STUDIES ON NEARCTIC NEGASTRIUS (COLEOPTERA: ELATERIDAE)

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ABSTRACT.—New species descriptions of *Negastrius rupicola* from California, Oregon, Washington, and British Columbia; *N. stibicki* from California, Montana, and British Columbia; *N. solox* from Arizona and New Mexico; and *N. atrosus* from Ontario and Quebec are given. *Negastrius colon* is returned to species status, and a neotype is designated for *N. choris. Fleutiauxellus extricatus* is a new combination. A key is provided to Nearctic species of *Negastrius*.

Key words: Negastrius, Elateridae, holotype, paratype, neotype.

HISTORY

Negastrius was established in the family Elateridae by Thomson (1859) to distinguish those species of Cryptohypnus Eschscholtz having arcuate prosternal sutures from species with straight or double sutures. Candeze (1860) did not use Thomson's assignments and placed all Negastrius species in Cryptohypnus. Horn's (1891) monograph of the species of Cryptohypnus of Boreal America rejected the name Negastrius and included all North American forms into 9 groups within the genus Cryptohypnus. Horn's choris group included N. delumbis (Horn), N. choris (Say), N. exiguus (Randall), and N. ornatus (LeConte), which were equivalent to Thomson's Negastrius. Schwarz (1906) included Negastrius and Cryptohypnus with the genus Hypnoidus Stephens in the tribe Hypnoidini. Leng (1920) also placed all species, except N. exiguus, in the genus Cryptohypnus. Using mesosternal characters, Nakane and Kishii (1956) made the distinction between the subfamilies Negastriinae and Hypolithinae (which they synonymized under the Ctenicerinae). Arnett (1963) recognized only the genera Negastrius and Oedostethus LeConte in the Negastriinae from North America. Stibick (1971) recognized or established Neohupdonus Stibick, Migiwa Kishii, Oedostethus, Fleutiauxellus Mequignon, Negastrius, Zorochrus Thomson, and Paradonus Stibick from North America. He restricted Negastrius to those species with coarse pronota, single prosternal sutures, and species with the 2nd and 3rd antennal segments equivalent in length. Later, Kishii (1976) erected *Microhypnus*, to which Stibick (1991) assigned the single North American species of *M. striatulus* (LeConte).

DISCUSSION OF CHARACTERS

With the exception of the Cardiophorinae, the subfamily Negastriinae is distinguished from other subfamilies of Elateridae by having the meso- and metasterna adjacent and separating the mesocoxal cavity from the mesepimeron and mesepisternum. The Negastriinae is distinguished from the Cardiophorinae by possession of a pointed prosternal process, which is shortened and truncated in the Cardiophorinae. Within the Negastriinae, Negastrius is apparently most closely related to the genus Microhypnus, both genera having a strigate and/or rugose pronotum. Following Stibick's (1971) presumed natural affinities, the sister group of Negastrius could be any of the North American genera, except Paradonus, which is more closely related to the Old World species of Thurana Stibick and Optitarynus Stibick, both of which are without externally visible elytral striae. Zorochrus is distinguished from Negastrius by the double prosternal sutures and/or by the arcuately extended pronotum that projects over the head. In addition, the pronotum in Zorochrus is more coarsely granulate on the anterior half. Fleutiquxellus differs from the other genera of Negastriinae by having the 3rd antennal segment nearly twice as long as the 2nd. The genus Neohypdonus is

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separated from *Negastrius* by a smooth to slightly punctate pronotum that is often shiny (Wells 1991). *Oedostethus* is distinguished from *Negastrius* by having a flange on the tarsal claws.

Horn's (1891) key to Negastrius (sensu stricto) used leg and antennal coloration, pronotal carinae, and lateral and dorsal profiles of individuals to separate the 4 North American species known to him (N. choris, N. delumbis, N. exiguus, and N. ornatus). The strongly arched profile and the short submarginal pronotal carinae of N. delumbis are characters useful only in distinguishing that species. Horn's other characters are too variable to be useful in distinguishing species. The most valuable characters in comparing species and species groups include the shape of the scutellum and the relief of the anterior portion of the interstriae. These characters readily distinguish all North American species except N. solox, N. ornatus, and N. colon. These species are separated by the substrigose ridges on the prosternum and by the curvature of the posterior margin of the prosternum.

Both male and female genital characters have been used by Stibick (1991) to separate species. Slight differences do exist in the length and position of the setae on the parameres and in the thickness of the base of the aedeagus; however, these differences are as pronounced intraspecifically as they are interspecifically. On average, over 20 terminalia (per sex) were dissected per species in this study, except *N. solox* for which only 2 specimens were available. None of the species contained consistent patterns that would be of taxonomic use, except *N. nadezhdae*, which has a slightly angled tip of the aedeagus (Fig. 17).

CLASSIFICATION

Negastrius Thomson

Negastrius Thomson, 1859:106. Type-species: Elater pulchellus Linnaeus, 1758, original designation.

DIAGNOSIS.—The genus *Negastrius* in North America is distinguished from other Negastriinae by the curved and simple prosternal sutures; by the rugose or granulose pronotum; and by a row of parallel setae extending from the posterior margin of the 4th abdominal sternite onto abdominal sternite 5.

DESCRIPTION.—Length 1.8–5.7 mm, width/length ratio 0.3–0.4; color golden brown to black and normally with various arrangements

of pale cuticular color patterns on the elytra. These color patterns include yellow or black maculae on the humeral angles of the elytra. Pale subapical maculae are also present on some specimens of *N. colon, N. atrosus*, and *N. ornatus*.

Head rugose to granulose; frontal carina transverse, evenly arcuate and margined between eyes, divided into 2 carinae immediately anterior to eyes; antennae short, never reaching posterior margin of pronotum; antennal segments 1–3 cylindrical, scape subequal in length to segments 2 and 3 combined, remaining segments slightly serrate; decumbent setae of antennae pale yellow to white, segments 3–11 each with 4–8 evenly distributed erect setae in addition to normal decumbent setae.

Pronotum rugose to granulose with carina of hind angle 0.2–0.8 times length of pronotum; pronotum with smooth median line from anterior margin to or near posterior margin, slightly convex to ridged; prosternal lobe extending over mouthparts; prosternal sutures single and slightly arcuate; prosternum more heavily and closely punctate than propleura; tarsi with each tarsomere progressively smaller than previous segment, except segment 5 which is subequal in length to segment 1, claws simple; scutellum punctate, gradually widening anteriorly.

Elytra elliptically narrowed posteriorly; posterior margin of abdominal sternite 4 with an even row of white to gold erect setae extending over anterior margin of abdominal sternite 5, setae more closely aligned and erect than other sternal setae.

Male genitalia with median lobe pointed and narrowed, gradually widening basally, 1.3 times longer than lateral lobes; lateral lobes straight on inner side, convex on outer apical third with 2 subapical setae. Female with bursa copulatrix membranous containing 1 anterior and 1 posterior lobe.

BIOLOGY.—North American species of *Negastrius* have been reported only in association with riparian habitats. *Negastrius delumbis* is the only species associated with coastal waters. It lives along the Atlantic seaboard north of Chesapeake Bay and south of Newfoundland. Most other species inhabit the sandy/rocky margin of streams and rivers. Adults are generally collected during the spring (except for some early records of *N. ornatus*) through early summer.

Key to the Species of North American *Negastrius*

- 1. Bases of elytral interstriae 2–5 strongly raised, forming a 90-degree angle in profile (Fig. 2); scutellum more strongly convex, anterior margin always emarginate (see Fig. 6) 2
- Base of elytral interstriae not or only slightly raised (Fig. 1); anterior margin of scutellum either emarginate (see Fig. 6) or medially extended (see Fig. 8)
- Profile of elytra rather weakly arched on basal half; bases of interstriae 3 and 4 weakly elevated, lacking tubercles; black with pale maculations; pronotal carina 0.3–0.8 times length of pronotum
- Pronotal strigosity obscure, punctures obsolete, ridges broken into rather coarse subconfluent tubercles; pronotal carina 0.6–0.8 times length of pronotum (Fig. 10); length 2.8–4.9 mm; California, Montana, and British Columbia (Fig. 14)
- 4(1). Anterior half of scutellum weakly convex, anterior border emarginate (Figs. 6, 9) 5
- Anterior half of scutellum medially elevated,
 anterior margin medially extended (Figs. 5, 8) . . 9
- 5(4). Anterior third of prosternum with 2 transverse impressions, area between margin and posterior impression with rugosities no different from rest of prosternum 6
- 6(5). Base of elytral interstria 3 elevated; prosternum convex on outer angle, equal to 0.17 length of basal margin; length 1.8–3.4 mm; northern California, Oregon, Washington, and British Columbia (Fig. 13) rupicola, n. sp.
- 7(6). Pronotum distinctly strigose, ridges narrow and long; anterior margin of scutellum only slightly emarginate, almost straight (Fig. 6); 12–16 setae on outer angle of metatibia; length 2.6–3.6 mm; northeastern U.S. west to Iowa, south to North Carolina (Fig. 12) exiguus (Randall)

- Pronotum obscurely strigose, ridges short; anterior margin of scutellum strongly emarginate (Fig. 9); 16–27 setae on outer angle of metatibia; length 2.8–5.7 mm; western United States east to Colorado (Fig. 12) colon (Horn)
- 8(5). Pronotum with 2 shiny usually impunctate areas near middle of disc; elytra black with pale markings; length 2.9–5.4 mm; southern California (Fig. 14) ornatus (LeConte)
- Prosternum without shiny or impunctate areas on disc; elytra brown without pale markings; length 3.5 mm; Arizona and New Mexico (Fig. 13) solox, n. sp.

- 10(9). Color brown with light bands or other patterns on elytra; scutellum more strongly pointed anteriorly (Fig. 5); length 2.5–3.9 mm; eastern U.S. and Canada west to North Dakota and Alberta (Fig. 14) arnetti Stibick
- Color black with 0, 2, or 4 pale elytral maculations; scutellum only slightly pointed anteriorly (Fig. 8); length 2.6–4.8 mm; Ontario and Quebec (Fig. 12) atrosus, n.sp.

Negastrius colon (Horn), new combination

(Figs. 9, 12)

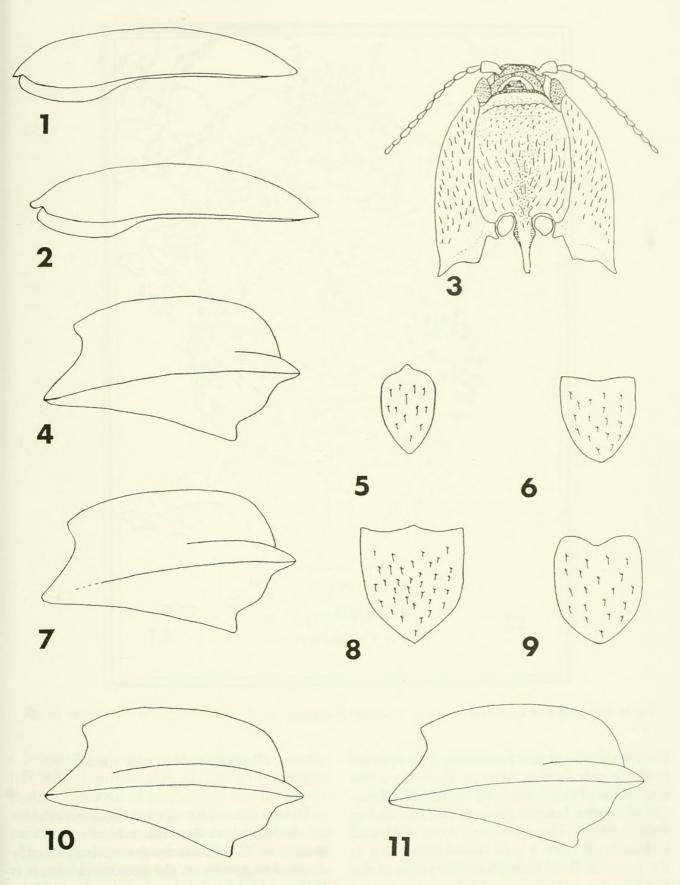
Cryptohypnus colon Horn 1871:305. Cryptohypnus ornatus colon; Horn 1891:17.

Cryptohypnus ornatus moerens Horn 1891:17. New synonym.

Hypnoidus ornatus colon; Leng 1920: 171, Schenkling 1925: 213.

Negastrius ornatulus Lane 1971: 19.

Horn's (1891) concept of *N. ornatus* included both the typical form with a pale band on the elytral disc, *N. colon* specimens with a similar band as in *N. ornatus*, and those specimens with 2 pale maculations on the posterior third of the elytra. He did not note the rugosities on the prosternal lobe. Horn's subspecies *N. ornatus moerens* represents completely black specimens of otherwise typical *N. colon*. Apparently, he did not see material with 2, 4, or 6 maculations on the elytral disc. In several areas, specimens with all color patterns and sizes occur together. In the vicinity of Lake Tahoe, California and Nevada, there is a form with the pale band on the elytra as well as golden brown



Figs. 1–11. Negastrius species: 1, N. ornatus, elytral profile; 2, N. stibicki, elytral profile; 3, N. ornatus, head and pronotum; 4, N. delumbis, pronotal profile; 5, N. arnetti, scutellum; 6, N. exiguus, scutellum; 7, N. choris, pronotal profile; 8, N. atrosus, scutellum; 9, N. colon, scutellum; 10, N. stibicki, pronotal profile; 11, N. nadezhadae, pronotal profile.

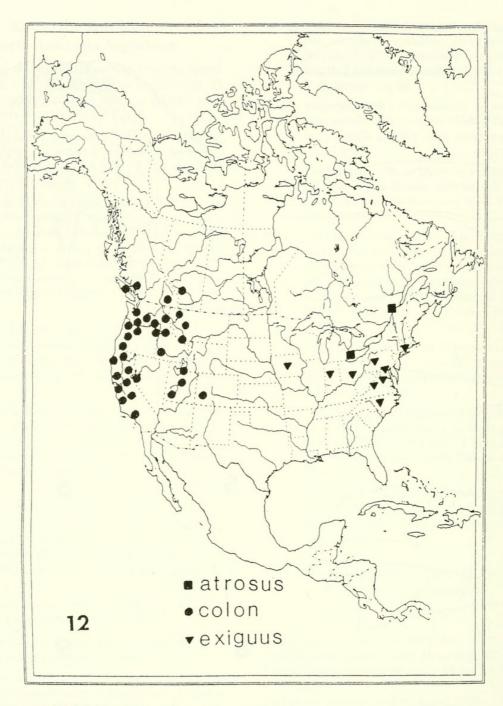


Fig. 12. Distribution of Negastrius atrosus, N. colon, and N. exiguus.

setae on the head and pronotum. This appears to be the only form in the area. There are a few specimens of this form from Seattle, Washington, along the Lostine River in Oregon, and in Parma, Idaho. The specimens from Utah and Colorado all have 4 pale maculations; this is the common form throughout the range of the species.

Negastrius colon is a common species in the western United States along the banks of small streams and larger waterways that have substantial riparian debris and ground cobbles. One population in Sanpete County, Utah, inhabits a small stream that is dry more than half the year.

Negastrius solox, new species (Fig. 13)

DIAGNOSIS.—This species and *N. ornatus* are distinguished from other North American species of *Negastrius* by possessing strongly elevated rugosities on the prosternal lobe; it is distinguished from *N. ornatus* by the absence of pale maculations on the elytra.

DESCRIPTION.—Length 3.5 mm, width/length ratio 0.4; color brunneus, without maculations on elvtra; profile elongate.

Head and pronotum granulose with a few granules forming short rugosities; median line of pronotum ridged; submarginal pronotal carina

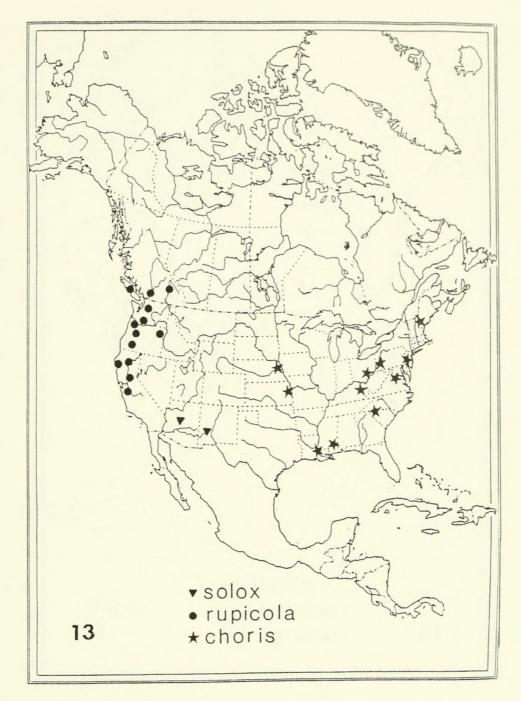


Fig. 13. Distribution of Negastrius solox, N. rupicola, and N. choris.

0.5 times length of pronotum; rugosities on the lobe of the prosternum elevated into ridges; posterior margin of prosternum evenly convex on lateral fourth; anterior margin of scutellum strongly emarginate; interstriae of elytral disc without punctures in center; lateral margin of mesosternal fossa evenly concave, without projecting knobs; outer angle of metatibia with 17 setae aligned along entire length.

HOLOTYPE.—Male, NEW MEXICO: Gila River, 19-VI-1901. Deposited in the Field Museum of Natural History, Chicago. Paratype (1) collected from ARIZONA: Yavapai Co., Prescott.

ETYMOLOGY.—The name *solox* is a Latin adjective meaning coarse or rough and refers to

the strongly ridged rugosities on the prosternal lobe.

DISCUSSION.—This species is known from 2 specimens. The paratype from Arizona is in the USNM.

Negastrius nadezhadae Dolin (Figs. 11, 15, 17)

Negastrius nadezhadae Dolin 1971:362.

This is the first report of this species for North America. Specimens examined were compared to 2 paratypes in the USNM. This small species occurs under stones along the banks of rivers in the eastern Tien Shan of central Asia.

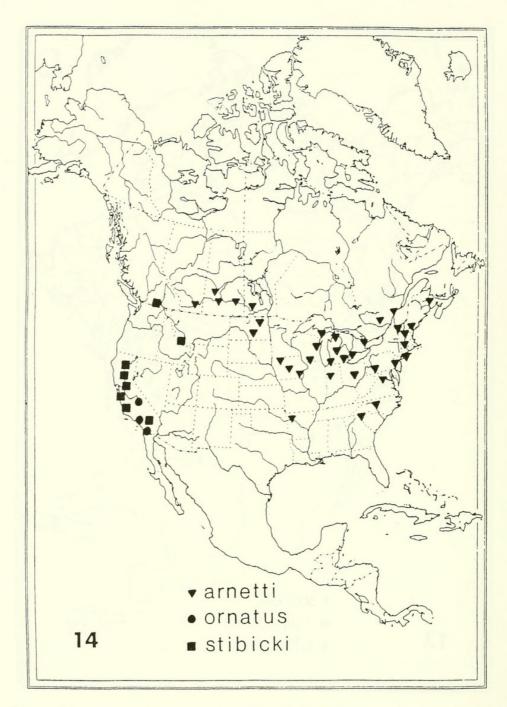


Fig. 14. Distribution of Negastrius arnetti, N. ornatus, and N. stibicki.

Four North American specimens were collected under lawn grass and by sweeping grass in Massachusetts and New Hampshire.

Negastrius stibicki, new species (Figs. 2, 10, 14, 16)

DIAGNOSIS.—Distinguished from all other Negastrius species by the strongly granulose pronotum; from N. rupicola, N. choris, N. arnetti, N. atrosus, N. colon, N. solox, N. ornatus, and N. exiguus by the anterior margin of elytra being nearly vertical in profile; and from N. nadezhadae and N. delumbis by the submarginal pronotal carina being longer than 0.5 length of pronotum.

DESCRIPTION.—Length (holotype 3.8 mm) 1.8-3.8 mm (mean = 3.6, s [standard deviation] = 0.5), width/length ratio 0.3–0.4 (mean = 0.4, s = 0.01); profile slightly arcuate; color rufous to black with a pale band on anterior third of elytra not extending mesally on interstriae 1 and extending to humerus on interstriae 5–8, each elytron also with a pale macula on posterior half.

Head and pronotum granulose; median line of pronotum distinctly elevated, especially on disc; some specimens with 2 smooth areas on middle of pronotum in sublateral areas; submarginal pronotal carina 0.6-0.8 times length of pronotum (mean = 0.7, s = 0.1); costa on

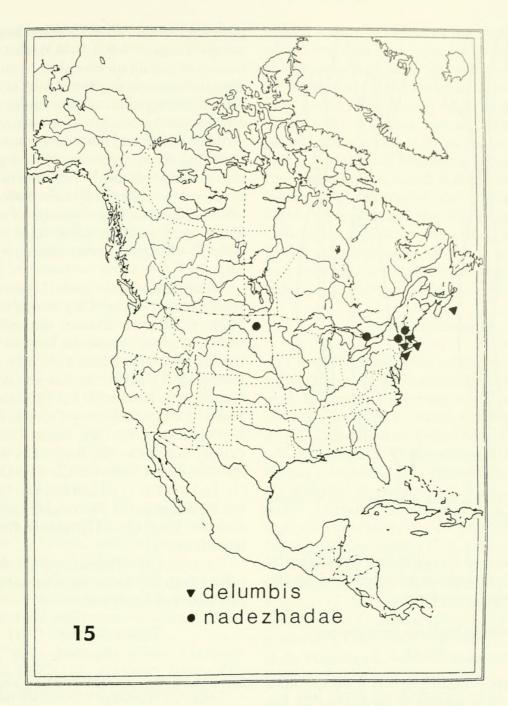


Fig. 15. Distribution of Negastrius delumbis, and North American distribution of N. nadezhadae.

lateral margin of pronotum complete to anterior margin; rugosities on prosternal lobe slightly more pronounced than rugosities on remainder of prosternum; posterior margin of prosternum convex on lateral eighth; lateral margin of mesosternal fossa evenly concave; scutellum convex, anterior margin only slightly extended; outer angle of metatibia with 17–22 aligned setae (mean = 20.3, s = 1.8); anterior margin of elytra elevated almost 90 degrees in profile; interstriae on disc slightly punctate throughout.

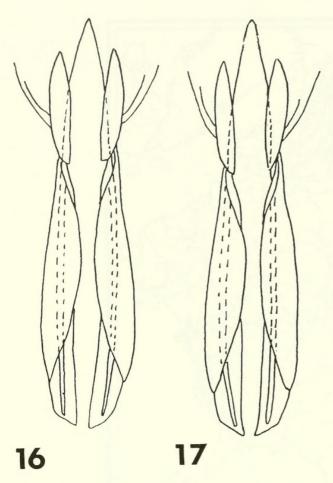
HOLOTYPE.—Male and 11 paratypes from CALIFORNIA: Sutter Co., Nicalous, 25-VI-1944, A. T. McClay, deposited in the USNM, 1 paratype with same label is in the California Acad-

emy of Sciences. Paratypes include: BRITISH COLUMBIA: Oliver (1); Summerland (1). CALIFORNIA: Los Angeles Co. (1); Monterey Co. (12); Sacramento Co. (6); San Luis Obispo Co. (1); Santa Clara Co. (4); Santa Cruz Co. (2); Shasta Co. (1); Trinity Co. (5); Tulare Co. (2); Yolo Co. (2). Montana: Beaverhead Co. (1).

ETYMOLOGY.—Named in honor of Dr. J. N. L. Stibick, who has added greatly to our understanding of the Negastriinae and whose help was invaluable in this study.

BIOLOGY.—Some specimens were collected from flood debris.

DISCUSSION.—This species appears to be most closely related to the European species,



Figs. 16–17. Male genitalia of Negastrius: 16, N. stibicki; 17, N. nadezhadae.

N. sabulicola and *N. pulchellus*, but differs by the strongly granulose pronotum and by the pronotal carina being longer.

Negastrius rupicola, new species (Fig. 13)

DIAGNOSIS.—Distinguished from all other North American species of *Negastrius* by the elevation of interstria 3; from *N. choris*, *N. arnetti*, *N. atrosus*, *N. solox*, *N. ornatus*, *N. colon*, *N. stibicki*, and *N. exiguus* by the posterior margin of the prosternum being convex on lateral sixth; and from *N. delumbis*, *N. nadezhadae*, and *N. stibicki* by the absence of elevation on the anterior margin of the elytra.

DESCRIPTION.—Length (holotype 2.4 mm) 1.8-3.4 mm (mean = 2.8, s = 0.4), width/length ratio 0.3-0.4 (mean = 0.4, s = 0.01); profile slightly arcuate; color black with 2 pale maculations on each elytron, 1 on humeral angle at base and 1 on posterior third.

Head and pronotum rugose to granulose; costa on anterior margin of pronotum thin; median line of pronotum smooth and slightly elevated to distinctly elevated; submarginal

pronotal carina 0.45–0.78 times length of pronotum (mean = 0.6, s = 0.1); costa on lateral margin of pronotum complete to anterior margin; rugosities on prosternal lobe not more distinct than rugosities on remainder of prosternum; posterior margin of prosternum convex on outer eighth and becoming concave mesally; scutellum strongly convex, widening anteriorly; elytral interstriae finely punctate on disc, base of interstriae 3 distinctly raised above level of other interstriae; lateral margin of mesosternal fossa evenly concave; outer angle of metatibia with 12–19 aligned setae (mean = 15.9, s = 1.4).

HOLOTYPE.—Male and 17 paratypes from Washington: King Co., Northbend, 8-VII-1920, E. P. Van Duzee, deposited in the USNM. Paratypes include: British Columbia: Bowser (1); Cowichan Lake (1); Hope (1); Keremeos (1); Salmo (1); Vancouver Island (1). California: Humboldt Co. (4); Marin Co. (1); Mono Co. (1); Monterey Co. (6); Plumas Co. (3); Santa Cruz Co. (2); Shasta Co. (2); Sierra Co. (4); Sutter Co. (2); Trinity Co. (6); Yolo Co. (1). Oregon: Columbia Co. (1); Douglas Co. (4); Jackson Co. (1); Linn Co. (1); Wallowa Co. (1); Washington Co. (5); Yamhill Co. (1). Washington: King Co. (17); Lewis Co. (1); Snohomish Co. (1).

ETYMOLOGY.—The name *rupicola* is a compound from the Latin *rupes* meaning rock and *cola* meaning to cultivate.

Negastrius choris (Say) (Figs. 7, 13)

Elater choris Say 1839:172 (Neotype, male; Lucedale, George Co. Mississippi; USNM). New designation. Cryptohypnus choris; Candeze 1860: 81.

Hypnoidus choris; Blatchley 1910: 724, Leng 1920: 171, Schenkling 1925: 212

Schenkling 1925: 212. Hypolithus choris; Dietrich 1945: 32.

Negastrius choris; Fattig 1951: 13, Stibick 1991: 6–7.

The neotype designation is made because of the loss of the holotype in Say's collection and to help define the species in comparison to *N. arnetti*, which has recently been described by Stibick (1991).

Negastrius atrosus, new species (Figs. 8, 12)

DIAGNOSIS.—This species is distinguished from *N. delumbis*, *N. stibicki*, *N. rupicola*, *N. nadezhadae*, *N. exiguus*, *N. ornatus*, *N. solox*, and *N. colon* by the pointed anterior margin of

the scutellum; and from *N. choris* and *N. arnetti* by its black color with 0, 2, or 4 maculations on the elvtra.

DESCRIPTION.—Length (holotype 3.5 mm) 2.7–4.8 mm (mean = 3.7, s = 0.5), width/length ratio 0.4–0.4 (mean = 0.4, s = 0.02); profile slightly arcuate to elongate; body entirely black or with 1 pale spot on posterior third of each elytron, uncommonly with another similar spot on anterior third of each elytron.

Head and pronotum granulose to rugose; median line of pronotum distinctly narrowly ridged; submarginal pronotal carina 0.6-0.8 times length of pronotum (mean = 0.7, s = 0.4); costa of pronotal margin complete to base; rugosities on prosternal lobe not more distinct than rugosities on remainder of prosternum; posterior margin of prosternum convex on lateral eighth; scutellum pointed in center of anterior margin and concave distally from center to lateral edge; elytral interstriae often rugose and without punctations on disc, although interstriae 1 and 2 often with punctures; lateral margin of mesosternal fossa evenly concave; outer angle of hind tibia with 14-19 aligned setae (mean = 16.6, s = 1.6).

HOLOTYPE.—Male and 16 paratypes were collected from Ontario: Essex, Point Pelee, 8-VII-1931, W. J. Brown, and are deposited in the Canadian National Collection.

ETYMOLOGY.—The name *atrosus* is from the Latin adjective *atrans* meaning black or dark, and the adjectival suffix *-osus* indicating abundance.

DISTRIBUTION.—Paratypes include: ONTARIO: Essex, Point Pelee (19). QUEBEC: Brome (1); Portneuf, St. Augustine (1); Cap-Rouge (6).

Fleutiauxellus extricatus, new combination

Hypnoidus extricatus Fall 1926: 191–192. Negastrius extricatus; Stibick 1991: 10–11.

The species referred to by Stibick (1991) as Negastrius extricatus is most likely N. nadezhadae, which occurs in the same geographical area. Stibick's N. extricatus and N. nadezhadae both have yellow patches on the elytra, a declivous scutellum, and a raised humeral area. Since Stibick's publication, specimens labeled N. extricatus have been located and are now in Stibick's collection. These specimens belong to the genus Fleutiauxellus. A specimen of Fleutiauxellus fitting Fall's description of N. extricatus in Stibick's collection (personal communi-

cation) was collected from the type locality in Alaska and may be a type. Fall's description of *N. extricatus* is clear on several points. The apical 3 segments of the antennae extend past the hind angles of the thorax whereas *N. nadezhadae* has the antennae not attaining the hind angles. Fall also refers to an impressed vertex that is absent in all *Negastrius* species. Several specimens from Cornell (taken from the type locality of *F. extricatus*), the USNM, Chicago Field Museum, and the Canadian National Collection, all of which were taken from Alaska, fit Fall's description on all points and have the 2nd segment of the antennae reduced; this is indicative of the genus *Fleutiauxellus*.

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