatheca with receptacle oval in shape (Fig. 45) ..... 9 **vaga** n. sp.
Spermatheca with receptacle globular (Fig. 52) ..... 16 **nana** (Say) (in part)
25. Elytral margins moderately broad in dorsal view (as in Fig. 9) 26
Elytral margins narrow in dorsal view (as in Fig. 10) 28
26. Elytral margin at declivity strongly rounded to apex; dorsal surface green to blue-green ..... 5 **decora** n. sp.
Elytral margin at declivity more gradually rounded to apex 27
27. Spermatheca (Fig. 44) with receptacle elongate-oval in shape..... ..... 8 **luminosa** n. sp. (in part)
Spermatheca (Fig. 52) with receptacle globular in shape..... ..... 16 **nana** (Say) (in part)
28. Pronotum appearing slightly swollen or more convex anteriorly (as in Fig. 4); shape more elongate ..... 15 **sculpturata** (Lazorko)
Pronotum not swollen or more convex anteriorly (as in Figs. 1,2,3); shape elongate-oval 29
29. Range east of Great Lakes and Mississippi River ..... 8 **luminosa** n. sp. (in part)
Range west of Great Lakes and Mississippi River 30
30. Range in Arizona, California and Utah ..... 7 **opulenta** (LeConte) (in part)
Range east and north of above ..... 16 **nana** (Say) (in part)

swollen, almost flat; elytra glabrous, regularly punctate-striate; procoxal cavities closed behind; hind tarsi with apical segment not globular; tarsal claws appendiculate; head with frontal tubercles elongate, oblique, convex, sharply delimited dorsally by distinct furrows; surface between frontal tubercle and margin of eye conspicuously, moderately punctate.

1. **Crepidodera longula** Horn
Figs. 17, 37; Map 1.

Crepidodera longula Horn 1889, p. 240, 316 (type locality, near McPherson, Kansas); Henshaw 1895, p. 28; Blatchley 1910, p. 1213; Leng 1920, p. 300; Heikertinger 1924-1925, p. 65; Douglass 1929, p. 31; Balsbaugh and Hays 1972, p. 156.

Chalcoides longula (Horn); Schaeffer 1932, p. 243; Heikertinger and Csiki 1939, p. 324; Heikertinger 1948-1950, p. 115, 136; Wilcox 1954, p. 455; Lazorko 1974, p. 146, 152, 153.

TYPE MATERIAL. Lectotype, here designated: male, with labels "Ks"/"Lectotype 3836"/"Lectotype, **Crepidodera longula** Horn, ♂, R.H. Parry, 1976". This specimen is in the Horn Collection, Museum of Comparative Zoology, Harvard University. The lectotype is accompanied by one female and two male specimens, each with the label "Ks" and a blue "Paratype" label with the numbers 3836.2, 3836.3 and 3836.4 respectively. Paratype 3836.4 has the head missing.

In addition, the LeConte Collection, M.C.Z., contains a single specimen of this species labelled "Ks". This probably belongs to the type series.

DIAGNOSIS: reddish-yellow to reddish-brown; setae on first abdominal sternum short and inconspicuous (both sexes).

MATERIAL EXAMINED: 35 specimens. UNITED STATES: Illinois, Indiana, Kansas, Kentucky, Missouri, Texas. (see Map 1).

REMARKS. Variation in the specimens examined is slight. The size and spacing of the larger pronotal punctures varies among specimens, some having them rather small and sparse and others having coarser, more closely placed punctures, giving the disc a slight rugose appearance. The median lobe in specimens from Texas is slightly more narrowly rounded at the tip than in Fig. 17.

2. **Crepidodera violacea** Melsheimer
Figs. 1, 18, 38; Map 2.

Crepidodera violacea Melsheimer 1847, p. 164 (type locality, Pennsylvania); Balsbaugh and Hays 1972, p. 155.

Crepidodera helxines (L.); Crotch (misidentification) 1873, p. 71 (in part); Hamilton 1889, p. 149; Horn 1889, p. 316; Hamilton 1894, p. 399; Duckett 1920, p. 149.

Chalcoides helxines (L.); Leng (misidentification) 1920, p. 300 (in part); Beller and Hatch 1932, p. 128, 129 (ab. **violacea**).

Chalcoides helxines violacea (Melsh.); Schaeffer 1924, p. 145.

Chalcoides fulvicornis violacea (Melsh.); Chittenden 1925, p. 120.

Chalcoides fulvicornis (Fabr.); Heikertinger and Csiki (misidentification) 1939, p. 320 (ab. **violacea** Melsh.), (in part).

Chalcoides violacea (Melsh.); Heikertinger 1948-1950, p. 110 (fig.), 116, 136; Wilcox 1954, p. 455; Lazorko 1974, p. 146, 150, 152, 153.

Crepidodera nana (Say); Hatch 1971, p. 219 (ab. **violacea** Melsh.), (in part).

TYPE MATERIAL. Lectotype, here designated, male, with the labels "Pennsylvania, Melsheimer"/"Lectotype, **Crepidodera violacea** Melsh., ♂, R.H. Parry, 1976". This specimen is in the Melsheimer-Ziegler Collection, Museum of Comparative Zoology, Harvard University.

The lectotype is the tenth in a series of 12 specimens. The first specimen in the series, a female, has a piece of red paper on the pin but bears only the label "Melsh". Therefore, it seems appropriate to select as lectotype the above male with a label denoting the type locality. The lectotype fits Melsheimer's description except that the antennae, palpi and tarsi are rufotestaceous rather than yellow-testaceous, the sides of the pronotum are moderately rounded rather than feebly rounded, and the length is 2.6 mm rather than 1.1 mm. Another female specimen, besides the female mentioned above, bears only the label "Melsh". Four specimens besides the lectotype bear the label "Pennsylvania, Melsheimer". A single male is labelled "Pa, Ziegler" and 4 specimens on one pin are labelled only "Ziegler".

In addition to the type series, 6 specimens of **violacea** labelled only "Melsh." occur in the Melsheimer-Ziegler Collection but do not seem to be placed under any name. A single female specimen of **violacea** labelled "Melsh." is found under the name **Caeporis nana** and 2 specimens, a male labelled "Pennsylvania, Melsheimer" and a specimen (sex undetermined) labelled "Pennsylvania, Ziegler" occur under the name **Crepidodera helxines.**

DIAGNOSIS: dorsal surface violet to dark blue; pronotum with generally fine punctation; pronotal transverse groove feebly impressed (less strongly pronounced than in other species); setae of the first abdominal sternum in the male short, inconspicuous (both sexes).

MATERIAL EXAMINED: 1100 specimens. CANADA: Ontario, Quebec. UNITED STATES: Colorado, Connecticut, District of Columbia, Florida, Illinois, Indiana, Iowa, Kansas, Maine, Maryland, Massachusetts, Michigan, Missouri, Nebraska, New Hampshire, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Vermont, Virginia, West Virginia. (see Map 2).

REMARKS. Variation in **C. violacea** was pointed out by Melsheimer (1847) in the original description. He described, in addition to his "type", 3 varieties of which 2 are based on slight colour differences and

differences in the punctation and smoothness of the pronotum. His third variety (Var c) differs mainly in being "brilliant brassy" and in having the elytra "indented behind the base towards the suture". These characters lead me to suspect that this "variety" is probably a different species, although I found no examples of it with the type material in the Melsheimer-Ziegler Collection.

The specimens examined show some variation in colour. The majority have the dorsal surface either entirely violaceous or dark blue to blue-green with violet reflections. Others have the pronotum and elytra differing in shade, the elytra violaceous or blue to blue-green with violet reflections and the pronotum more greenish, or vice versa. A few specimens are blue-green, dark green or slightly brassy-green above with no trace of violet. Variation in the median lobe is slight. Some specimens are not as strongly broadened apically as in Fig. 18 and have the tip slightly more narrowly rounded.

3. **Crepidodera spenceri** (Lazorko) new combination
Figs. 19, 39; Map 3.

Chalcoides spenceri Lazorko 1974, p. 147, 148 (fig.), 150, 151, 153 (type locality, Vancouver, British Columbia).

TYPE MATERIAL. Holotype: Male, Vancouver, British Columbia, U.B.C. Endow. Lands, on **Salix** sp., June 10, 1953, W. Lazorko (W. Lazorko Coll.). Allotype: Female, same data as holotype (W. Lazorko Coll.). Paratypes: 5 males, 5 females, Vancouver, British Columbia, U.B.C. Endow. Lands and Shaughnessy Hosp. Lands, W. Lazorko (W. Lazorko Coll.; 1 female, L.G. Gentner Coll.).

No type material was seen. The name is applied on the basis of the original description and a single female topotype bearing Lazorko's determination label.

DIAGNOSIS: anterior pronotal angles very prominent; disc with dense, rather uniform punctation; dorsal surface black; pronotal transverse groove strongly impressed; the elytral margins very narrow; first abdominal sternum with setae short, sparse and inconspicuous (in both sexes).

MATERIAL EXAMINED: 329 specimens. CANADA: British Columbia. UNITED STATES: California, Montana, Nevada, Oregon, Utah, Washington. (see Map 3).

REMARKS. There is some variation in the colour pattern of the antennae and legs in this species. The antennae typically have the distal one-half to two-thirds darker than the basal segments, becoming piceous or almost black apically. A number of specimens, however, have the more distal segments scarcely or no darker than the basal ones. Rarely, the antenna is entirely dark except for the basal two or three segments. The hind femora are typically entirely piceous but in some specimens, especially many from California, they are partially light to dark reddish-brown or entirely the same colour as the remainder of the legs.

In the majority of specimens, the pronotal punctation is (as described by Lazorko, 1974) moderately strong, dense and quite uniform. Very few specimens have the pronotum more finely and sparsely punctate giving the disc a smoother appearance while a number of specimens have coarser, virtually contiguous punctures making the disc appear somewhat rugose.

4. **Crepidodera solita** new species
Figs. 14, 20, 40; Map 4

DIAGNOSIS: dorsal surface dark bronze to coppery-bronze with margins greenish; shape elongate-oval; major pronotal punctures moderate to coarse in size; elytral declivity evenly rounded; elytral disc at most only very feebly depressed behind basal one-quarter; lateral margins of elytra moderately to strongly broadened in dorsal view, visible for their entire length; metasternum glabrous near midline in posterior two-thirds; males with pubescence of first abdominal sternum longer and more conspicuous than in females, denser apically forming a distinct, sharply-defined median brush near hind margin (Fig. 14); middle and hind trochanters without a distinct brush of setae.

MALE. Holotype: length 2.4 mm, greatest width 1.2 mm. Shape elongate-oval; length equal to twice the width. Dorsum shining, metallic; vertex of head dark bronze-green; pronotum and elytra dark bronze with green reflections at margins; head below vertex dark green to blue-green; scutellum piceous. Antennae and legs testaceous. Ventral surface shining black.

Vertex of head along anterior edge of pronotum smooth, very finely punctulate. Pronotum with sides slightly sinuous with apical two-thirds moderately arcuate and basal one-third subparallel; anterior angles feebly produced, truncation slightly less than length of second antennal segment. Ante-basal transverse groove deep, strongly pronounced. Major punctures of pronotal disc dense, irregularly distributed; size moderately coarse, close or equal to size of

basal serial punctures of elytra; punctures in interspaces minute, much smaller than major punctures. Elytron at declivity evenly rounded; disc in basal one-half almost evenly convex. Lateral margins of elytra moderately broad in dorsal view, visible for entire length. Elytral striae strongly, distinctly punctate from base to apex. Metasternum medially somewhat sparsely, conspicuously setose except glabrous near midline in posterior two-thirds. First abdominal sternum (Fig. 14) medially with a very dense patch of long, erect setae near apical margin forming a conspicuous well-defined brush; area anterior to brush sparsely setose. Middle and hind trochanters with a few inconspicuous setae as in adjacent parts of femora.

Median lobe of genitalia (Fig. 20) 0.8 mm long, evenly arcuate except slightly recurved at apex; in dorsal view, of even thickness in apical two-thirds except slightly tapered near tip; tip rounded, appearing subtruncate. Ventral side smooth except for a short, shallow median furrow at apex.

FEMALE. Allotype: length 2.8 mm, greatest width 1.4 mm. Similar to male except for sexual differences at apex of abdomen; setae of metasternum and first abdominal sternum shorter and less conspicuous; first abdominal sternum lacking a brush of setae but with a median patch of very crowded setiferous punctures near hind margin; and the following non-sexual difference: antennae and legs rufotestaceous.

TYPE MATERIAL. Holotype: Male, Port Rowan, Ontario, June 23, 1944, W.J. Brown, on **Salix** (CNC No. 15394). Allotype: Female, same data as holotype (CNC No. 15394). Both holotype and allotype are in the Canadian National Collection, Ottawa.

Paratypes: 1151 specimens. CANADA. **Alberta:** Calgary, Edmonton, Kimball, Lethbridge, Scandia. **British Columbia:** Canal Flats, Creston, Golden, Hatzic, Kamloops, Mission City, Oliver, Salmon Arm, Similkameen R. (7 mi. S. Cawston), Sirdar, Sumas Pr. **Manitoba:** Brandon, Ceder Lake, Minnedosa, Morris, Ninette, The Pas, Winnipeg, 51 mi. E. Winnipeg. **Ontario:** Ancaster, Cumberland, Delhi, Dunnville, Georgetown, Kingsville, Leamington, Merivale, Moose Factory, Moosonee, Ojibway, Ottawa, Pelee Island, Point Pelee, Port Rowan, Simcoe, Terra Cotta, Tilbury, Turkey Point, Walsingham, Wheatley. **Quebec:** Hull, Montreal, St. Hilaire. **Saskatchewan:** Assiniboia, Lumsden, Sask. Landing, Saskatoon. UNITED STATES. **Colorado:** Buena Vista, Garland, Keenesburg, Littleton, Mesa. **Illinois:** Bowmanville, Chicago, Glen Ellyn, Homewood, Mt. Forest, Palos Park, Sauk Trail Forest Pres. (Steger), St. Joseph, Volo, Willow's Sprgs. **Indiana:** Bluffton, Hesseville, Monroe, Vera Cruz, Vermillion, Vero Co. **Iowa:** Adair Co., Adams Co., Crawford Co., Jones Co., Lake Okoboji. **Kansas:** Onaga, Topeka. **Michigan:** Selfridge Field. **Montana:** Bozeman, Gallatin Co. **Nebraska:** near Brady. **New York:** Bridgeport, Danby, Honeoye Falls, Howland Id., Ithaca, Kingston, Lake Placid, Olcott, Penn Yan, Stanley. **North Dakota:** Golden Valley Co., Heart Butte Dam. **Oregon:** Burlington, Corvallis, Dayton, Orenco, Westport, Willamette Valley. **South Dakota:** Aberdeen, Badlands, Beresford, Big Stone, Bigstone City, Blunt, Brookings, Canning, Ceder Canyon, Chamberlain, Clark Co., Cottonwood, Dimock, Dry Lake, Elk Point, Fort Pierre, Fort Thompson, Gettesburg, Gregory, Hecla, Highmore, Kennebec, Kimball, Lake City, Lake Oakwood, Lake Pointsett, Lead, Mason, Midland, Newell, Nisland, Phillip, Pierre, Presho, Sisseton, Spearfish, Springfield, Sturgis, Union Co. State Park, Vayland, Vermillion, Volga, Walker, Waubay, Wentworth, Yankton. **Utah:** Logan, Provo. **Washington:** Hover, Lake Semanish State Park, Lewis and Clark State Park, Yakima River (Yakima Co.). **Wisconsin:** Madison. (see Map 4). Paratypes are deposited in the following collections: CAS, CNC, CSCA, CU, FMNH, HAHC, MCZ, OSU, RHP, SDSU, UA, USNM.

VARIATION. Males range from 2.1 to 2.9 mm in length and from 1.0 to 1.4 mm in greatest width. Females range from 2.3 to 3.4 mm in length and from 1.2 to 1.7 mm in greatest width. In both sexes, the length is equal to or slightly greater than twice the width. Variation in colour is slight. The pronotum and elytra are typically dark bronze to coppery-bronze with the margins greenish. A few specimens, mostly from British Columbia, have the dorsum bronze-green to coppery-green. Antennae and legs range from light testaceous to rufotestaceous with the hind femora occasionally slightly darker or partially piceous. The metasternum and first abdominal sternum occasionally show a greenish reflection. The sides of the pronotum range from evenly arcuate in very few specimens to slightly sinuous with the apical two-thirds feebly to strongly arcuate. Major pronotal punctation varies among specimens from moderately sparse to very dense. Size of the punctures ranges from moderate to coarse, about equal to the

size of the basal serial punctures of the elytra. The punctures of the interspaces range from very fine to about one-half the diameter of the major punctures. Unlike the holotype, some specimens have the elytral disc slightly depressed behind the basal one-quarter. The lateral margins of the elytra range from moderately broad to more conspicuously broad as in **heikertingeri** (Fig. 9). Male genitalia range in length from 0.7 to 0.8 mm. In dorsal view, the median lobe varies from slightly tapered at the aperture to slightly broadened. In females, spermathecae range in length from 0.17 to 0.21 mm and are similar to Fig. 40.

FIRST INSTAR LARVA: Length about 1.0 mm, greatest width about 0.2 mm. Maximum length of head capsule 0.18 to 0.22 mm, maximum width 0.16 to 0.18 mm. Colour pale yellowish-white (when alive) except head and terga of prothorax and 9th abdominal segment light brown. Body orthosomatic, subcylindrical, slightly flattened ventrally, widest at thorax and slightly narrowed posteriorly.

Head nutant, prognathous, notched posteriorly; labrum short, transverse, slightly rounded anteriorly, with a lateral pair of long setae placed medially, a central pair of moderately long setae placed basally and 2 central pairs of short setae at anterior margin; clypeus short, transverse, with a lateral pair of short setae placed medially, and 2 central pairs of very short setae placed basally; frons triangular, distinctly separated from epicranium by V-shaped frontal suture, with 4 pairs of long setae -- a lateral pair at anterior margin and 3 central pairs located anteriorly, medially and posteriorly; epicranium divided posteriorly by a short coronal suture, with 10 pairs of setae -- 5 dorsal pairs, 2 lateral pairs and 3 ventral pairs; ocelli absent. Antenna short, 2-segmented, attached to head by a broad membrane, first segment with several sensilla. Mandible palmate, 5-toothed, the 3rd tooth the most elongate. Maxillary palpus prominent, conical, 3-segmented, with apical segment as long as the other 2 combined. Labium with mentum subquadrate and submentum rectangular; labial palpus short, 2-segmented, apical segment elongate-conical; submentum with 1 anterior pair and 1 posterior pair of setae.

Thorax distinctly 3-segmented; prothorax with a slightly sclerotized, longitudinally divided, transverse tergal shield bearing anteriorly a row of 5 pairs of setae and posteriorly a row of 3 pairs of setae; mesothorax and metathorax dorsally each with a central pair of dark hatching spines located medially and with 2 rows of setae -- anterior row with 1 short lateral pair and 1 long central pair, posterior row with 3 long pairs located 1 pair centrally, 1 pair posterior to hatching spines and 1 pair laterally; lateral margins of mesonotum and metanotum each with a long, strong, laterally-projecting medial seta and 2 short setae -- 1 located anterodorsal and 1 located posteroventral to median seta; thoracic sterna each with 2 central pairs of setae -- a long anterior pair and a shorter posterior pair; prothoracic sternum also with a lateral pair of setae located anterior to legs. Legs short, 4-segmented with 4th segment terminated by a moderately curved claw and a membranous empodium; segments 1 to 4 each with several short to moderately long setae.

Abdomen 10-segmented; segments 1 to 8 each divided dorsally into 3 transverse folds -- anterior fold with 3 pairs of long setae, medial fold with 1 short pair and posterior fold with 3 long pairs plus a very short pair ventral to lateral-most pair of long setae; pleural area of segments 1 to 8 with a long, strong medial seta and a shorter seta anteroventral to medial seta; venter of segments 1 to 8 with 2 transverse rows of setae -- anterior row with 2 pairs and posterior row with 3 pairs; 9th segment with a sclerotized, spatulate, posteriorly rounded dorsal plate (anal plate); anal plate flat, with 1 anterior pair and 1 medial pair of moderately long setae located centrally and with 4 pairs of long setae and 1 pair of very short setae located laterally and posteriorly; venter of 9th segment with a transverse row of 2 pairs of long setae; 10th segment reduced, hidden from above by 9th segment, disc-like with a single median anal proleg.

Spiracles small, annular; 1 pair on mesothorax and 1 pair on each of abdominal segments 1 to 8.

The above description is based on 12 specimens reared from adults collected in Ottawa, Ontario.

The second instar larva, third instar larva and pupa of this species are unknown.

A single first instar larva was found in the roots of a potted willow (**Salix alba** x **fragilis**) removed from a rearing cage (No. 3) on July 11, 28 days after adults had been placed in the cage. The larva was mining below the epidermis of a small root about 0.5 mm in diameter. When the mine was dissected, the larva emerged and crawled around the dish containing the washed roots but did not resume feeding. When placed on

a fresh new root of S. **alba** x **fragilis** and left overnight, the larva chewed at several places on a small lateral root but did not mine. It became inactive and died several hours later. Some of the other small, tender roots on the same plant contained vacant larval mines. Some mines ran for a short distance along a root and out into smaller lateral roots. Entrance or exit holes were apparent in each mine. Larvae had fed on the tissues of the cortex and on the tender tissues, probably endodermis and pericycle, surrounding the central vascular bundle. Reddish-brown frass occurred throughout the mines.

REMARKS. The characters given in the diagnosis will separate **solita** from all the other species. However, **solita** may be confused with **vaga**, similarly coloured specimens of **nana** and, possibly, **opulenta**. The lateral elytral margins in **solita** are distinctly broader than in **opulenta** and slightly broader than in **vaga** and **nana**. Males can usually be separated from those of **opulenta** and **nana** by the more sharply-defined apical brush of setae on the first abdominal sternum. Males of **solita** can easily be distinguished from those of **nana** and **vaga** by the shape of the genitalia (Fig. 20). The shape of the spermatheca (Fig. 40) in females will also readily separate **solita** from the other three species.

5. **Crepidodera decora** new species
Figs. 21, 41; Map 5.

DIAGNOSIS: dorsal surface bright green to blue-green; elytral declivity evenly rounded; lateral margins of elytra moderately broad in dorsal view, visible for their entire length; males with pubescence of first abdominal sternum longer and more conspicuous than in females, denser apically forming a distinct, sharply-defined median brush near hind margin; median lobe of male genitalia evenly arcuate in lateral view, without conspicuous ventral sculpture except for a shallow median furrow at apex.

MALE. Holotype: length 2.4 mm, greatest width 1.1 mm. Shape elongate-oval; length slightly greater than twice the width. Dorsum shining, metallic; vertex of head, pronotum and elytra green; head below vertex blue-green; scutellum piceous. Antennae and legs rufotestaceous. Ventral surface shining black.

Vertex of head along anterior edge of pronotum smooth, very finely punctulate. Pronotum with sides slightly sinuous with apical two-thirds feebly arcuate and basal one-third subparallel; anterior angles feebly produced, truncation slightly less than length of second antennal segment. Antebasal transverse groove deep, strongly pronounced. Major punctures of pronotal disc moderately dense, irregularly distributed; size moderate to slightly coarse, the latter close or equal to size of basal serial punctures of elytra; punctures in interspaces minute, much smaller than major punctures. Elytron at declivity evenly rounded; disc in basal one-half almost evenly convex. Lateral margins of elytra moderately broad in dorsal view, visible for entire length. Elytral striae strongly, distinctly punctate from base to apex. Metasternum medially somewhat sparsely, inconspicuously setose except glabrous near midline in posterior two-thirds. First abdominal sternum medially with a very dense patch of long, erect setae near apical margin forming a conspicuous well-defined brush; area anterior to brush sparsely setose. Middle and hind trochanters with a few inconspicuous setae as in adjacent parts of femora.

Median lobe of genitalia (Fig. 21) 0.8 mm long, evenly arcuate except slightly recurved at apex; in dorsal view, of even thickness in apical two-thirds except slightly narrowed at tip; tip rounded. Ventral side smooth except for a short, shallow median furrow at apex.

FEMALE. Allotype: length 2.9 mm, greatest width 1.4 mm. Similar to male except for sexual differences at apex of abdomen; setae of first abdominal sternum shorter and less conspicuous; first abdominal sternum lacking a brush of setae but with a median patch of crowded setiferous punctures near hind margin; and the following non-sexual differences: anterior pronotal angles with truncation equal to length of second antennal segment; major pronotal punctures slightly more dense.

TYPE MATERIAL. Holotype: Male, Ottawa, Ontario, May 31, 1962, W.J. Brown, on **Salix discolor** (CNC No. 15395). Allotype: Female, same data as holotype (CNC No. 15395). Both holotype and allotype are in the Canadian National Collection, Ottawa.

Paratypes: 360 specimens. CANADA. **Ontario:** Arnprior, Bell's Corners, Blackburn, Brittania Hts., Constance Bay, Delhi, Georgetown, Hazeldean, Kinburn, Marmora, Merivale, Ottawa, Ramsayville Marsh, Simcoe. **Quebec:** Carman Lake, Farm Point, Gatineau Pk., Hull, Knowlton, Knowlton's Landing. UNITED STATES. **Connecticut:** New Haven. **Massachusetts:** Boston, West Medford. **Michigan:** Lansing,

New Baltimore. **New Hampshire:** Exeter, Mt. Washington, N. Conway, Rumney. **New York:** Ithaca, Lake Placid, Whiteface Mt., Wayne Co. (see Map 5). Paratypes are deposited in the following collections: CAS, CNC, CSCA, CU, FMNH, HAHC, MCZ, OSU, RHP, USNM.

VARIATION. Males range from 2.0 to 2.8 mm in length and from 0.9 to 1.3 mm in greatest width. Females range from 2.3 to 3.2 mm in length and from 1.1 to 1.6 mm in greatest width. In both sexes, the length ranges from equal to twice the width to slightly greater than twice the width. Variation in color is slight. The head, pronotum and elytra range from green to blue-green. Antennae are typically entirely rufotestaceous but occasionally have the apical one-half darker to dark reddish-brown. Hind femora range from entirely rufotestaceous to partially or entirely dark reddish-brown to piceous. The metasternum and first abdominal sternum occasionally show a greenish reflection. The sides of the pronotum range from evenly, feebly to moderately arcuate in a few specimens to slightly sinuous with the apical two-thirds feebly to moderately arcuate and the basal one-third subparallel. The anterior pronotal angles have the truncation equal to or slightly less than the length of the second antennal segment. The major punctation of the pronotal disc varies from sparse to very dense, the size of the punctures ranging from fine to moderate in some specimens and from moderate to coarse in others. The small punctures of the pronotal interspaces range from very fine to about one-half the diameter of the major punctures. Male genitalia range in length from 0.7 to 0.8 mm. In dorsal view, the median lobe varies from slightly tapered at the aperture to slightly broadened and the tip ranges from narrowly to broadly rounded. In females, spermathecae range from 0.20 to 0.25 mm in length and are similar to Fig. 41.

REMARKS. The characters given in the diagnosis and its eastern range should separate **decora** from all the other species. On the basis of external characters, **decora** will easily be confused with **luminosa, nana,** and possibly **sculpturata.** In colour and shape, **decora** is similar to some **sculpturata** but can be distinguished from this species by the distinctly broader elytral margins and, in males, by the pubescence of the first abdominal sternum forming a distinct median brush near the hind margin. The elytral margins in **decora** are generally only slightly broader than in **luminosa.** In **luminosa,** the major punctation of the pronotum is generally denser and slightly coarser than in **decora.** Male genitalia in **decora** differ slightly from those in **luminosa** in lacking distinct longitudinal impressions on the ventral side. In shape, **decora** usually differs from both **luminosa** and **nana** in having the sides of the elytra at the declivities more strongly rounded to the apex. In **luminosa** and **nana,** the sides of the elytra are generally slightly more gradually rounded at the declivities. It is, however, very difficult to separate **decora** from eastern specimens of **nana** except by the distinct difference in the shape of the male genitalia (Fig. 21) and female spermatheca (Fig. 41). The shape of the spermatheca will also separate females of **decora** and **luminosa.**

6. **Crepidodera browni** new species
Figs. 8, 22, 42; Map 6.

DIAGNOSIS: Dorsal surface bright green, brassy-green, coppery-green, pure coppery, coppery-bronze or dark bronze colour; elytra in both sexes bulging laterally at the declivities to overhang and hide part of the lateral margins (Fig. 8); males with the pubescence of the first abdominal sternum longer and more conspicuous than in females, pubescence denser apically forming a distinct, feebly to strongly-defined median brush near the hind margin.

MALE. Holotype: length 2.7 mm, greatest width 1.35 mm. Shape elongate-oval; length equal to twice the width. Dorsum shining, metallic; head, pronotum and elytra brassy-green; scutellum black. Antennae and legs rufotestaceous. Ventral surface shining black.

Vertex of head along anterior edge of pronotum smooth, very finely punctulate. Pronotum with sides slightly sinuous with apical two-thirds moderately arcuate and basal one-third subparallel; anterior angles feebly produced, truncation slightly less than length of second antennal segment. Ante-basal transverse groove deep, strongly pronounced. Major punctures of pronotal disc dense, irregularly distributed; size moderate, smaller than basal serial punctures of elytra; punctures in interspaces minute to about one-half diameter of major punctures. Elytron (Fig. 8) at declivity slightly bulging laterally to overhang margin; disc gently depressed behind basal one-quarter. Lateral margins of elytra narrow in dorsal view, hidden at declivity by bulge. Elytral striae strongly, distinctly punctate from base to apex. Metasternum medially somewhat

sparsely, inconspicuously setose except glabrous near midline in posterior two-thirds. First abdominal sternum medially with a dense patch of long, erect setae near apical margin forming a conspicuous, slightly loose brush; area anterior to brush moderately densely setose. Middle and hind trochanters with a few inconspicuous setae as in adjacent parts of femora.

Median lobe of genitalia (Fig. 22) 0.8 mm long, evenly arcuate from base to apex; in dorsal view, of even thickness in apical two-thirds except slightly narrowed at tip; tip rounded. Ventral side with a shallow longitudinal impression on each side at middle and a short, shallow longitudinal median furrow at apex.

FEMALE. Allotype: length 2.8 mm, greatest width 1.4 mm. Similar to male except for sexual differences at apex of abdomen; setae of metasternum and first abdominal sternum shorter and less conspicuous; first abdominal sternum lacking a brush of setae but with a median patch of slightly crowded setiferous punctures near hind margin; and the following non-sexual differences: major punctures of pronotal disc slightly coarser, punctures of interspaces minute.

TYPE MATERIAL. Holotype: Male, Plummers Island Maryland, May 23, 1964, on **Salix**, W.J. Brown collector (CNC No. 15396). Allotype: Female, same data as holotype (CNC No. 15396). Both holotype and allotype are in the Canadian National Collection, Ottawa.

Paratypes: 444 specimens. CANADA. **Alberta:** Medicine Hat. **Ontario:** Brittania, New Sarum, Walsingham. UNITED STATES. **Alabama:** Coleta, Jackson. **District of Columbia:** Rock Creek Pk. **Florida:** Oak Grove. **Georgia:** Hiawassee. **Illinois:** Cairo, Chandlerville, Grand Tower. **Indiana:** Elkhart, LaFayette, Leavenworth, Vigo Co., Wabash River. **Iowa:** DeWitt, Independence, Iowa City, Keokuk, Solon. **Kansas:** Topeka. **Kentucky:** Louisville, Morehead. **Louisiana:** Covington, Logansport, Morgan City, Mound. **Maryland:** Baltimore, Bladensburg, Cabin John, Ft. Washington, Glen Echo, Montg. Co., Plummers Isl., Riverdale. **Massachusetts:** Chicopee, Sherborn. **Michigan:** Maple (? Rapids). **Mississippi:** Agr. Col., Leakesville, Lucedale, Meridian, Richton, Starkville. **Missouri:** (state record only). **New Jersey:** Bound Brook, Phillipsburg. **New York:** West Point. **North Carolina:** Anson Co., Franklin, Raleigh, Richmond Co. **Ohio:** Columbus, Liverpool, Painesville, Sugar Grove, Vinton Co. **Pennsylvania:** Allegheny Co., Clarks Ferry, Easton, Reading. **South Carolina:** Aiken, Clemson, Greenwook Co. **Tennessee:** Clarksville, Oak Ridge, Rhea Col, Roane Co. **Texas:** Austin, Corsicana, Houston, Jewett, Kerrville, Leon Co., Longview, Marshall, Nacodoches, Navasota, Tatum. **Vermont:** Brattleboro. **Virginia:** Alex. Co., Fredericksberg, Great Falls, Nelson Co., Rosslyn. **West Virginia:** Fairmont. (see Map 6). Paratypes are deposited in the following collections: CAS, CNC, CSCA, FMNH, HAHC, OSU, RHP, SDSU, UA, USNM.

VARIATION. Males range from 2.1 to 2.8 mm in length and from 1.0 to 1.4 mm in greatest width. Females range from 2.4 to 3.3 mm in length and from 1.2 to 1.7 mm in greatest width. In both sexes, the length ranges from equal to twice the width to slightly greater than twice the width. There is considerable variation in the colour of the dorsal surface. Specimens vary in colour from green, brassy-green or coppery-green to pure coppery, coppery-bronze or dark bronze. This variation appears to be clinal. Specimens from the northeastern part of the range, from Massachusetts and Ontario to Georgia are generally green or greenish while specimens from Florida to Texas and from Iowa, Kansas and southern Illinois are darker, from pure coppery to coppery-bronze or dark bronze. Material from Tennessee, Alabama and Mississippi includes both greenish and coppery to dark bronze specimens.

Greenish specimens exhibit some variation in shade. They range from unicolorous, with the head, pronotum and elytra green or brassy-green, to slightly bicolorous with head and pronotum green, blue-green or brassy-green and the elytra more brassy or coppery. Also, the head may be green to blue-green with the pronotum and elytra ranging from brassy-green or coppery-green to pure coppery. Antennae occasionally have the apical four or five segments slightly darker than the remainder to medium reddish-brown. Hind femora range from entirely to partially rufotestaceous or entirely medium to dark reddish-brown.

The sides of the pronotum vary from evenly, moderately arcuate to slightly sinuous with the apical two-thirds feebly to strongly arcuate and the basal one-third subparallel. The truncation of the anterior pronotal angle ranges from slightly less than to equal the length of the second antennal segment. There is considerable variation in the punctation of the pronotal disc. The major punctation ranges from sparse to very dense. Size of the major

punctation ranges from moderate to coarse, the latter equal in size to the basal serial punctures of the elytra. The size in individual specimens varies among moderate, moderate to slightly coarse, moderate to coarse, and coarse. The lateral elytral margins range from narrow to moderately broad in dorsal view. In males, the metasternal setae range from somewhat sparse and inconspicuous as in the holotype to more closely placed and more conspicuous. The setal brush on the first abdominal sternum in males varies from slightly loose as in the holotype to more strongly defined. Male genitalia range in length from 0.7 to 0.8 mm. In dorsal view, the median lobe varies from slightly more strongly narrowed apically than in Fig. 22 to scarcely narrowed apically with the tip appearing subtruncate. In females, spermathecae (Fig. 42) range from 0.13 mm to 0.16 mm in length.

REMARKS. In most external characters and in male genitalia, **Crepidodera browni** is similar to **solita, decora, luminosa** and **opulenta.** It can easily be separated from these and most other species by the elytron bulging laterally at the declivity to overhang and hide part of the lateral margin in dorsal view. This condition is also present to some extent in a few other species, namely **violacea, spenceri** (more commonly in females) and **populivora** (some females only). However, **browni** can readily be distinguished from these species by the slightly more elongate shape, the different colour of the dorsal surface and by the pubescence of the first abdominal sternum in males. Males of **browni** differ from those of **violacea** and **spenceri** in having the setae of the first abdominal sternum longer and more conspicuous than in females and from males of **populivora** in having a conspicuous brush of setae near the hind margin of the sternum.

This species is named in memory of the late Mr. W.J. Brown who collected a good part of the type series of this species and much of the material used in this revision.

7. **Crepidodera opulenta** (LeConte) new combination
Figs. 23, 43; Map 7.

Haltica opulenta LeConte 1858, p. 86 (type locality, Fort Yuma, California).
Crepidodera helxines (L.); Crotch (misidentification) 1873, p. 71 (in part); Hamilton 1889, p. 149; Horn 1889, p. 316; Hamilton 1894, p. 399; Duckett 1920, p. 149.
Chalcoides helxines (L.); Leng (misidentification) 1920, p. 300 (in part); Beller and Hatch 1932, p. 128, 129.
Chalcoides fulvicornis (Fabr.); Heikertinger and Csiki (misidentification) 1939, p. 320 (in part).
?Chalcoides fulvicornis nana (Say); Heikertinger 1948-1950, p. 110 (fig.), 115, 136-137 (in part); Lazorko 1974, p. 148 (fig.), 152.
Crepidodera nana (Say); Balsbaugh and Hays 1972, p. 156 (in part).

DIAGNOSIS: dorsal surface dark green, bronze-green, brassy-green, coppery-green, coppery-bronze to dark bronze; shape elongate-oval; anterior pronotal angles feebly produced; major pronotal punctures moderate to slightly coarse in size; elytral declivity evenly rounded; lateral margins of elytra narrow in dorsal view, visible for their entire length; males with pubescence of first abdominal sternum longer and more conspicuous than in females, denser apically forming a distinct but poorly developed median brush near hind margin; median lobe of male genitalia evenly arcuate in lateral view; range in southwestern United States.

TYPE MATERIAL. Lectotype, here designated: male, with a circular gold label which represents California, a red label "type 4437" and the following labels: "**A. (C.) opulenta** Lec. Cal."/"Lectotype ♂, **Crepidodera opulenta** (Lec.), R.H. Parry, 1976". This specimen is in the LeConte Collection, Museum of Comparative Zoology, Harvard University. The lectotype is accompanied by two female specimens. These each bear a circular gold label and are probably syntypes.

MATERIAL EXAMINED: 253 specimens. UNITED STATES. Arizona, California, Colorado, Utah. (see Map 7).

REMARKS. In the original description, LeConte (1858) described the colour of this species as "laete viridiaurea" or bright green-gold. The lectotype differs from this in having the dorsal surface coppery-bronze with a slight greenish reflection.

The external characters given in the diagnosis and its southwestern range should separate **opulenta** from all the other species except western specimens of **nana.** It may also be confused with **sculpturata** and **vaga.** Specimens of **opulenta** usually differ from those of **sculpturata** in that the pronotum does not appear as strongly convex or swollen anteriorly as in **sculpturata.** In addition, males of **sculpturata** lack a distinct brush of setae in the pubescence of the first abdominal sternum. In **vaga,** the lateral margins of the elytra are generally scarcely broader than in **opulenta.** The shape of the male genitalia (Fig. 23) will

easily separate **opulenta** from otherwise similar males of **nana.** This character, along with the shape of the spermatheca (Fig. 43) in females, will also readily distinguish **opulenta** from **sculpturata** and **vaga.** The spermatheca in **opulenta** is occasionally very similar to that in western specimens of **nana.**

8. **Crepidodera luminosa** new species
Figs. 10, 24, 44; Map 8.

DIAGNOSIS: dorsal surface bright green, blue-green, brassy-green or bronze-green; elytral declivity evenly rounded; lateral margins of elytra narrow to moderately broad in dorsal view, visible for their entire length; males with pubescence of first abdominal sternum longer and more conspicuous than in females, denser apically forming a distinct, well-defined median brush near hind margin; median lobe of male genitalia evenly arcuate in lateral view, with distinct longitudinal impressions on ventral side.

MALE. Holotype: length 2.4 mm, greatest width 1.1 mm. Shape elongate-oval; length slightly greater than twice the width. Dorsum shining, metallic; vertex of head and pronotum green; elytra brassy-green; head below vertex green to blue-green; scutellum black. Antennae and legs, except hind femora, rufotestaceous; hind femora dark reddish-brown. Ventral surface shining black.

Vertex of head along anterior edge of pronotum smooth, very finely punctulate. Pronotum with sides evenly, feebly arcuate; anterior angles feebly pronounced, truncation slightly less than length of second antennal segment. Ante-basal transverse groove deep, strongly pronounced. Major punctures of pronotal disc moderately dense, irregularly distributed; size moderately coarse, close or equal to size of basal serial punctures of elytra; punctures in interspaces fine, much smaller than major punctures. Elytron (Fig. 10) at declivity evenly rounded; disc in basal one-half almost evenly convex. Lateral margins of elytra narrow in dorsal view, visible for entire length. Elytral striae strongly, distinctly punctate from base to apex. Metasternum medially sparsely, inconspicuously setose except glabrous near midline in posterior two-thirds. First abdominal sternum medially with a very dense patch of long, erect setae near apical margin forming a conspicuous well-defined brush; area anterior to brush moderately densely setose. Middle and hind trochanters with a few inconspicuous setae as in adjacent parts of femora.

Median lobe of genitalia (Fig. 24) 0.7 mm long, evenly arcuate except slightly recurved at apex; in dorsal view, of even thickness in apical two-thirds except slightly narrowed at tip; tip rounded. Ventral side sculptured with a distinct longitudinal impression on each side at middle and a short, shallow median furrow at apex.

FEMALE. Allotype: length 2.8 mm, greatest width 1.4 mm. Similar to male except for sexual differences at apex of abdomen; setae of first abdominal sternum shorter and less conspicuous, the sternum lacking a brush of setae but with a patch of slightly crowded setiferous punctures near hind margin; and the following non-sexual differences: sides of pronotum slightly sinuous with apical two-thirds feebly arcuate and basal one-third subparallel; major punctures of pronotal disc dense; lateral margins of elytra moderately broad in dorsal view.

TYPE MATERIAL. Holotype: Male, Hartland, New Brunswick, July 8, 1942, G.M. Stirrett, small willows on beach (CNC No. 15397). Allotype: Female, same data as holotype (CNC No. 15397). Both holotype and allotype are in the Canadian National Collection, Ottawa.

Paratypes: 144 specimens. CANADA. **New Brunswick:** Hartland, Woodstock, Young's Cove. **Newfoundland:** South Branch (W. Newfoundland), Spruce Brook, Steady Bk.. **Nova Scotia:** Truro. **Quebec:** Cascapedia, Gaspe. UNITED STATES. **Massachusetts:** Little Deer R. **New Jersey:** Phillipsburg. New York: Ithaca, Lake Placid. **Pennsylvania:** Easton, Lehigh Gap. (see Map 8). Paratypes are deposited in the following collections: CAS, CNC, CU, HAHC, UA, USNM.

VARIATION. Males range in length from 2.2 to 2.8 mm and in greatest width from 1.1 to 1.4 mm. Females range in length from 2.3 to 3.1 mm and in greatest width from 1.1 to 1.5 mm. In both sexes, length ranges from equal to twice the width to slightly greater than twice the width. Variation in colour is light. The head, pronotum and elytra range from pure green to blue-green, brassy-green or bronze-green. The head and pronotum occasionally differ in shade from the elytra, the latter being slightly more brassy or bronze. Antennae, typically entirely rufotestaceous, occasionally have the apical one-third to one-half darker to dark reddish-brown. Hind femora range from entirely rufotestaceous to partially or

entirely dark reddish-brown. The sides of the pronotum range from evenly, feebly or moderately arcuate to slightly sinuous with the apical two-thirds feebly to moderately arcuate and the basal one-third subparallel. The major punctation of the pronotal disc generally ranges from moderately dense to very dense and is rarely sparse. The lateral elytral margins range in width from somewhat narrow as in the holotype to moderately broad as in the allotype. Male genitalia range in length from 0.7 to 0.8 mm. In dorsal view, the median lobe varies from slightly tapered at the aperture to slightly broadened. In females, spermathecae range from 0.16 to 0.19 mm in length and are similar to Fig. 44.

REMARKS. The holotype and allotype are slightly damaged. The holotype is missing the last three segments of the left front tarsus and the last segment of the right hind tarsus. Part of the left antenna is broken off but this was salvaged and is glued to the point with the specimen. The allotype is missing the last three segments of the left middle tarsus. The tarsi of the right middle and hind legs are broken off but these were salvaged and are glued to the point with the specimen. Both specimens were originally mounted with the antennae and legs held in an excessive amount of an acetate glue. The damage was discovered when the glue was dissolved in amyl acetate in order to remove the specimens from their original mounting for examination of the ventral surface and for dissection of the male specimen.

The characters given in the diagnosis and its eastern range should separate **luminosa** from all the other species. On the basis of external characters, **luminosa** will be easily confused with **decora, nana** and, possibly, **sculpturata.** It can usually be distinguished from **decora** by the generally denser and slightly coarser punctation of the pronotum, the generally slightly narrower elytral margins and the sides of the elytra at the declivities more gradually rounded to the apex. Male genitalia in **luminosa** differ from those in **decora** in having distinct lateral longitudinal impressions on the ventral side. In **luminosa,** the pronotum is not as convex or swollen anteriorly as in **sculpturata.** Also, males of **luminosa** differ from those of **sculpturata** in having a distinct median brush in the pubescence of the first abdominal sternum. The only sure way of separating **luminosa** from **nana** is by the shape of the male genitalia (Fig. 24) and female spermatheca (Fig. 44). These will also distinguish **luminosa** from **decora** and **sculpturata.**

9. **Crepidodera vaga** new species
Figs. 25, 45; Map 9.

DIAGNOSIS: dorsal surface dark coppery-bronze to dark purplish; shape elongate-oval; major pronotal punctures moderately coarse in size; elytral declivity evenly rounded; elytral disc at most only very feebly depressed behind basal one-quarter; lateral margins of elytra narrow in dorsal view, visible for their entire length; males with pubescence of first abdominal sternum longer and more conspicuous than in females, denser apically forming a distinct, sharply-defined median brush near hind margin; median lobe of male genitalia evenly arcuate in lateral view; range east of Rocky Mountains.

MALE. Holotype: length 2.7 mm, greatest width 1.3 mm. Shape elongate-oval; length slightly greater than twice the width. Dorsum shining, metallic; pronotum and elytra dark coppery-bronze with margins greenish; head dark green; scutellum piceous. Antennae and legs yellowish-brown. Ventral surface shining black.

Vertex of head along anterior edge of pronotum smooth, very finely punctulate. Pronotum with sides slightly sinuous with apical two-thirds moderately arcuate and basal one-third subparallel; anterior angles feebly produced, truncation slightly less than length of second antennal segment. Ante-basal transverse groove deep, strongly pronounced. Major punctures of pronotal disc dense, irregularly distributed; size moderately coarse, close or equal to size of basal serial punctures of elytra; punctures in interspaces fine, much smaller than major punctures. Elytron at declivity evenly rounded; disc very gently depressed behind basal one-quarter. Lateral margins of elytra narrow in dorsal view, visible for entire length. Elytral striae strongly, distinctly punctate from base to apex. Metasternum medially somewhat closely, conspicuously setose except glabrous near midline in posterior two-thirds. First abdominal sternum medially with adense patch of long erect setae near apical margin forming a conspicuous, welldefined brush; area anterior to brush sparsely setose. Middle and hind trochanters with a few inconspicuous setae as in adjacent parts of femora.

Median lobe of genitalia (Fig. 25) about 0.8 mm long, evenly arcuate from base to apex; in dorsal view, broadened just posterior to middle, strongly narrowed in apical one-third; tip rounded. Ventral side with a distinct impression on each side near middle converging in apical one-third into a single median longitudinal furrow extending to apex.

FEMALE. Allotype: length 3.1 mm, greatest width 1.5 mm. Similar to male except for sexual differences at apex of abdomen; setae of metasternum and first abdominal sternum shorter and less conspicuous; first abdominal sternum lacking a brush of setae but with a median patch of crowded setiferous punctures near hind margin.

TYPE MATERIAL. Holotype: Male, Pt. Pelee, Ontario, June 15, 1940, W.J. Brown, on **Populus deltoides** (CNC No. 15398). Allotype: Female, same data as holotype (CNC No. 15398). Both holotype and allotype are in the Canadian National Collection, Ottawa.

Paratypes: 32 specimens. CANADA. **Ontario:** Pt. Pelee. UNITED STATES. **South Dakota:** Fort Pierre, Newell. **Tennessee:** Clarksville. (see Map 9). Paratypes are deposited in the following collections: CNC, HAHC, RHP, SDSU, USNM.

VARIATION. Males range from 2.4 to 2.9 mm in length and from 1.2 to 1.4 mm in greatest width. Females range from 2.7 to 3.3 mm in length and from 1.3 to 1.6 mm in greatest width. In both sexes, length ranges from equal to twice the width to slightly greater than twice the width. Colour of the dorsal surface ranges from dark coppery-bronze to piceous with purplish reflections. The colour of the head below the vertex ranges from green to blue-green and the vertex varies from dark green to dark bronze-green or purplish. In some specimens, the last abdominal sternum has the medial and apical portion paler than the remainder to medium reddish-brown. The sides of the pronotum range from evenly, moderately arcuate to slightly sinuous with the apical two-thirds feebly to moderately arcuate. The major punctation of the pronotal disc ranges from slightly sparse to dense and the punctures of the interspaces vary from minute to about one-half the diameter of the major punctures. The elytral disc varies from very gently depressed behind the basal one-quarter as in the holotype to almost entirely convex. Male genitalia range in length from 0.8 to 0.9 mm. In females, spermathacae (Fig. 45) range from 0.15 to 0.16 mm in length.

REMARKS. The characters given in the diagnosis and its range east of the Rocky Mountains should separate **vaga** from all the other species. In external characters, **vaga** is similar to **solita, opulenta** and mid-western or western specimens of **nana** and will likely be confused with these. Females may also be confused with those of **populivora.** The lateral elytral margins in **vaga** are narrower than in **solita** and generally scarcely broader than in **opulenta** and **populivora.** Males of **vaga** can usually be separated from similar males of **nana** by the more strongly defined median brush of setae near the hind margin of the first abdominal sternum. The different range of **vaga** will distinguish it from **opulenta.** The shape of the male genitalia (Fig. 25) and female spermatheca (Fig. 45) will readily separate **vaga** from all of these species.

10. **Crepidodera heikertingeri** (Lazorko) new combination

Figs. 9, 15, 26, 33-36, 46; Map 10.

Chalcoides heikertingeri Lazorko 1974, p. 147, 148 fig., 149, 152 (type locality, Essondale, British Columbia).

DIAGNOSIS: Dorsal surface dark metallic bronze, purplish or dark greenish; shape broadly oval; lateral margins of elytra conspicuously broad, relatively wider than in other North American species except for some specimens of **solita;** males with middle of metasternum covered throughout with setae almost as long and conspicuous as those of first abdominal sternum which is conspicuously hirsute from base to apex, the hairs forming a loose, poorly defined brush; middle and hind trochanters each with a distinct brush of setae on posterior margin. The distinctive male genitalia (Fig. 26) will also separate **heikertingeri** from all other species.

TYPE MATERIAL. Holotype: Male, Essondale, British Columbia, May 8, 1962, W. Lazorko (W. Lazorko Coll.). Allotype: Female, Essondale, British Columbia, October 11, 1972, W. Lazorko (W. Lazorko Coll.). Paratypes: 3 males, 2 females, Vancouver, British Columbia, U.B.C. Endow. Lands, Shaughnessy Hosp. Lands and Beaver Lake, W. Lazorko (W. Lazorko Coll.).

No type material was seen. The name is applied on the basis of the original description plus two specimens from Vancouver, B.C. and three specimens from Vernon, B.C., all bearing Lazorko's determination labels.

MATERIAL EXAMINED: 982 specimens. CANADA: British Columbia, Manitoba, New Brunswick, Newfoundland, Nova Scotia, Ontario, Quebec, Saskatchewan. UNITED STATES: Idaho, Maine, Maryland, Massachusetts, Michigan, Minnesota, Montana, New Hampshire, New Jersey, New York, Oregon, South Dakota, Vermont, Washington. (see Map 10).

FIRST INSTAR LARVA: Length about 1.0 mm, greatest width about 0.2 mm. Maximum length of head capsule 0.19 to 0.22 mm, maximum width 0.16 to 0.19 mm. Similar to first instar larva of **C. solita** n. sp.

SECOND INSTAR LARVA: Length 2.6 to 2.7 mm, greatest width 0.3 mm. Maximum length of head capsule 0.26 to 0.28 mm, maximum width 0.21 to 0.23 mm. Similar to first instar larva except prothoracic tergal shield paler, mesonotum and metanotum without a pair of hatching spines and anal plate with a weakly developed pair of dorsal tooth-like projections at apex.

THIRD INSTAR LARVA: Length 3.0 to 3.3 mm, greatest width 0.4 mm. Maximum length of head capsule (Fig. 33) 0.38 to 0.41 mm, maximum width 0.30 to 0.33 mm. Similar to second instar larva except for the following: prothoracic tergal shield (Fig. 34) very pale brown, almost white, very lightly sclerotized; anal plate (Fig. 36) with apical tooth-like projections strongly developed.

PUPA: Length 2.1 to 2.8 mm. Colour white except eyes and mandibular teeth dark. Head with 3 pairs of dorsal setae -- 1 pair medially on vortex, 1 pair on anterior margins of eyes and 1 pair medially at bases of antennae. Pronotum with 8 pairs of setae -- 2 pairs centrally near anterior margin, 2 pairs medially near centre of disc, 2 pairs medially on lateral margins and 2 pairs on posterior margin. Abdomen with 1 pair of lateral setae per segment and with several additional pairs apically on last segment.

REMARKS. As Lazorko (1974) pointed out, this species was apparently recognized by Heikertinger (1948-1950) who, in a footnote, briefly described a single specimen from Riverdale, New Jersey but did not provide a name. His description of the male genitalia corresponds quite well to that of Lazorko (1974) and the above. Lazorko (1974), however, knew this species only from British Columbia.

The characters given in the diagnosis will separate **heikertingeri** from all of the other species except, possibly, females of **digna** and **solita**. It can be distinguished from **digna** by the slightly wider elytral margins and the generally stronger punctation of pronotum and elytra. Females of **heikertingeri** can usually be separated from those of **solita** by their slightly broader shape, the slightly wider elytral margins and the dense, uniform pubescence of the first abdominal sternum.

11. **Crepidodera digna** new species
Figs. 13, 16, 27, 47; Map 11.

DIAGNOSIS: Dorsal surface shining black; lateral margins of elytra moderately broad, slightly narrower than in **heikertingeri**; males similar to those of **heikertingeri** with metasternum conspicuously setose throughout median region, first abdominal sternum conspicuously hirsute from base to apex; males differing from **heikertingeri** in having setae of first abdominal sternum slightly shorter and less dense, not forming a brush; middle and hind trochanters, as in **heikertingeri**, each with a distinct brush of setae on hind margin. The distinctive male genitalia (Fig. 27) will also separate **digna** from all other species. In addition, **digna** can usually be distinguished from **heikertingeri** by the generally finer, sparser pronotal punctation and, often, by the outer corners of the anterior pronotal angles being more strongly acute.

MALE. Holotype: Length 2.4 mm, greatest width 1.3 mm. Shape broadly oval, slightly elongate; length less than twice the width. Dorsum shining, metallic; vertex of head, pronotum and elytra black with a purplish reflection on pronotal disc and with pronotal margins and sutural margins of elytra green; head below vertex green to blue-green; scutellum piceous. Antennae light testaceous in basal one-half, darker in apical one-half to medium reddish-brown. Legs, except hind femora, rufotestaceous; hind femora piceous. Ventral surface shining black.

Vertex of head along anterior edge of pronotum smooth except for a few scattered fine punctures. Pronotum with sides evenly, moderately arcuate; anterior angles feebly produced, truncation slightly less than length of second antennal segment. Ante-basal transverse groove moderately deep, moderately pronounced. Major punctures of pronotal disc somewhat sparse, irregularly distributed; size moderate to coarse, the latter close or equal to size of basal serial punctures of elytra; punctures in interspaces very minute, much smaller than major punctures. Elytron at declivity evenly rounded; disc in basal one-half almost evenly convex. Lateral margins of elytra moderately broad in dorsal view, visible for entire length. Elytral striae

strongly, distinctly punctate from base to apex. Metasternum medially closely, conspicuously setose. First abdominal sternum (Fig. 13) medially with conspicuous, long, semi-erect to erect setae closely placed from base to apex of sternum but not forming a brush. Middle and hind trochanters each with a distinct posterior marginal brush of setae (Fig. 13).

Median lobe of genitalia (Fig. 27) 0.7 mm long, evenly arcuate; in dorsal view, gradually tapered apically except slightly broadened near tip; tip rounded with a deep notch at middle. Ventral side smooth except for a short, shallow median furrow at apex.

FEMALE. Allotype: Length 2.8 mm, greatest width 1.5 mm. Similar to male except for sexual differences at apex of abdomen; setae of metasternum and first abdominal sternum (Fig. 16) much shorter, less conspicuous and slightly sparser; brush of setae on middle and hind trochanters less distinct; and the following non-sexual differences: pronotal disc without a purplish reflection; antennae entirely rufotestaceous; pronotum with sides slightly sinuous with apical two-thirds moderately arcuate and basal one-third subparallel.

TYPE MATERIAL. Holotype: Male, Gillam, Manitoba, June 30, 1950, W.J. Brown, on **Salix** (CNC No. 15399). Allotype: Female, same data as holotype (CNC No. 15399). Both holotype and allotype are in the Canadian National Collection, Ottawa.

Paratypes: 706 specimens. CANADA: **Alberta:** Bilby, Edmonton, 30 mi. N.Hotchkiss, McMurray, Slave Lake, 5 mi. n. Westlock, Whitford Lake. **British Columbia:** Fort Nelson, 9 mi. NW. Golden, Lakelse Lake bog (nr. Terrace), Paul Lake. **Manitoba:** Gillam, Norway House, Riding Mountain Park, 5 mi. SW. Shilo, The Pas, Turtle Mountain For. Res., 51 mi. E. Winnipeg. **Northwest Territories:** Norman Wells. **Nova Scotia:** Mt. Uniacke. **Ontario:** 4 mi. E., Alcona, 42 mi. N. Black Sturgeon Lk., 46 and 56 mi N. Hurkett, Ignace, Lake Superior Prov. Pk. (Lake Mijinemungshing), Moose Creek 10 mi S. Sioux Lookout, Moose Factory, Moosonee, 12 mi. NE Moosonee, 27 mi. S. to 109 mi. n. Pickle Lake, 16 mi. S. and 5 mi. N. Savant Lake, Thunder Bay Mt. McKay 1600 ft., Whitney. **Quebec:** Duchesnay, Duparquet, Mistassini, Mistassini Post, Mt. Lyall. **Saskatchewan:** Canora, Prince Albert. UNITED STATES: **Alaska:** Fairbanks. **Montana:** (Fort?) Assiniboine, Bear Paw Mt., Helena. **New Hampshire:** Mt. Washington 5000-6000 ft. **New York:** Jordanville, Mt. Whiteface. **South Dakota:** Flynn Creek 8 mi. N. Pringle 5400 ft. **Utah:** Park City. (see Map 11). Paratypes are deposited in the following collections: CAS, CNC, CSCA, CU, FMNH, HAHC, MCZ, OSU, RHP, SDSU, UA, USNM.

VARIATION. Size of the males ranges from 2.1 to 2.7 mm in length and from 1.1 to 1.4 mm in greatest width. Females range from 2.3 to 3.0 mm in length and from 1.2 to 1.6 mm in greatest width. The colour of the dorsal surface is shining black, occasionally with purplish or greenish reflections and often with greenish reflections at the margins. Antennae vary from entirely rufotestaceous to testaceous in the basal one-half with the apical one-half darker as in the holotype. The hind femora range in color from entirely piceous to only partially piceous or dark reddish-brown with the remainder rufotestaceous. The sides of the pronotum vary from evenly, moderately arcuate as in the holotype to slightly sinuous as in the allotype. The anterior pronotal angles range from feebly to somewhat strongly produced and the truncation ranges from slightly less to slightly greater than the length of the second antennal segment. The major punctation of the pronotal disc ranges from sparse to moderately dense. Most specimens have the major punctures of moderate size while others have them slightly coarser as in most **heikertingeri.** A few have these punctures relatively fine and sparse. The elytral disc ranges from almost evenly convex in the basal one-half as in the holotype togently depressed behind the basal one-quarter as in **heikertingeri.** Elytral striae apically vary from distinctly punctate to somewhat obsolete. Male genitalia range in length from 0.6 to 0.8 mm. In dorsal view, the median lobe is either continuously tapered apically or has the tip slightly broadened. The notch at the tip ranges from somewhat shallow to deep. In females, spermathecae are about 0.20 mm long and are similar to Fig. 47.

REMARKS. **Crepidodera digna** and the closely related **heidertingeri** overlap in their ranges and both species seem to live in similar habitats. In at least three localities, Lake Mijinemungshing in Lake Superior Provincial Park, Ontario, Black Sturgeon Lake, Ontario, and near Golden, British Columbia, both species were collected in the same habitat from the same species of **Salix.**

12. **Crepidodera populivora** new species
Figs. 28, 48; Map 12.

DIAGNOSIS: Dorsal surface dark purple to

black, rarely blue, blue-green or dark green; anterior pronotal angles feebly produced; pronotal ante-basal transverse groove strongly pronounced; major pronotal punctures sparse to dense, moderate to coarse in size, irregularly distributed; elytral declivity evenly rounded except in some females which have elytra slightly bulging laterally to overhang lateral margins; elytral disc at most only very gently depressed behind basal one-quarter; lateral margins of elytra narrow, visible for their entire length except when partially hidden by a bulge at the declivity in some females; males with pubescence of first abdominal sternum longer and more conspicuous than in females and uniformly dense, not forming a brush.

MALE. Holotype: Length 3.0 mm, greatest width 1.5 mm. Shape oval, slightly elongate; length equal to twice the width. Dorsum shining, metallic; vertex of head dark green, pronotum and elytra dark purple, margins of pronotum greenish; head below vertex blue-green; scutellum black. Antennae and legs rufotestaceous. Ventral surface shining black.

Vertex of head along anterior edge of pronotum smooth, very finely punctulate. Pronotum with sides slightly sinuous with apical two-thirds moderately arcuate and basal one-third subparallel; anterior angles feebly produced, truncation slightly less than length of second antennal segment. Ante-basal transverse groove deep, strongly pronounced. Major punctures of pronotal disc moderately dense, irregularly distributed; size moderate to coarse, the latter close or equal to size of basal serial punctures of elytra; punctures in interspaces minute, much smaller than major punctures. Elytron at declivity evenly rounded; disc in basal one-half almost evenly convex. Lateral margins of elytra narrow in dorsal view, visible for entire length. Elytral striae strongly, distinctly punctate from base to apex. Metasternum medially sparsely, inconspicuously setose except glabrous near midline in posterior two-thirds. First abdominal sternum medially with conspicuous, moderately long semi-erect setae very closely, uniformly placed, not forming a brush. Middle and hind trochanters with a few inconspicuous setae as in adjacent parts of femora.

Median lobe of genitalia (Fig. 28) 0.8 mm long, evenly arcuate except slightly recurved at apex; in dorsal view, slightly broadened apically in apical two-thirds; tip broadly rounded. Ventral side without conspicuous sculpture except for a shallow longitudinal median furrow at apex.

FEMALE. Holotype: Length 3.2 mm, greatest width 1.6 mm. Similar to male except for sexual differences at apex of abdomen, setae of metasternum and first abdominal sternum shorter and less conspicuous, elytron at declivity very slightly bulging laterally to overhang and hide part of lateral margin.

TYPE MATERIAL. Holotype: Male, Blackburn, Ontario, May 21, 1963, W.J. Brown, on **Populus tremuloides** (CNC No. 15400). Allotype: Female, same data as holotype (CNC No. 15400). Both holotype and allotype are in the Canadian National Collection, Ottawa.

Paratypes: 1389 specimens. CANADA: **Alberta:** Beaverlodge, Bilby, Edmonton, 30 mi. N. Hotchkiss, McMurray, 18 mi. S. Peace River. **British Columbia:** Agassiz, Lum and Abner 58°N Alaska Hwy., Canal Flats, Carbonate, Creston, Enderby, Gleneden, 9 mi. NW. Golden, Hatzic, MacGillivray Creek Game Reserve nr. Chilliwack, Mission City, Similkameen R. 7 mi. S. Cawston, Stanley, Tappen, Vernon, Victoria. **Manitoba:** Morris, Ninette, Norway House, Riding Mt. Pk., 2 mi W. Stockton, The Pas, Winnipeg. **New Brunswick:** Bathurst, Boiestown, Chatham, Lindsay, Perth, Tabusintac. **Northwest Territories:** Simpson. **Nova Scotia:** Amherst, Mt. Uniacke, Newport, Truro, Waverley. **Ontario:** 52 mi. S. Armstrong, Arnprior, Bell's Corners, Blackburn, Clifford, Constance Bay, Georgetown, Gold Rock Rainy R. Dist., Gull R.Falls Mindan, 42 mi. N. Black Sturgeon Lake, 56 mi. N. Hurkett, Ignace, Frater and Noisy Bay and Old Women Bay in Lake Superior Prov. pk., in Marmora, Merivale, Moose Creek 10 mi. S. Sioux Lookout, Moose Factory, Osgoode, Ottawa, 25 and 27 mi. S. Pickle Lake, Pt. Pelee, 5 mi. N and 16 mi S. Savant Lake, 9 mi. E. Terrace Bay, Terra Cotta, Thunder Bay Mt. McKay, 1600 ft. **Quebec:** Anc. Lorette, Brome, Carman Lake, Duchesnay, Duparquet, Gaspe, 25 mi. W. Gaspe, Knowlton, Megantic, Montreal, Mt. Albert north base 650 ft., Mt. Jacques Cartier 4000 to 4150 ft., Rimouski, St. Alexandre. **Saskatchewan:** Assiniboia, Val Marie. UNITED STATES: **Colorado:** Steamboat Springs. **Connecticut:** Hartford. **Maine.** Bar Harbor, Lebson, Monmouth, Mt. Katahdin 5215 ft., Paris, Weld. **Massachusetts:** Charlemont, Dracut, Florida, Holyoke, Little Deer R., No. Adams, Springfield. **Michigan:** Detroit, Hrn. Mtn. Club, Marquette, Port Sanillac, Sanford. **Montana:** Gallatin Co., Kalispell. **New Hampshire:** Mt. Washington 5000-5700 ft., Rumney, White Mts. 1500 ft. **New York:** Buffalo, Croton Falls, Crown Pt.,

Gainesville, Great Kills S.I., Heart Lake Essex Co., Ithaca, Lancaster, Long Eddy, Mt. MacIntyre, Mt. Marcy, Mt. Whiteface, Napeague L.I., Olcott, Peru, Portage, Slide Mt. Ulster Co., Underwood, Up. Saranac, Whitehall. **Oregon:** Hood River. **Pennsylvania:** McKean Co., Pocono Lake. **South Dakota:** Englewood, Pierre, Seechee Hollow, Spearfish, Sturgis, 2 mi. S. Sylvan L. Black Hills. **Utah:** Fillmore. **Wisconsin:** Bayfld. (Bayfield). **Wyoming:** Jenning Lk. Gr. Tetons. (see Map 12). Paratypes are deposited in the following collections: CAS, CNC, CSCA, CU, FMNH, HAHC, MCZ, OSU, RHP, SDSU, UA, USNM.

VARIATION. Males range from 2.2 to 3.3 mm in length and from 1.1 to 1.7 mm in greatest width. Females range from 2.4 to 3.5 mm in length and from 1.2 to 1.8 mm in greatest width. In both sexes, length ranges from slightly less than twice the width to equal twice the width, rarely slightly greater. There is very little variation in colour in most of the type series. The colour of the pronotum and elytra normally varies from dark purple with greenish margins to black, occasionally with greenish reflections. The head has the vertex similar in colour to the pronotum and elytra or dark green. Geographical variation in colour is exhibited by 12 paratypes from the lower Fraser Valley of British Columbia. These have the head, pronotum and elytra dark blue to blue-green or dark green. In the whole series, hind femora range from entirely rufotestaceous to partially or entirely piceous. The sides of the pronotum are generally slightly sinuous as in the holotype and allotype with the apical two-thirds ranging from feebly to moderately arcuate. A few specimens have the sides evenly, moderately arcuate. The truncation of the anterior pronotal angles ranges from slightly less than to equal the length of the second antennal segment. The major punctation of the pronotal disc ranges from sparse to dense. Size of the major punctures varies among specimens, some having them all of moderate size, others with them moderate to coarse or all somewhat coarse, and rarely with them fine to moderate. The punctures of the interspaces of the pronotal disc range in size from minute to about one-half the diameter of the smaller major punctures. In females, the declivity of the elytron ranges from evenly rounded to slightly bulging laterally as in the allotype, with the bulge overhanging and hiding part of the lateral elytral margin in dorsal view. The elytral disc ranges from almost evenly convex in the basal one-half as in the holotype to very gently depressed behind the basal one-quarter. Male genitalia range from 0.7 to 0.9 mm in length. In dorsal view, the median lobe varies from slightly broadened apically to slightly narrowed with the tip broadly to slightly narrowly rounded. In females, spermathecae range from 0.17 to 0.22 mm in length and are similar to Fig. 48.

REMARKS. The characters given in the diagnosis should separate this species from all other North American species. Females of **populivora** may be confused with similarly-coloured females of **vaga.** They can usually be separated from this species by the slightly broader and more convex body, the elytra occasionally slightly bulging at the declivities and the generally slightly narrower elytral margins. The shape of the spermatheca (Fig. 48) will easily separate **populivora** from **vaga.** Although differing in some important characters given in the diagnosis, **populivora** seems to be most closely related to **bella** and **aereola.** All three species have a similar pattern of pubescence on the first abdominal sternum in males, similarly shaped male genitalia and generally similar spermathecae.

13. **Crepidodera bella** new species
Figs. 2, 5, 6, 29, 49; Map 13.

DIAGNOSIS: Dorsal surface coppery-bronze, dark bronze or black; shape elongate-oval; vertex of head strongly, distinctly punctate at anterior edge of pronotum; elytral declivity evenly rounded; elytral disc with a distinct depression behind basal one-quarter; lateral margins of elytra moderately broad, visible for their entire length; males with pubescence of first abdominal sternum longer and more conspicuous than in females and uniformly dense, not forming a brush.

MALE. Holotype: Length 2.5 mm, greatest width 1.2 mm. Shape (Fig. 5) elongate-oval; length slightly greater than twice the width. Dorsum shining, metallic; head, pronotum and elytra dark coppery-bronze; scutellum black. Antennae and legs rufotestaceous. Ventral surface shining black with greenish reflections in posternum, metasternum and first abdominal sternum.

Vertex of head along anterior edge of pronotum closely, moderately punctate (Fig. 2). Pronotum (Fig. 2) with sides slightly sinuous with apical two-thirds moderately arcuate and basal one-third subparallel;

anterior angles feebly produced, truncation slightly less than length of second antennal segment. Ante-basal transverse groove deep, strongly pronounced. Major punctures of pronotal disc dense, irregularly distributed; size moderately coarse, close or equal to size of basal serial punctures of elytra; punctures in interspaces fine, much smaller than major punctures. Elytron at declivity evenly rounded; disc strongly, distinctly depressed behind basal one-quarter. Lateral margins of elytra moderately broad in dorsal view, visible for entire length. Elytral striae strongly, distinctly punctate from base to apex. Metasternum medially somewhat closely, conspicuously setose except glabrous near midline in posterior two-thirds. First abdominal sternum medially with conspicuous, moderately-long, erect setae very closely, uniformly placed, not forming a brush. Middle and hindtrochanters each with a rather loose, inconspicuous posterior marginal brush of setae.

Median lobe of genitalia (Fig. 29) 0.7 mm long, evenly arcuate from base to apex; in dorsal view, slightly broadened apically in apical two-thirds; tip rounded. Ventral side smooth, without sculpture.

FEMALE. Allotype: Length 2.8 mm, greatest width 1.4 mm. Similar to male except for sexual differences at apex of abdomen setae of metasternum and first abdominal sternum shorter, slightly sparser, and less conspicuous; and the following non-sexual difference: anterior pronotal angles with truncation equal to length of second antennal segment.

TYPE MATERIAL. Holotype: Male, Copeland, Florida, June 28, 1963, D.G. Kissinger, on **Salix** (CNC No. 15401). Allotype: Female, same data as holotype (CNC No. 15401). Both holotype and allotype are in the Canadian National Collection, Ottawa.

Paratypes: 39 specimens. UNITED STATES: **Alabama:** Spring Hill. **Florida:** Arcadia, Copeland, Elfers, Ft. Ogden, Homestead, Royal Palm Park, Oviedo, Paradise Key, Starke. **Louisiana:** Mansura, Tallulah. **South Carolina:** Yemassee. (see Map 13). Paratypes are deposited in the following collections: CNC, CU, HAHC, MCZ, RHP, USNM.

VARIATION. Size of the males ranges from 2.2 to 2.5 mm in length and from 1.1 to 1.2 mm in greatest width. Females range from 2.3 to 2.9 mm in length and from 1.1 to 1.4 mm in greatest width. In both sexes, length ranges from equal to twice the width to slightly greater than twice the width. The colour of the head, pronotum and elytra ranges from coppery-bronze to dark bronze or black. In the head, the clypeus and genae are occasionally greenish. The sides of the pronotum are generally slightly sinuous with the apical two-thirds ranging from feebly to moderately arcuate. In a few specimens, the sides are evenly, moderately arcuate. The anterior pronotal angles have the truncation slightly less than to equal to the length of the second antennal segment. The major punctation of the pronotal disc is generally somewhat coarse, the size of the major punctures ranging from moderate to coarse with the latter about equal to the size of the basal serial punctures of the elytra. Punctures in the pronotal interspaces range in size from minute to about one-half the diameter of the major punctures.

In females, spermathecae range from 0.15 to 0.16 mm in length and are similar to Fig. 49.

REMARKS. Although distinctly different in some characters, **bella** appears to be most closely related to **aereola** and **populivora.** All three species are very similar in the pattern of pubescence on the first abdominal sternum in males, the shape of the male genitalia, and in the general shape of the spermatheca.

14. **Crepidodera aereola** (LeConte) new combination

Figs. 3, 7, 30, 50; Map 14.

Haltica aereola LeConte 1857, p. 68 (type locality, San Francisco, California).
Crepidodera helxines (L.); Crotch (misidentification) 1873, p. 71 (in part); Hamilton 1889, p. 149; Horn 1889, p. 316; Hamilton 1894, p. 399; Duckett 1920, p. 149.
Chalcoides helxines (L.); Beller and Hatch 1932,p. 128, 129 (in part).
Chalcoides fulvicornis (Fabr.); Heikertinger and Csiki (misidentification) 1939, p. 320 (in part).
?Chalcoides fulvicornis nana (Say); Heikertinger 1948-1950, p. 110 (fig.), 115, 136-137 (in part); Lazorko 1974, p. 148 (fig.), 152.

DIAGNOSIS: Anterior pronotal angles strongly produced, outer corners acutely pointed; pronotum with dense, irregularly distributed, very coarse punctation (Figs. 7, 3); males with the median pubescence of the first abdominal sternum longer and more conspicuous than in females, pubescence uniformly dense, not forming a brush.

TYPE MATERIAL. Lectotype, designated here: Female, with a circular gold label which denotes California, a red label "type 8258"

and the following labels: "**A. (C.) aereola** Lec. S. Fr."/"Lectotype ♀, **Crepidodera aereola** (Lec.), R.H. Parry, 1976". This specimen is in the LeConte Collection, Museum of Comparative Zoology, Harvard University. The lectotype is accompanied by a male and a female specimen, each with a circular gold label. These are evidently syntypes. In addition, the LeConte Collection contains two females labelled "Cal." and a male with no label. These are similar to the lectotype but are probably not part of the type series.

MATERIAL EXAMINED: 474 specimens. UNITED STATES: **California:** Nevada, Oregon, Utah, Washington, Wyoming. (see Map 14). Specimens are deposited in the following collections: CAS, CSCA, CU, FMNH, MCZ, OSU, USNM.

REMARKS. Although easily distinguished by some of the characters given in the diagnosis, **aereola** appears to be most closely related to **bella** and **populivora** in having a similar pattern of pubescence on the first abdominal sternum in males, similar male genitalia, and a generally similar spermatheca.

15. **Crepidodera sculpturata** (Lazorko) new combination
Figs. 4, 11, 12, 31, 51; Map 15.

Chalcoides sculpturata Lazorko 1974, p. 148 (fig.), 149, 150, 152 (type locality, Creston, British Columbia).

DIAGNOSIS: Dorsal surface bright green, blue-green, brassy-green or coppery-green; shape elongate; major pronotal punctures moderate to coarse in size; elytral declivity evenly rounded; lateral margins of elytra narrow in dorsal view, visible for their entire length; males with median pubescence of first abdominal sternum longer, denser and more conspicuous than in females, not forming a brush; median lobe of male genitalia evenly arcuate in lateral view.

TYPE MATERIAL. Holotype: Male, Creston, British Columbia, May 29, 1949, host **Salix exigua,** G. Stace Smith (University of British Columbia Coll.). Allotype: Female, Creston, British Columbia, June 13, 1952, ex **Salix exigua,** G. Stace Smith (University of British Columbia Coll.). Paratypes, 6 males, 8 females, Creston, British Columbia, G. Stace Smith (University of British Columbia Coll.).

Only the holotype and allotype were examined. Lazorko (1974) gives the date of collection of the holotype as "29 May 1959". This is slightly in error as the year given on the specimen label of the holotype is 1949.

MATERIAL EXAMINED: 478 specimens. CANADA: British Columbia, Manitoba, Ontario. UNITED STATES: Colorado, Idaho, Illinois, Indiana, Iowa, Kansas, Michigan, North Dakota, Oregon, South Dakota, Utah, Washington, Wisconsin. (see Map 15). Specimens are deposited in the following collections: CAS, CNC, CU, FMNH, HAHC, MCZ, OSU, SDSU, UBC, USNM.

REMARKS. The variation in the colour of the dorsal surface in this species is evident within series of specimens from single localities as well as among specimens from different localities. The majority of specimens are bright green with those from British Columbia, Washington and Oregon tending to be blue-green.

There is some variation in the punctation of the pronotum. The size of the major pronotal punctures ranges among specimens from uniformly moderate, smaller than the basal serial punctures of the elytra to uniformly coarse, about equal to the size of the basal serial punctures. The size also ranges from moderate to coarse within individual specimens. In some males, the tip of the median lobe is not as strongly broadened as in Fig. 31.

The external characters given in the diagnosis will separate **sculpturata** from all the other North American species except, possibly, **nana** and **opulenta.** It can usually be distinguished from **nana** by the slightly narrower elytral margins and from both species by the pronotum appearing slightly more convex or swollen anteriorly. Males can usually be separated from those of **opulenta** by the lack of a distinct brush in the pubescence of the first abdominal sternum. Western specimens of **nana** and some specimens of **opulenta** are very similar in appearance to **sculpturata** and it is often difficult to separate them. However, the shape of the male genitalia (Fig. 31) and female spermatheca (Fig. 51) will readily distinguish **sculpturata** from these and all other species.

16. **Crepidodera nana** (Say)
Figs. 32, 52; Map 16.

Altica nana Say 1824, p. 86 (type locality, United States).

Haltica nana (Say); Melsheimer 1847, p. 165.

Haltica helxines (L.); LeConte (misidentification) 1858, p. 87 (var. **nana** Say).

Crepidodera helxines (L.); Crotch (misidentification) 1873, p. 71 (in part);

LeConte 1874, p. 271; Hamilton 1889, p. 149; Horn 1889, p. 316; Hamilton 1894, p. 399; Duckett 1920, p. 149.

Chalcoides fulvicornis nana (Say); Heikertinger 1911, p. 9 (fig.), 10, 19; 1924-1925, p. 67; Heikertinger and Csiki 1939, p. 320.

Chalcoides helxines (L.); Leng (misidentification) 1920, p. 300 (in part); Beller and Hatch 1932, p. 128, 129.

Chalcoides chittendeni Heikertinger 1948-1950, p. 110 (fig.), 116, 136 (type locality, "Kahokia", Illinois); Lazorko 1974, p. 146, 148 (fig.), 151, 153. NEW SYNONYMY.

Chalcoides nana (Say); Wilcox 1954, p. 455; Dillon and Dillon 1961, p. 712.

Crepidodera nana (Say); Hatch 1971, p. 219; Balsbaugh and Hays 1972, p. 156.

DIAGNOSIS: Dorsal surface generally green or greenish with brassy, bronze, coppery or blue tones, occasionally coppery-red, coppery-bronze to dark bronze, rarely pure blue; shape elongate-oval; anterior pronotal angles feebly produced; major pronotal punctures moderate to coarse in size; elytral declivity evenly rounded; elytral disc at most only very feebly depressed behind basal one-quarter; lateral margins of elytra, in dorsal view, moderately broad in eastern specimens, generally narrower in western specimens; males with median pubescence of first abdominal sternum longer and more conspicuous than in females, denser apically forming a distinct, well-defined brush in eastern specimens, a poorly-developed or obsolete brush in western specimens; median lobe of male genitalia not arcuate but straight in apical two-thirds in lateral view.

TYPE MATERIAL. Neotype: Here designated, Male, with the labels "Knoxville, Tenn., V-20-1957, W.J. Brown"/"on **Salix**" /"Neotype, ♂, **Crepidodera nana** (Say), R.H. Parry". This specimen is in the Canadian National Collection, Ottawa.

The original type material of this species has been lost. Because Say's (1824) original description could apply to several of the North American species, there had been much confusion in the identity of **nana** (Say). Heikertinger (1911) illustrated the distinctive male genitalia of the species described above and referred this form to **nana** (Say) but considered it a subspecies of the European species **fulvicornis** (Fab.). He later (1948-1950) recognized this North American form as a new species which he described as **Chalcoides chittendeni.** In order to end all previous confusion, it seems best to consider this species as being **nana** (Say), as Heikertinger first suggested in 1911, and to designate a neotype.

The neotype is 2.8 mm long and 1.3 mm in greatest width; it has the head, pronotum and elytra brassy-green in colour, the antennae and legs entirely rufotestaceous, the major pronotal punctures moderately dense and moderate to coarse in size, the lateral elytral margins moderately broad in dorsal view, the first abdominal sternum medially with a conspicuous well-defined apical brush of setae, the median lobe of the genitalia tapered apically except slightly broadened at the apex in dorsal view, and the tip of the median lobe subtruncate.

MATERIAL EXAMINED: About 2000 specimens. CANADA: **Alberta:** Calgary, Edmonton, Kimball, Lethbridge, Magrath, McMurray, Medicine Hat, Milk R., Oldman River Lethbridge, Onefour, Scandia, Waterton. **British Columbia:** Lum and Abner 58°N Alaska Hwy., Creston, Hatzic, Kamloops, Mission City, Similkameen R. 7 mi. S. Cawston. **Manitoba:** Carberry, Glenboro, Herchmer, The Pas. **New Brunswick:** Bathurst, Oakville. **Northwest Territories:** Fort Liard, Fort Simpson, Norman Wells. Ontario: Ancaster, Delhi, Eden, Moose Factory, Moosonee, Walsingham. **Quebec:** Cascapedia, Gaspe, South Bolton. **Saskatchewan:** Battle River, Elbow, Esterhazy, Pennant, Saskatchewan Landing, Saskatoon. UNITED STATES: **Colorado:** nr. Cameo, Denver, 2 mi. w. Granby, Ladore Canyon 5000-6000 ft. **Connecticut:** Cornwall. **District of Columbia:** Anacostia, Rock Creek Pk., Washington, Woodridge. **Georgia:** Peach Co. **Illinois:** Cairo, Chandlerville, Grand Tower Union Co. (? Jackson Co.), LaSalle Co., St. Clair Co. **Indiana:** Leavenworth, New Harmony. **Iowa:** Clinton, DeWitt, Iowa City, Keokuk, Muscatine, Solon. **Kansas:** Lawrence, McPherson, Medora, Topeka. **Kentucky:** Morehead. **Louisiana:** Mansura, Shreveport. **Maine:** Ft. Kent. **Maryland:** Baltimore, Beltsville, Bladensburg, Cabin John, Chevy Chase, College Park, Glen Echo, Kensington. **Massachusetts:** Attleboro, Boston Arnold Arboretum, Sherborn. **Mississippi:** Meridian. **Missouri:** Scott Co., 2 mi. E. Sikeston, 2 mi. W. St. Louis. **Montana:** Gallatin Co. 4800 ft. **Nebraska:** Omaha Child's Point, Waterloo. **New Jersey:** Clementon, Colonia, Dundee L., Elizabeth, Kingston, Lake Hopatcong, Ocean Co., Riverton. **New Mexico:** Jemez Mts., Mesilla Prk. **New York:** Buffalo, Chenango Co., Great Kills S.I., Ithaca, Lancaster, New York Van Cortland Pk. **North Carolina:**

Abbotsburg, Anson Co., Franklin 2000 ft., Highlands 3800 ft., Raleigh, Richmond Co., Southern Pines, Wayah Gap. **North Dakota:** 13 mi. W. Medora, Heart Butte Dam Grant Co. **Ohio:** Ashtabula, Ashville Pickaway Co., Buckeye Lake Licking Co., Cedar Swp., Clinton Co., Columbus, Delaware Co., Ironton, Marion Co. **Oaklahoma:** Norman, Oklahoma Co. **Oregon:** Corvallis, Hood River. **Pennsylvania:** Allegheny Co., Castle Rock, Easton, Glenolden, Harrisburg, Kennett Sq., Lancaster, Philadelphia, Phila. Neck, Reading, W. Park, Wissinoming, Wyoming Philadelphia. **South Carolina:** Aiken, Calhoun Falls, Clemson Honeycut Creek Seneca River, Greenwood Co., Newry Oconee Co. 900 ft. Yemassee Rt. 17 bridge. **South Dakota:** Badlands Interior, Beresford, Cedar Canyon, Chamberlain, Elk Point, Fort Pierre, Ft. Thompson, Highmore, Newell, Philip, Pierre, Spearfish, Springfield, Tabor Grainery, Union Co. State Park, Vermillion, Yankton. **Tennessee:** Knoxville, Oak Ridge A.E.C. Area, Rhea Co. **Texas:** Austin, Brownsville, Burnet Co., Cameron Co., Dallas, Devils Riv., El Paso, Gillespie Co., Kerrville, Presidio, Val Verde Co., Victoria, Welder Wildlife Ref. nr. Sinton San Patricio Co. **Virginia:** ? Alex. Co., Arlington, Bull Run, Fairfax Co., Fredericksburg, Glencarlyn, Penington Gap, Potmac Cr., Rosslyn, Stone Cr. Lee Co. **West Virginia:** East Panhandle, Fairmont, W. Sulphur. **Wyoming:** Pine Bluff. (see Map 16).

REMARKS. This species exhibits considerable variation. The colour of the dorsum varies greatly, both geographically and within many local populations. In eastern populations ranging from New Brunswick, southern Quebec and southern Ontario to Georgia, Indiana and Mississippi, the head, pronotum and elytra are generally pure green to blue-green and occasionally brassy-green or pure blue. In greenish specimens, the pronotal and elytral margins are often bluish. A series of specimens from Gaspe, Quebec ranges from coppery-green or cupreo-aeneous to coppery-red with greenish margins. Similarly, specimens from northern Ontario, Manitoba, Saskatchewan and Alberta are brassy-green, coppery-green or cupreo-aeneous to pure coppery or coppery-red in colour, rarely pure green. This range of colour variation also occurs southward in Montana, Wyoming, South Dakota and Colorado. Specimens from western Northwest Territories, British Columbia and Oregon have the dorsum generally brassy-green, coppery-green or cupreo-aeneous, occasionally pure green but rarely pure coppery. In populations from the central United States, from Illinois to Nebraska and south to Louisiana, Texas and New Mexico, specimens are generally dark coppery or coppery-bronze to dark bronze or dark purple, occasionally bronze-green and rarely cupreo-aeneous. Specimens from southwestern Texas (El Paso, Presidio) and a few from New Mexico tend to be more greenish, ranging from cupreo-aeneous to pure green. A large species from south-central Texas (Kerrville) containing mainly coppery-bronze to dark bronzespecimens, includes also a few dark blue or blue-green individuals. These occur with a frequency of about 11%. The coppery-bronze or dark bronze colour variant also extends into southern Manitoba, South Dakota and Colorado.

There is some geographical variation in the punctation of the pronotum. Specimens from western Canada and northwestern United States generally have the major punctures denser and both major and minor punctures slightly coarser than in specimens from eastern Canada and United States and midwestern and southern United States. The width of the elytral margins also varies geographically. The green or blue-green eastern specimens have the margins moderately broad in dorsal view. In all other populations, the lateral elytral margins are generally narrower, only occasionally moderately broad. A similar geographical pattern of variation occurs in the pubescence of the first abdominal sternum in males. In eastern populations (as defined above), males have the setae of the first abdominal sternum denser apically, usually forming a distinct, well-defined brush. In males of populations in northern and western Canada and in the central and western United States, the brush of setae ranges from poorly-developed to obsolete.

The external characters given in the diagnosis should separate **nana** from all the other species except **vaga, decora, luminosa, opulenta** and, possibly, **solita** and **sculpturata.** Males and females of **nana** can be distinguished from some of these species by characters given in their respective diagnoses but are most easily separated by the distinctive male genitalia (Fig. 32) and female spermatheca (Fig. 52).

Incertae Sedis

Crepidodera bicolor Boheman 1859
Crepidodera puberella Boheman 1859
Crepidodera suturella Boheman 1859
Crepidodera vafra Boheman 1859

In 1859, Boheman described as

Crepidodera a number of species taken during the 1851-1853 voyage of the Swedish frigate "Eugenie". These included **C. vafra** from "California (St. Francisco)", C. **suturella** from "California (St. Francisco), Insula Puna", C. **bicolor** from "California (St. Francisco), Taiti", and **C. puberula** from "Montevideo, California, Insulae Puna, Taiti et Oahu". These names were apparently not noticed and not referred to by North American authors until 1889 when Horn pointed them out and made the following comment:

> The localities of the Eugenies Resa material are notoriously badly mixed, and no reliance can be placed upon them. As I have been unable to identify them, notwithstanding all the collecting that has been done in California I think it best to omit them from our lists.

Confusion in the labelling of some of the "Eugenies Resa" specimens was also reported by Smith and Lawrence (1967) who found, for example, that two species of **Diabrotica** listed by Boheman (1859) as from "California (St. Francisco)" are actually Ecuadorian forms. They also pointed out that "Insulae Puna" and "Taiti" (Paiti) are locaïities in Ecuador.

I have not seen Boheman's types but, after careful examination of his descriptions, I am very doubtful that his species belong in the genus **Crepidodera.** Since the distributions given for some of these species are unusual, it is also possible that specimens were mislabelled. Therefore, it is probably best to regard these species, supposedly from California, as "incertae sedis".

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The abbreviations in parentheses in the above list are those used in the text when citing material examined.

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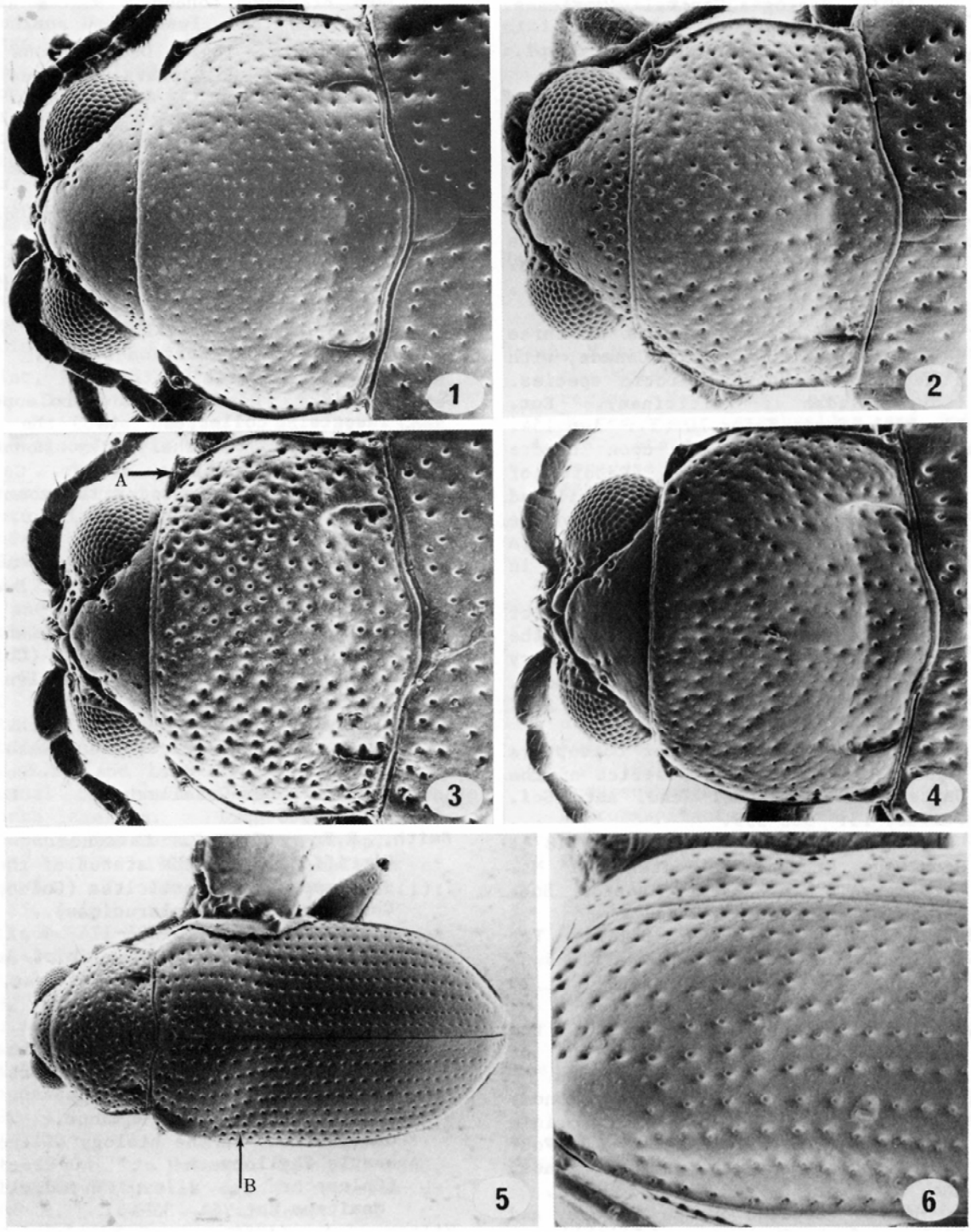


Fig. 1. **Crepidodera violacea** Melsheimer. Male, head and pronotum. Fig. 2. **C. bella** n. sp. Male, head and pronotum. Fig. 3. **C. aereola** (LeConte). Male, head and pronotum; (A) Anterior pronotal angle. Fig. 4. **C. sculpturata** (Lazorko). Male, head and pronotum. Figs. 5, 6. **C. bella** n. sp. 5. Male, dorsal habitus; (B) Elytral depression. 6. Male, dorsal lateral view of elytral depression.

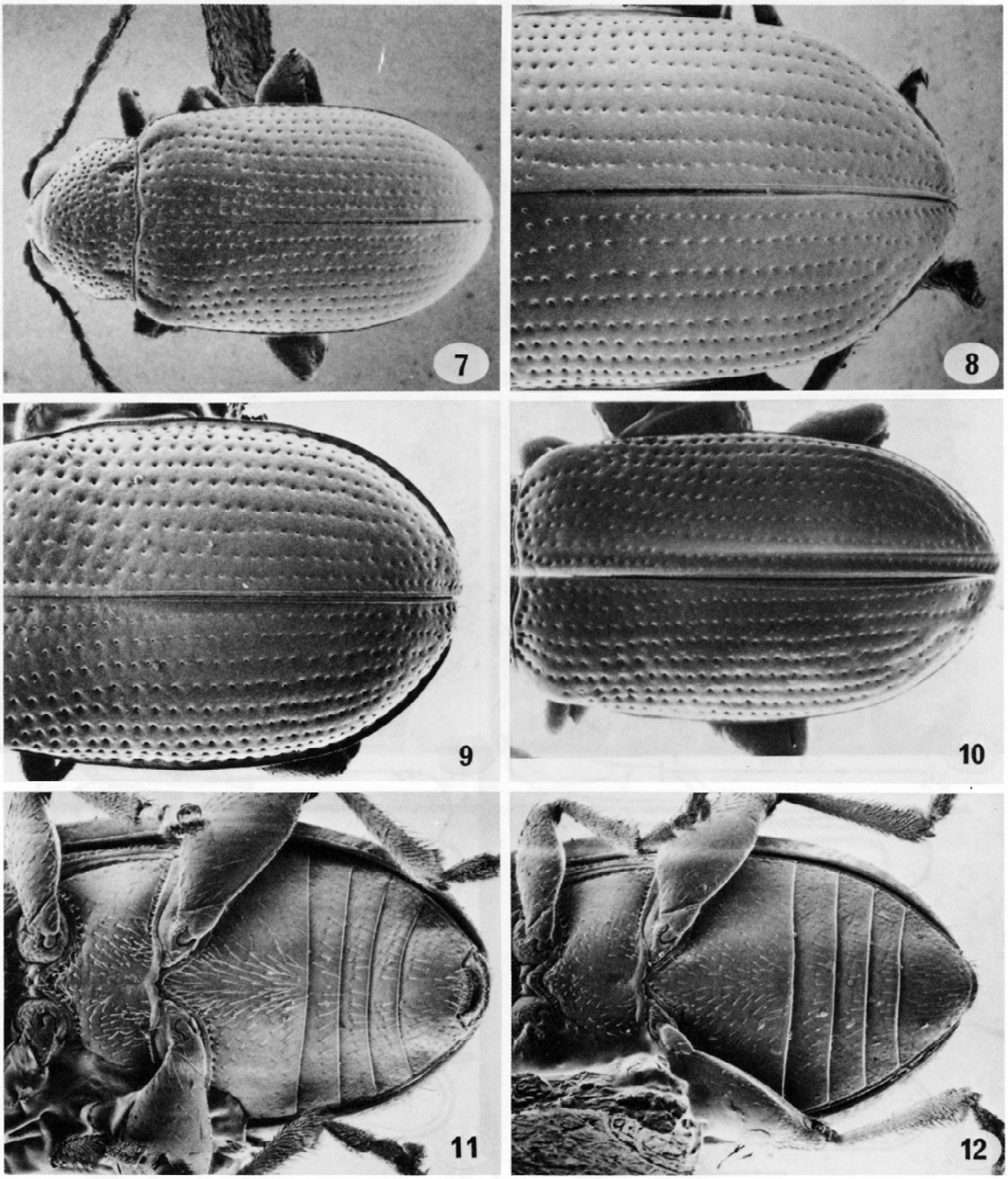


Fig. 7. **Crepidodera aereola** (LeConte). Male, habitus view. Fig. 8. **C. browni** n. sp. Male, holotype, dorsal view of elytra. Fig. 9. **C. heikertingeri** (Lazorko). Male, dorsal view of elytra. Fig. 10. **C. luminosa** n. sp. Male, dorsal view of elytra. Figs. 11, 12. **C. sculpturata** (Lazorko). 11. Male, ventral view. 12. Female, ventral view.

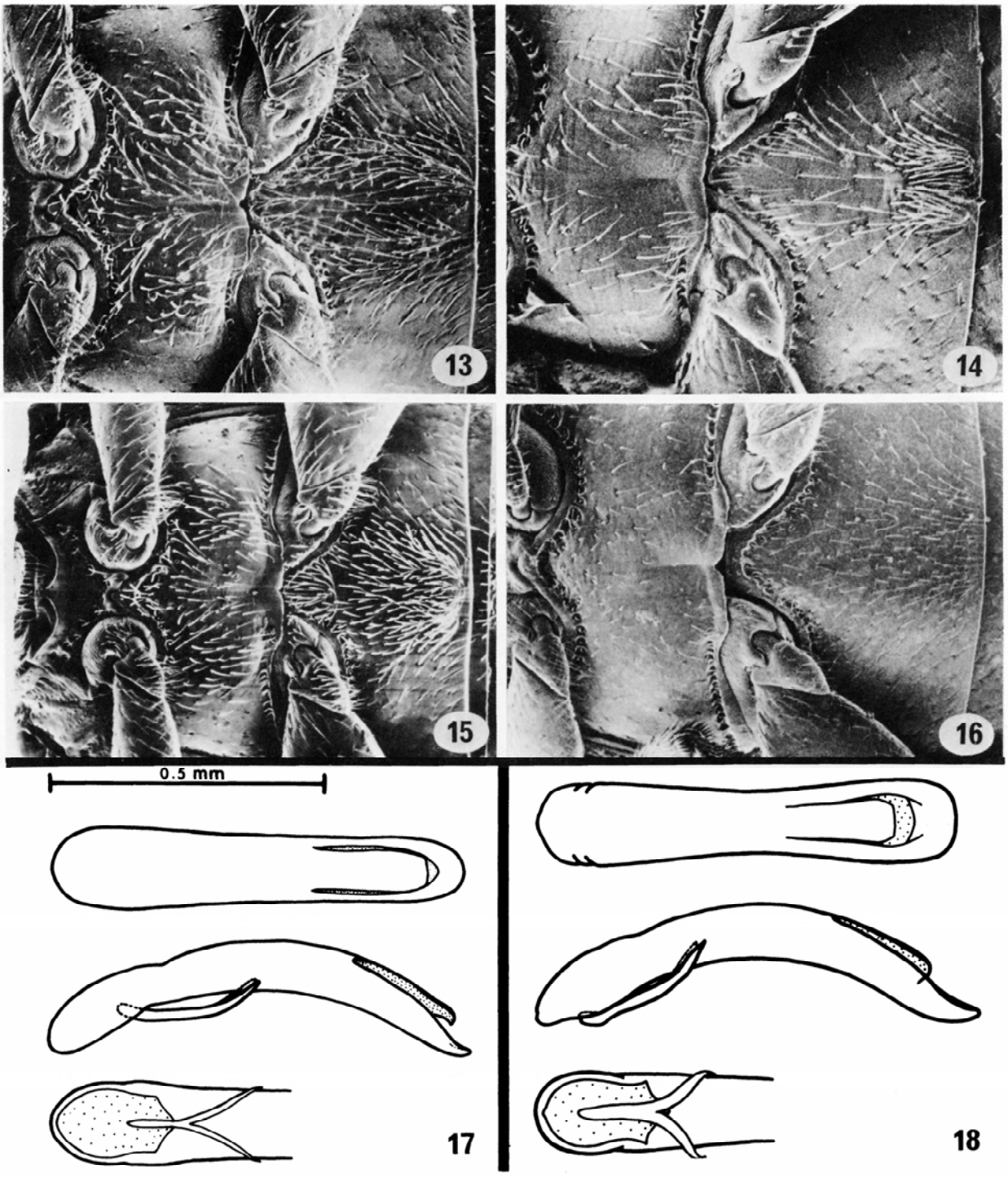


Fig. 13. **Crepidodera digna** n. sp. Male, ventral view of metasternum. Fig. 14. **C. solita** n. sp. Male, ventral view of metasternum. Fig. 15. **C. heikertingeri** (Lazorko). Male, ventral view of metasternum. Fig. 16. **C. digna** n. sp. Female, ventral view of metasternum. Fig. 17. **C. longula** Horn and Fig. 18. **C. violacea** Melsheimer. Male genitalia, dorsal, left lateral, and ventral view of median lobe and tegmen.

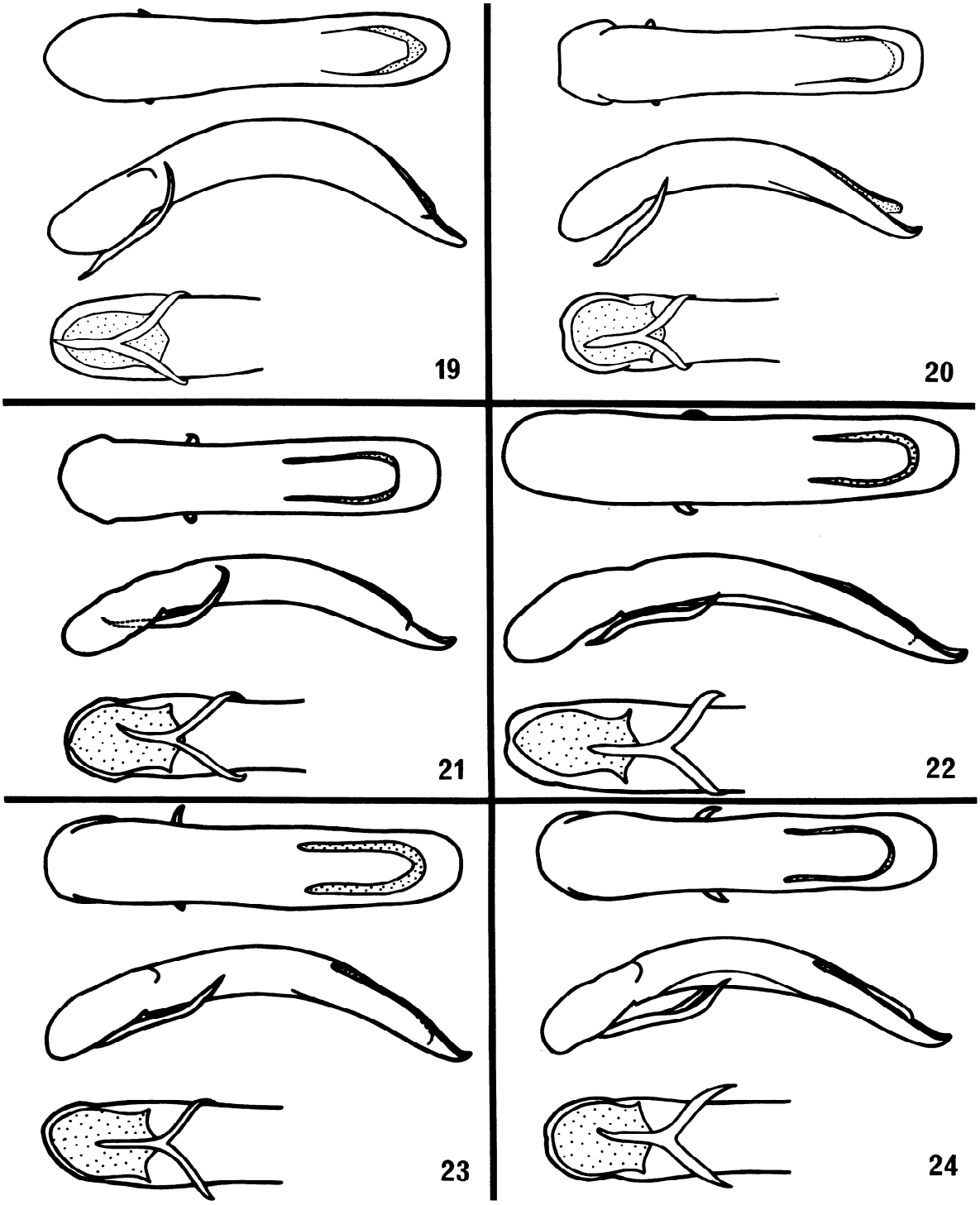


Fig. 19. **Crepidodera spenderi** (Lazorko); Fig. 20. **C. solita** n. sp.; Fig. 21. **C. decora** n. sp.; Fig. 22. **C. browni** n. sp.; Fig. 23. **C. opulenta** (LeConte); Fig. 24. **C. luminosa** n. sp.; Male genitalia, dorsal, left lateral, and ventral view of median lobe and tegmen.

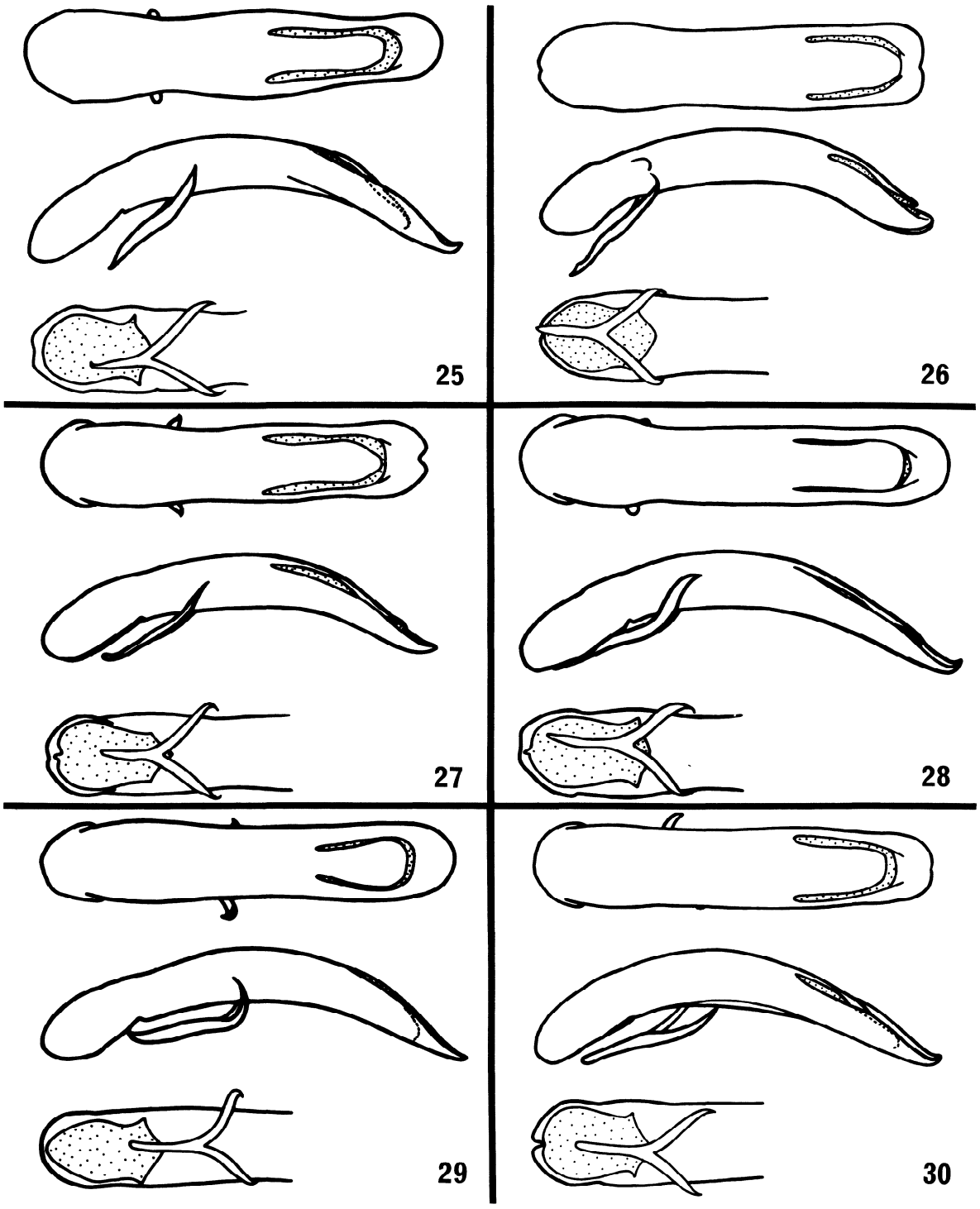


Fig. 25. **Crepidodera vaga** n. sp.; Fig. 26. C. **heikertingeri** (Lazorko); Fig. 27. **C. digna** n. sp.; Fig. 28. C. **populivora** n. sp.; Fig. 29. C. **bella** n. sp., holotype; Fig. 30. C. **aereola** (LeConte); Male genitalia, dorsal, left lateral, and ventral view of median lobe and tegmen.

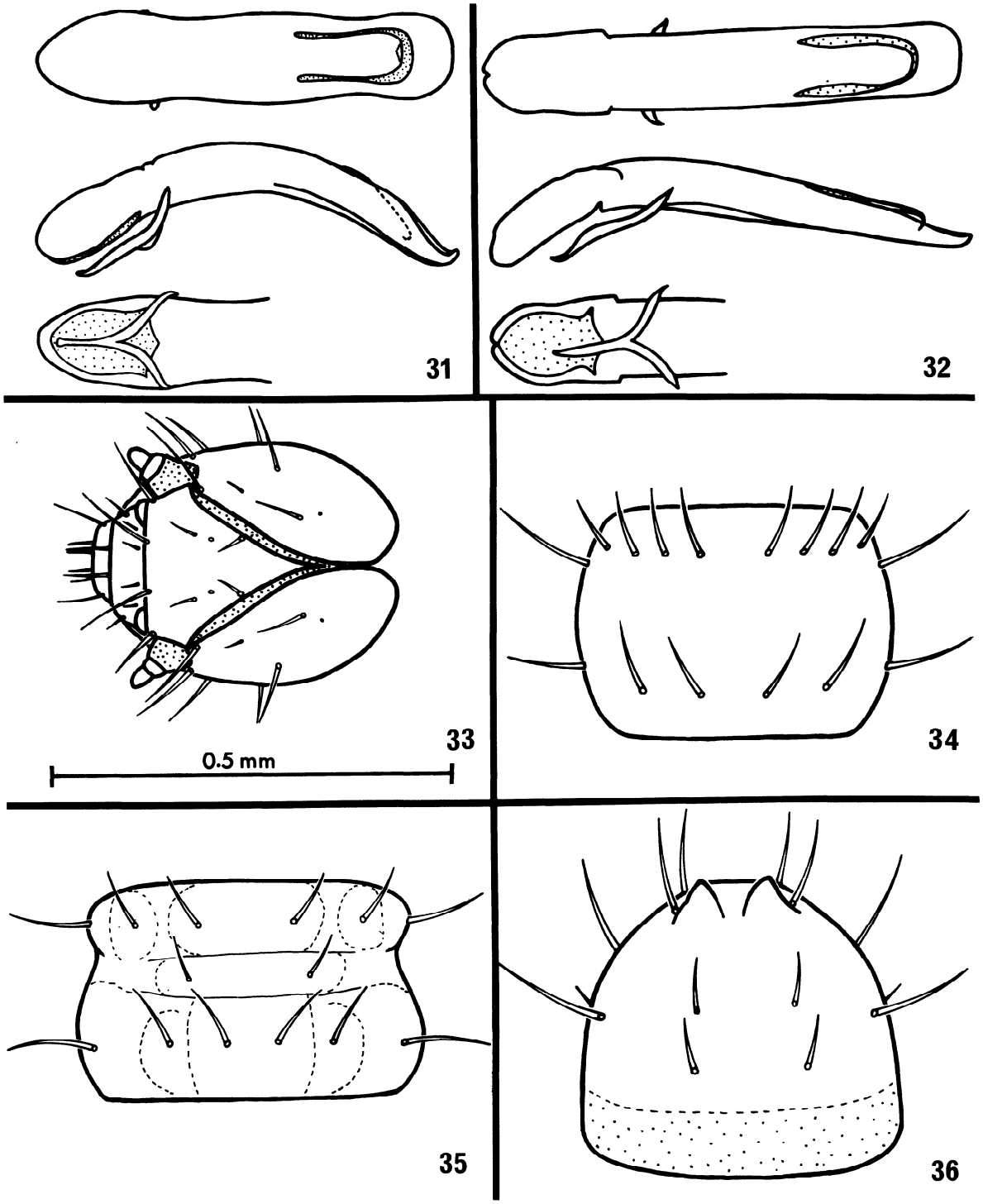


Fig. 31. **Crepidodera sculpturata** (Lazorko); Fig. 32. C. **nana** (Say); Male genitalia, dorsal, left lateral, and ventral view of median lobe and tegmen. Figs. 33-36. C. **heikertingeri** (Lazorko); third instar larva. 33. Dorsal view of head. 34. Dorsal view of prothorax. 35. Dorsal view of typical abdominal segment. 36. Dorsal view of anal plate (9th abdominal tergum).

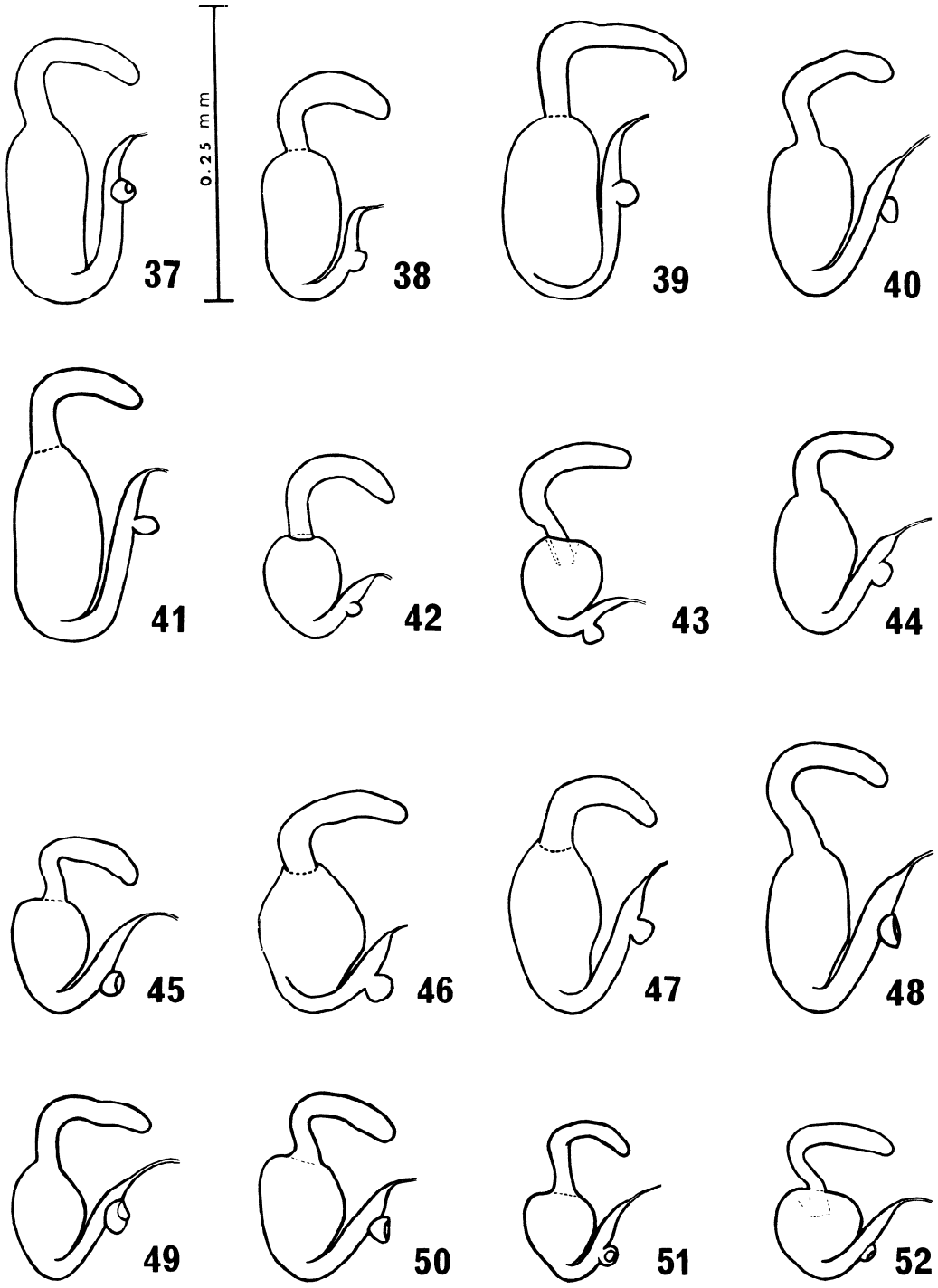
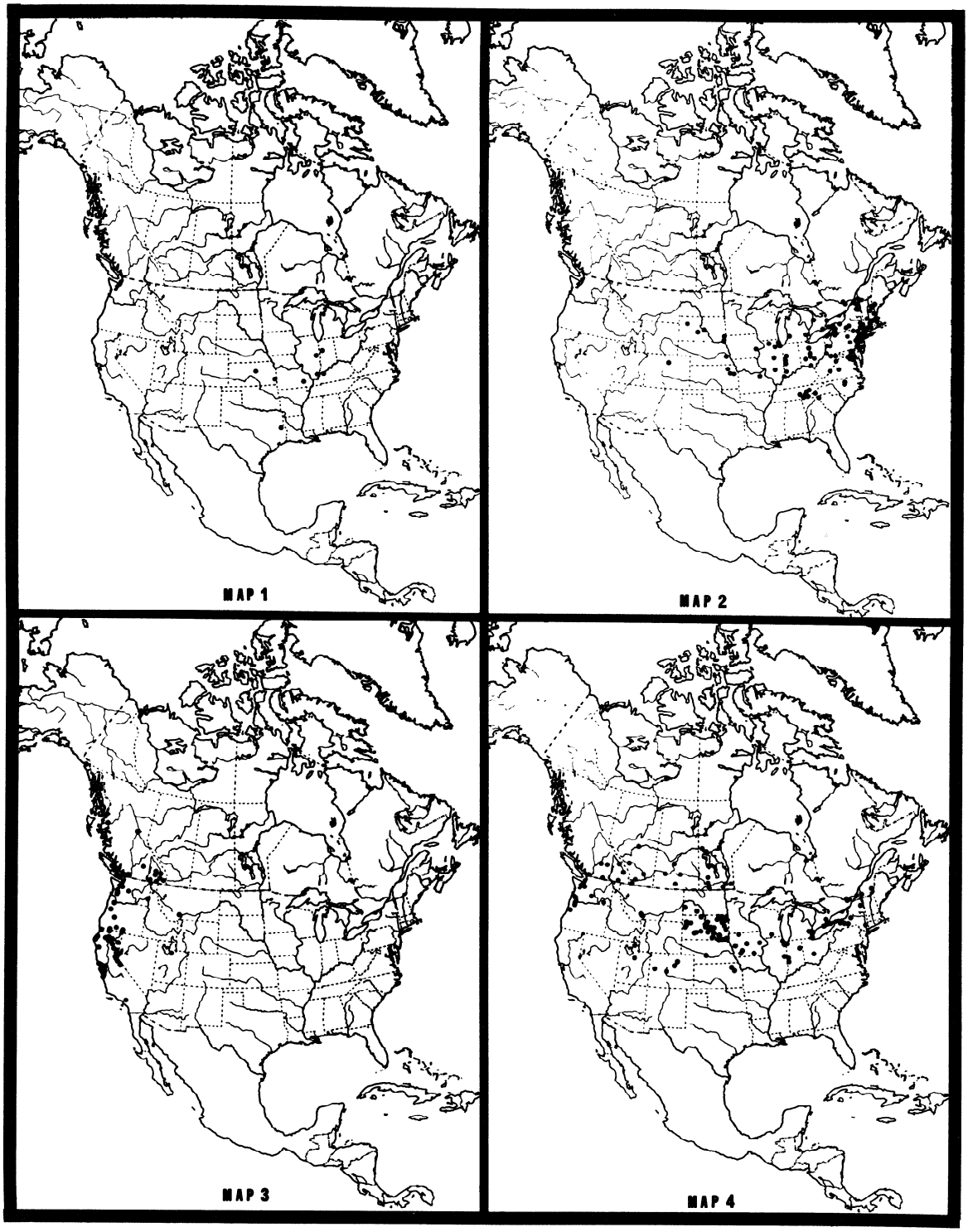
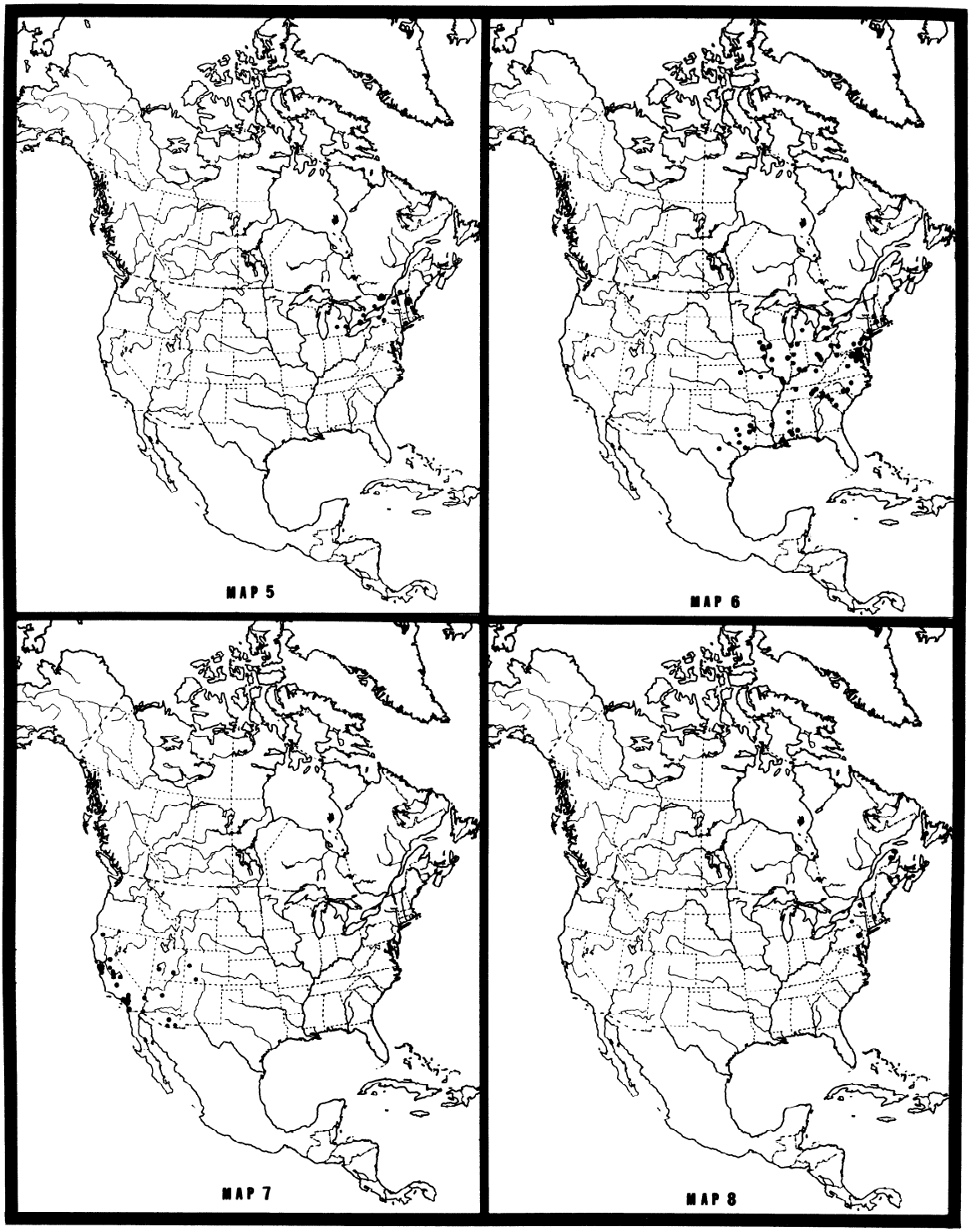


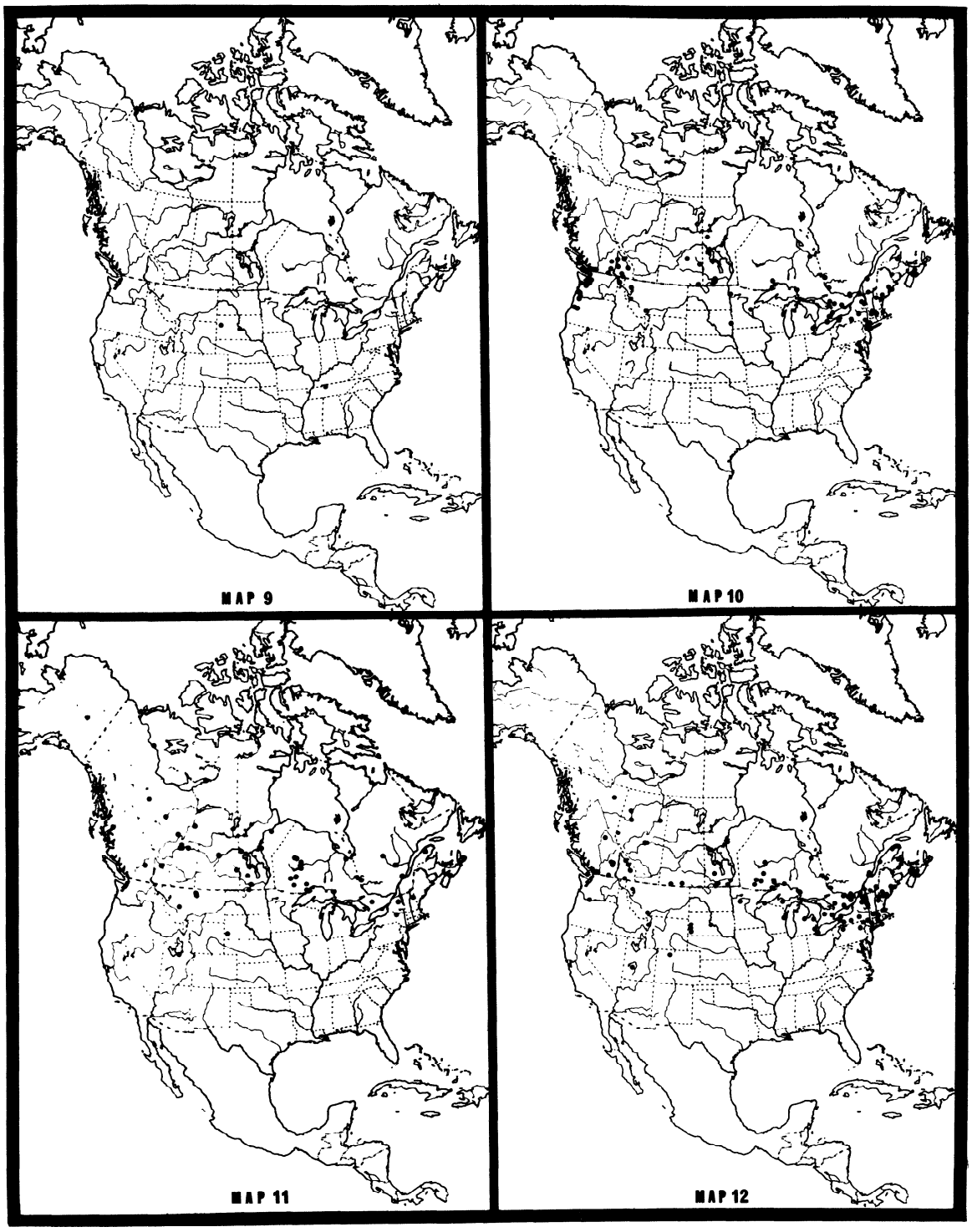
Fig. 37. **Crepidodera longula** Horn; Fig. 38. C. **violacea** Melsheimer; Fig. 39. C. **spenceri** (Lazorko); Fig. 40. C. **solita** n. sp.; Fig. 41. C. **decora** n. sp.; Fig. 42. C. **browni** n. sp.; Fig. 43. C. **opulenta** (LeConte); Fig. 44. C. **luminosa** n. sp.; Fig. 45. C. **vaga** n. sp.; Fig. 46. C. **heikertingeri** (Lazorko); Fig. 47. C. **digna** n. sp.; Fig. 48. C. **populivora** n. sp.; Fig. 49. C. **bella** n. sp.; Fig. 50. C. **aereola** (LeConte); Fig. 51. C. **sculpturata** (Lazorko); Fig. 52. C. **nana** (Say); Spermathecae, lateral view.



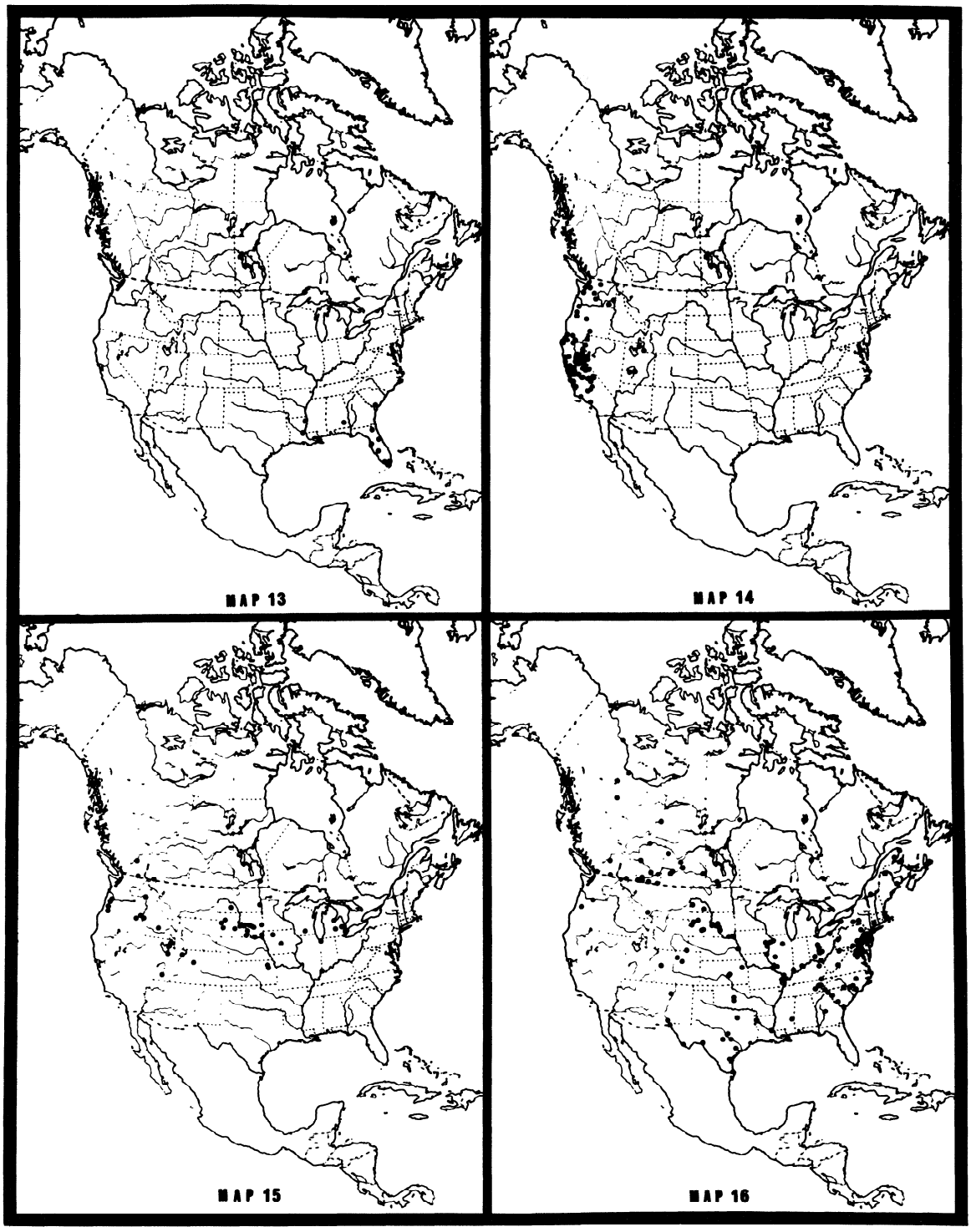
Distributions of: Map 1. **Crepidodera longula** Horn. Map 2. **C. violacea** Melsheimer. Map 3. **C. spenderi** (Lazorko). Map 4. **C. solita** n. sp.



Distributions of: Map 5. **Crepidodera decora** n. sp. Map 6. **C. browni** n. sp. Map 7. **C. opulenta** (LeConte). Map 8. **C. luminosa** n. sp.



Distributions of: Map 9. **Crepidodera vaga** n. sp. Map 10. **C. heikertingeri** (Lazorko). Map 11. **C. digna** n. sp. Map 12. **C. populivora** n. sp.



Distributions of: Map 13. **Crepidodera bella** n. sp. Map 14. **C. aereola** (LeConte). Map 15. **C. sculpturata** (Lazorko). Map 16. **C. nana** (Say).