

American Museum Novitates

PUBLISHED BY THE AMERICAN MUSEUM OF NATURAL HISTORY
CENTRAL PARK WEST AT 79TH STREET, NEW YORK, N. Y. 10024

NUMBER 2445

JANUARY 21, 1971

The North American *Pterostichus* of the Subgenus *Cylindrocharis* Casey (Coleoptera, Carabidae)¹

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The subgenus *Cylindrocharis* was established by T. L. Casey (1918) to receive *Pterostichus rostratus* (Newman) and other supposedly distinct species that Casey described. Although it has long been noted that southern *Cylindrocharis* differ in the possession of sharply pointed metatrochanters, whereas the metatrochanters of northern *Cylindrocharis* are apically rounded (Nicolay and Weiss, 1934), the southern form (*grandiceps* of authors, not LeConte) has no valid name, as *Stereocerus grandiceps* LeConte is based on typical *rostratus* from New York State. This nomenclatural problem was noted by Lindroth (1966), who did not rectify it because he believed that the northern and southern forms of *Cylindrocharis* were at best geographical races of a single polytypic species.

The status of northern and southern forms can be inferred from their behavior as distinct species in the zone of range overlap, which occurs in the mountains of western North Carolina and eastern Tennessee. Typical northern *rostratus* occurs at elevations of 4000–6000 feet, whereas the southern form is found on the lower slopes of the mountains, occasionally ascending to over 6000 feet, and extends southward into

¹ The investigation was supported in part by a National Science Foundation grant-in-aid through the Highlands Biological Station (GB-2496) and by a grant to the author from the Theodore Roosevelt Memorial Fund.

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Georgia and westward into the Cumberland plateau. No intermediates are known despite coexistence of the two forms both sympatrically and syntopically. Furthermore, the examination of considerable fresh material from the southern Appalachian Mountains and elsewhere has made possible the recognition of several constant diagnostic characters in addition to the shape of the apex of the metatrochanter.

The *Cylindrocharis* of the Blue Grass and western Pennyroyal regions of central Kentucky constitute a third, undescribed taxon of the subgenus distinct from, although closely similar to, the southern mountain species. In the present paper I have considered it subspecifically distinct. During the summer of 1969, a previously unknown species of *Cylindrocharis* was discovered in the Nantahala and Snowbird mountains of North Carolina. It is found only beneath deeply embedded rocks and logs at altitudes of 4000–5000 feet, and is possibly an obligate inhabitant of deep soil (edaphobite).

CYLINDROCHARIS CASEY

Cylindrocharis CASEY, 1918, p. 326. Type species: *Feronia rostrata* Newman, by original designation. NICOLAY AND WEISS, 1934, p. 197. BALL, 1960, p. 123. LINDROTH, 1966, p. 456 ("*rostratus* [species] group").

DIAGNOSIS: A subgenus of *Pterostichus* Bonelli. Form elongate, subparallel. Black to piceous; microsculpture isodiametric on head and elytra, obsolescent on pronotum and parts of head. Mandibles large and falcate; eyes small, diameter never greater than length of tempora. Elytra without discal punctures; scutellar stria short and irregular. Last segment of metatarsus glabrous beneath. Aedeagus with apical orifice sinistral; internal sac with a dense scale patch on right wall, an elongate patch on floor, and a small patch on left wall; right paramere short, small, spoutlike; left paramere large and conchoid.

DESCRIPTION: Length 11–19 mm. Form elongate, subparallel, flattened to subconvex. Microsculpture isodiametric, well developed only on elytra, more or less obsolescent on dorsal surface of head and especially central part of pronotal disc; all dorsal surfaces with scattered micropunctures. Head large; eyes small to minute, diameter never greater than length of tempora behind; supraorbital grooves nearly continuous with post-temporal grooves, which extend around tempora to ventrolateral part of head; frontal grooves short, not attaining level of front margin of eye; mandibles porrect, falcate, left mandible hooked more sharply than right, mandible with retinaculum forming a shearing blade, lower surfaces each with row of fine setae near base; labrum about 1.8 times wider than long; antenna one-third body length, segments IV–XI pubescent, V–XI

distinctly flattened; ligula simple with two apical setae; mentum tooth rather deeply emarginate; mentum with two setiferous punctures posterior to tooth, submentum with transverse row of six punctures behind suture. Pronotum disc depressed, antebasal foveae short and linear, not attaining hind margin; basal carina short; hind angles prominent, subquadrate to slightly acute; median sulcus deep but not attaining either apical or basal margin. Elytra elongate-subparallel, disc flattened to subconvex, margins feebly sinuate before middle and near apex; scutellar stria short and irregular, joining sutural stria or not; longitudinal striae complete and usually impunctate, in some local populations feebly but regularly punctulate; intervals flat to convex; humerus with a small tooth; umbilicate series of 16–20 punctures on or just lateral to eighth stria, usually consisting of a subhumeral group of six punctures, a variable subapical group of eight to 10, with two or three isolated medial punctures in between; a single puncture on seventh stria near apex; margins of elytra feebly sinuate before middle and near apex. Metathoracic wings reduced to small, scalelike rudiments (about 0.65 mm. long in *P. rostratus*). Mesosternum and bases of prosternum and metasternum with scattered punctures at sides; abdominal sternites each with transverse row of short, longitudinal, closely spaced striae at base, irregularly wrinkled at sides; sixth abdominal sternite with large, shallow, rounded median impression in males, smooth in females. Tarsi more or less glabrous above and below except for adhesive brush on male protarsi and fixed, stiff setae at sides below; last segment of metatarsus glabrous beneath; first segment of meso- and metatarsi with or without a lateral carina. Aedeagus strongly arcuate, 2.4–3.2 mm. long, basal bulb rather narrow, apical orifice large and sinistral, apex slender and briefly produced on right side; right paramere smaller than left, with anterior bladelike process and more or less narrowed posterior process; left paramere larger than right, conchoid, with slender, sinuate vertical anterior process; internal sac armed with numerous small, blunt scales, a dense patch of scales on right wall, an elongate patch on floor, and a smaller, less prominent patch on left wall.

DISCUSSION: All species of *Cylindrocharis* burrow deeply in the soil. They are most readily collected by turning large rocks on the slopes of forested ravines. As pointed out by Nicolay and Weiss (1934), they may be found throughout the year except for the coldest winter months and “although local cannot be considered rare.” Little is known of the life cycle, but I have taken teneral and a presumed larva of *rostratus* in early September in the Great Smoky Mountains and pale teneral of *hypogeus* (described below) in mid-August. Both *rostratus* and *acutipes* (described below) have been taken in early spring, indicating imaginal hibernation.

KEY TO SPECIES AND SUBSPECIES OF *Cylindrocharis* CASEY

1. Tempora rounded behind eyes (figs. 2, 3, 4); posttemporal grooves punctured; metatrochanter more or less sharply acuminate at apex (figs. 6, 7) . . . 2
- Tempora subangular behind eyes (fig. 1); posttemporal grooves smooth; metatrochanter rounded at apex (fig. 5); southeastern Canada through the Appalachians to Great Smoky and Great Balsam mountains, North Carolina-Tennessee *rostratus* (Newman)
- 2(1). Length 15–19 mm.; form subconvex; aedeagus 3.1–3.2 mm. long; head and pronotum as in figures 2 and 3 3
- Length 11–14 mm.; form slender, subparallel, depressed (fig. 4); eyes minute; aedeagus about 2.4 mm. long; Nantahala and Snowbird mountains, North Carolina *hypogaeus*, new species
- 3(2). Eyes smaller, their diameter about 65 per cent of scape length; pronotum subequal in width at apex and base (fig. 2); first segment of metatarsus with weakly defined lateral carina or not carinate; mountains of western North Carolina and adjacent Tennessee and Georgia, westward into Cumberland plateau of Tennessee *acutipes acutipes*, new species and subspecies
- Eyes larger, diameter about 85 per cent of scape length; pronotum narrower at base, which is about nine-tenths as wide as apex (fig. 3); first segment of metatarsus with well-developed lateral carina; known only from central Kentucky *acutipes kentuckensis*, new subspecies

Pterostichus (*Cylindrocharis*) *rostratus* (Newman)

Figures 1, 5, 8

Feronia rostrata NEWMAN, 1838, p. 387. Type locality, Utica, New York; type in British Museum of Natural History (not seen). CHAUDOIR, 1868, p. 336 (?*Hypherpes*).

Pterostichus rostratus: LECONTE, 1873, p. 305; LINDROTH, 1966, p. 457 (in part).

Cylindrocharis rostratus: LENG, 1920, p. 55.

Pterostichus (*Cylindrocharis*) *rostratus*: CSIKI, 1930, p. 578. NICOLAY AND WEISS, 1934, p. 198.

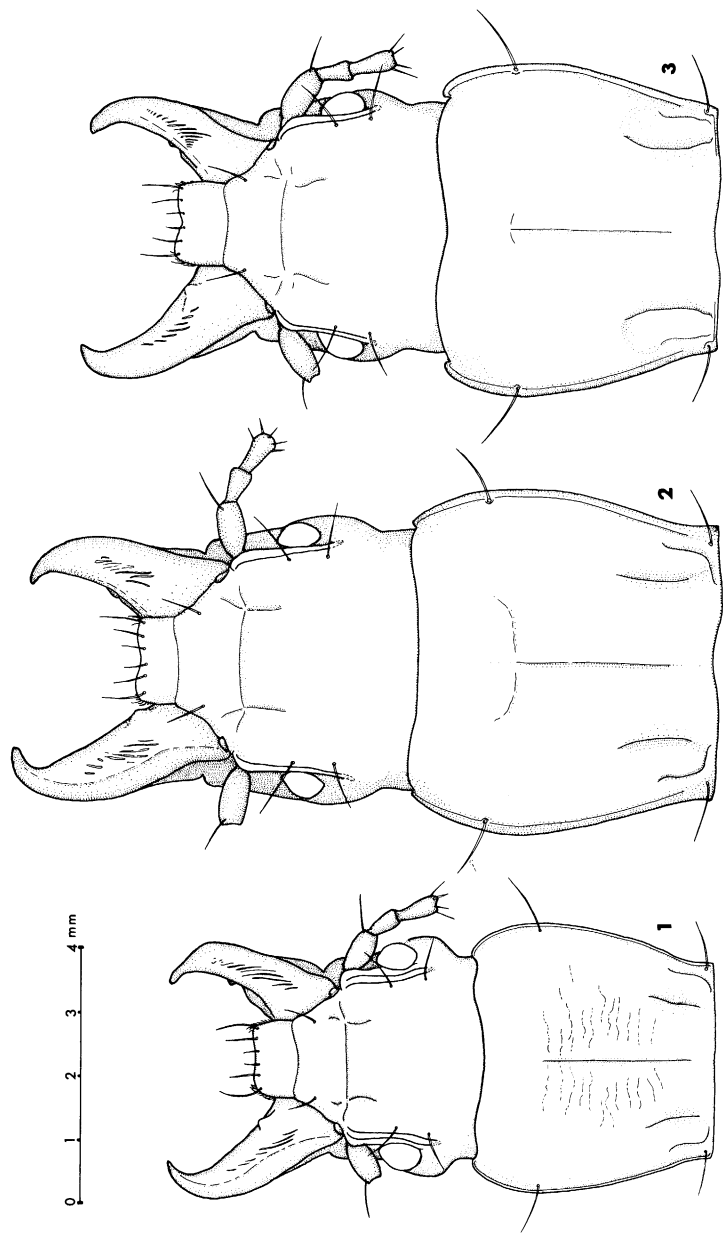
Cylindrocharis sulcatula CASEY, 1918, p. 327. Type locality, ?Indiana, type in United States National Museum, Smithsonian Institution.

Cylindrocharis piceata CASEY, 1918, p. 327. Type locality, New York, type in United States National Museum, Smithsonian Institution.

Stereocerus grandiceps LECONTE, 1848, p. 336. Type locality, New York, type in Harvard Museum of Comparative Zoology.

DIAGNOSIS: Distinguished by the subangular tempora, impunctate posttemporal grooves, and bluntly rounded apexes of the metatrochanters.

DESCRIPTION: Length 13.0–15.3 mm., mean 13.8 ± 0.7 mm. Black, dull shining; form subconvex; microsculpture isodiametric on head and elytra, obsolescent on central disc of pronotum and often dorsal surfaces of head. Head nearly nine-tenths as wide as long (length not including mandibles); eye small, in shape of spherical triangle, base of triangle subequal to scape length; tempora tumid and subangular behind eyes;



FIGS. 1-3. *Pterostichus* (*Cylindrocharis*), head and pronotum. 1. *P. rostratus* (Newman), Pocahontas County, West Virginia. 2. *P. acutipes acutipes*, new species and subspecies, Buncombe County, North Carolina. 3. *P. acutipes kentuckensis*, new subspecies, Jessamine County, Kentucky.

posttemporal grooves unpunctured. Pronotum 1.2 times wider than long, widest in apical fifth, width at base nine-tenths width at apex; anterior angles salient, posterior angles a little more than right, sides oblique

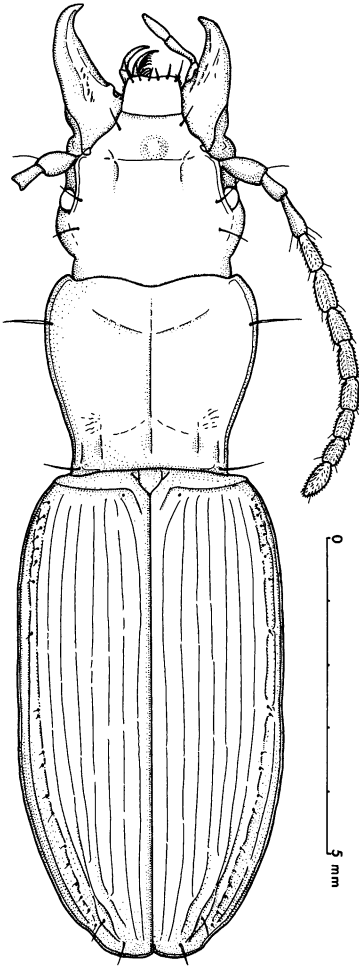


FIG. 4. *Pterostichus* (*Cylindrocharis*) *hypogeus*, new species. Macon County, North Carolina.

with very feeble sinuation just before hind angles; anterior marginal setae placed just behind greatest width. Elytra 1.6 times longer than wide, subconvex; margins feebly sinuate in basal third, more deeply sinuate near apices; longitudinal striae deep, usually impunctate but locally and individually punctulate; intervals subconvex. Metatrochanter bluntly

rounded at apex, half as long as metafemur. First segment of meso- and metatarsi with or without a feeble lateral carina, but carina is weakly and irregularly developed at best. Aedeagus 2.7–2.9 mm. long, apex of right paramere rather slender.

MEASUREMENTS: Male specimen from Kennison Mountain, Pocahontas County, West Virginia (T. C. Barr, private collection): Total length 14.7 mm., head 3.9 mm. long (not including mandibles) \times 3.4 mm. wide, pronotum 3.3 mm. long \times 4.0 mm. wide, 3.2 mm. wide at apex and 2.9 mm. wide at base, elytra 7.7 mm. long \times 4.8 mm. wide, antenna 6.0 mm. long, aedeagus 2.7 mm. long.

DISTRIBUTION: *Pterostichus rostratus* ranges from southeastern Canada (New Brunswick, Quebec, Ontario, *vide* Lindroth, 1966, p. 457) south-westward through the Appalachian region into the higher mountains of North Carolina and Tennessee. Its western limit is undefined. At the southern limit of the range it has been taken abundantly in the Bald, Black, Great Balsam, Plott Balsam, and Great Smoky mountains from 4000 feet to the summits, but its presence in other mountain ranges to the south and west has not yet been demonstrated. In the southern Appalachians, then, it appears to be a northern relic limited to the higher elevations. It is not clear whether this altitudinal limitation is related to temperature tolerances or to interspecific competition with the following species.

DISCUSSION: Casey's (1918, p. 327) type species of *Cylindrocharis* is given as *C. rostrata* (Newman), but his description of *rostrata* is based on a specimen of *P. (C.) acutipes acutipes* from the Black Mountains, North Carolina. As *rostratus* and *acutipes* are so closely similar, and as there cannot be any question of the identity of the subgenus *Cylindrocharis*, I propose that *rostratus* be accepted as the type species even though Casey misidentified it. LeConte (1873) himself synonymized his species *grandiceps*, and Nicolay and Weiss (1934) synonymized Casey's *sulcatula* and *piceata* with *rostratus*. According to Lindroth (1966), Newman's type specimen was taken at Trenton Falls near Utica, New York.

***Pterostichus (Cylindrocharis) acutipes acutipes*, new species
and subspecies**

Figures 2, 6, 9

Feronia (?*Hypherpes*) *grandiceps*: CHAUDOIR, 1868, p. 336.

Pterostichus grandiceps (Chaudoir): LECONTE, 1873, p. 305, not *Stereocerus grandiceps* Le Conte, 1848, p. 336 (= *rostratus* Newman).

Cylindrocharis grandiceps: NICOLAY AND WEISS, 1934, p. 198.

Cylindrocharis rostrata: CASEY, 1918, p. 327, not *Feronia rostrata* Newman, 1838, p. 387.

ETYMOLOGY: Latin *acutus*, sharp + *pes*, foot, referring to the pointed apex of the metatrochanter.

DIAGNOSIS: Distinguished by the rounded tempora, punctured post-temporal grooves, acuminate apices of the metatrochanters, larger size, and subconvex form.

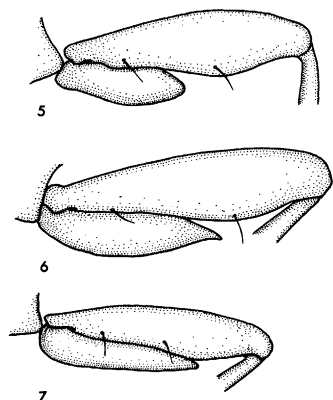
DESCRIPTION: Length 15.0–19.0 mm., mean 16.2 ± 1.1 mm. Black, dull shining; form subconvex; microsculpture isodiametric on head and elytra, obsolescent on central disc of pronotum and often dorsal surfaces of head. Head almost as long as wide (length not including mandibles); eye diameter about six-tenths (0.60–0.67) the scape length; tempora rounded behind eyes; posttemporal grooves with two to six irregular punctures. Pronotum 1.1 times wider than long, widest in apical third, apex and base widths subequal; pronotum angles and marginal sinuation about as in *rostratus*; anterior marginal setae placed well before greatest width. Elytra 1.7 times longer than wide, subconvex; disc a little flatter, intervals flatter, marginal and subapical sinuations shallower, and apices more tapered than in *rostratus*. Metatrochanter more or less sharply but always distinctly acuminate at apex, about two-thirds as long as metafemur. First segment of meso- and metatarsi with or without a feeble lateral carina. Aedeagus 3.0–3.1 mm. long, larger than that of *rostratus* but otherwise nearly identical; right paramere with apex broader and less sharply pointed.

Holotype male (American Museum of Natural History) and three paratypes, Round Mountain, elevation 2500 feet, easternmost Buncombe County, North Carolina, September 6, 1969 (T. C. Barr).

MEASUREMENTS OF HOLOTYPE: Total length 18.5 mm., head 4.5 mm. long \times 4.3 mm. wide, pronotum 4.4 mm. long \times 4.9 mm. wide, pronotum 3.9 mm. wide at apex and 3.9 mm. wide at base, elytra 9.6 mm. long \times 5.7 mm. wide, antenna 7.0 mm. long, aedeagus 3.1 mm. long.

DISCUSSION: As LeConte (1873), Nicolay and Weiss (1934), and Lindroth (1966) have pointed out, the *Feronia grandiceps* of Chaudoir (1868) is not the same as *grandiceps* LeConte, which LeConte (1873, p. 305) himself synonymized with *rostratus*. Consequently the species here described has no valid name and must be considered a new species. Unlike Lindroth (*op.cit.*), I have found several apparently constant characters other than the metatrochanters which serve to separate *acutipes* and *rostratus*. *Pterostichus acutipes* is a larger species (the difference between the means of measured series is significant at the 5 per cent level), and the aedeagus is correspondingly larger. The eyes are proportionally smaller; the temporal region is always rounded, without the characteristic bulge seen in *rostratus*, and the posttemporal grooves are punctured (I have seen

one small specimen in which the punctures are present but indistinct). The pronotum is more nearly subquadrate, with its greatest width in the apical third behind the anterior marginal setae instead of in the apical fifth at the site of the setae. The elytra are less convex, the intervals are flatter, the marginal sinuations in the basal third and before the apex are very shallow and occasionally indistinct, and the apices are more tapered. The broader apex of the right paramere, mentioned by Lindroth (*ibid.*), appears to be a constant difference, as is the larger aedeagal size.



FIGS. 5-7. Metatrochanters of *Pterostichus* (*Cylindrocharis*). 5. *P. rostratus* (Newman). 6. *P. acutipes acutipes*, new species and subspecies. 7. *P. hypogeus*, new species.

DISTRIBUTION: The exact limits of distribution are incompletely known, but the nominate subspecies ranges widely in the southern Appalachians from the Black Mountains (Yancey, Buncombe, and McDowell counties, North Carolina) southwest into the Bald, Great Smoky, Great Balsam, Unicoi, and Nantahala mountains and Blue Ridge of North Carolina, Tennessee, and Georgia.

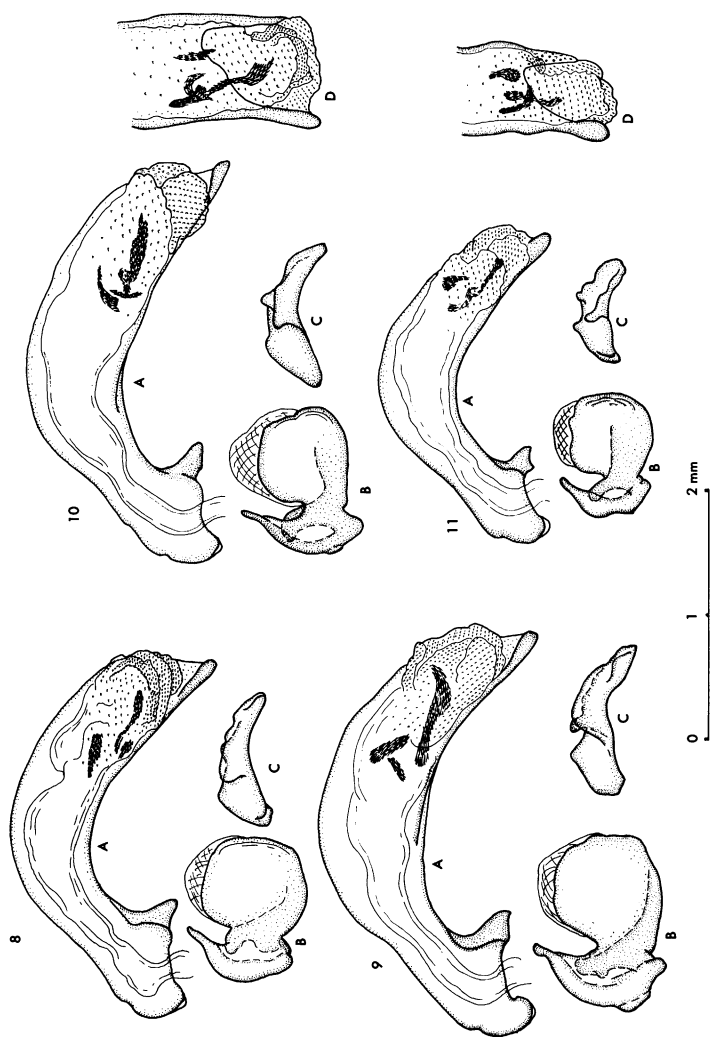
***Pterostichus* (*Cylindrocharis*) *acutipes kentuckensis*, new subspecies**

Figures 3, 10

ETYMOLOGY: Adjective derived from Kentucky.

DIAGNOSIS: Closely similar to *acutipes acutipes*, differing principally in the narrower pronotum base, larger eyes, well-developed external carina on the first metatarsal segment, slightly more convex elytra with apices more tapered, and narrower apex of the right paramere.

DESCRIPTION: Length 15.3-18.4 mm., mean 17.2 ± 1.1 mm. Head with tempora rounded behind eyes, posttemporal grooves punctured, eye diameter about 85 per cent length of scape. Pronotum 1.1 times wider than long, greatest width in apical fourth, base about nine-tenths



FIGS. 8–11. Aedeagi of *Pterostichus* (*Gylindrocharis*); all left lateral view except 10D and 11D. A. Penis. B. Left paramere. C. Right paramere. D. Apex of median lobe in ventral view. 8. *P. rostratus* (Newman). 9. *P. acutipēs acutipēs*, new species and subspecies. 10. *P. acutipēs kentuckensis*, new subspecies. 11. *P. hypogaeus*, new species.

as wide as apex. Elytra 1.8 times longer than wide, a little more convex and apices more tapered than in *acutipes acutipes*; marginal sinuations extremely shallow. Metatrochanter apically acuminate, as in *acutipes acutipes*; basal segment of metatarsus strongly carinate on outer side. Aedeagus 3.1–3.2 mm. long, similar to that of *acutipes acutipes* except that apex of right paramere is more slender, about as in *rostratus*.

Holotype male (American Museum of Natural History) and five paratypes, Jessamine Creek gorge, 3 miles south of Wilmore, Jessamine County, Kentucky, September 21, 1969 (T. C. Barr).

MEASUREMENTS OF HOLOTYPE: Total length 15.7 mm., head 3.9 mm. long \times 3.6 mm. wide, pronotum 4.0 mm. long \times 4.4 mm. wide, pronotum 3.6 mm. wide at apex and 3.2 mm. wide at base, elytra 8.9 mm. long \times 5.0 mm. wide, antenna 6.6 mm. long, aedeagus 3.1 mm. long.

DISTRIBUTION: I have seen this subspecies from four localities in central Kentucky. In addition to the type series, I took two specimens in Marble Creek gorge, Jessamine County; a dozen specimens in the Big Woods, Mammoth Cave National Park, Edmonson County; and one specimen from the valley of Big Sinking Creek, Lee County. A single specimen bearing the label "Ky." was seen in the collection of the Department of Entomology, Purdue University.

DISCUSSION: The proposed taxonomic relationship between nominate *acutipes* and *acutipes kentuckensis* must remain conjectural until specimens have been seen from south-central Kentucky and north-central Tennessee. It is probable that *kentuckensis* is actually rather widely distributed west of the Allegheny plateau and south of the margins of Pleistocene glaciation, but study material is not available at the present time.

***Pterostichus (Cylindrocharis) hypogeus*, new species**

Figures 4, 7, 11

ETYMOLOGY: Latin *hypogeus*, subterranean.

DIAGNOSIS: Distinguished by the rounded tempora, punctured posttemporal grooves, acuminate apices of the metatrochanters, small size, small eyes, and slender, depressed form.

DESCRIPTION: Length 11.2–14.3 mm., mean 13.1 ± 0.9 mm. Piceous black to piceous, dull shining; form very slender and subparallel, depressed; microsculpture obsolete on head and pronotum, weakly isodiametric on elytra. Head 1.1 times longer than wide (length not including mandibles); eyes minute, their diameter two-thirds the scape length or less; tempora rounded behind eyes; posttemporal grooves with three or four irregular punctures. Pronotum 1.2 times wider than long, widest in apical fourth, base width nearly nine-tenths width at apex;

anterior angles salient, hind angles prominent, slightly acute, sides distinctly sinuate in basal fifth; anterior marginal setae placed at about apical fourth. Elytra nearly 1.8 times longer than wide, feebly subconvex, narrower and more subparallel than in other species of the subgenus; marginal sinuations very shallow; intervals nearly flat. Metatrochanter slender, acuminate at apex, about five-sevenths length of metafemur. First segment of meso- and metatarsi without a distinct lateral carina. Aedeagus smaller and more arcuate than in other species of the subgenus, about 2.4 (2.38–2.42) mm. long; apex of right paramere a little shorter and broader than in other species.

Holotype male (American Museum of Natural History), west side of Big Butt (mountain) in the upper Bearpen Creek basin, elevation 4800 feet, Coweeta Hydrologic Laboratory, Macon County, North Carolina, July 26, 1969 (T. C. Barr). Four paratypes from the same locality, August 13, 1969 (T. C. Barr), and 10 paratypes from the same locality, August 17, 1969 (T. C. Barr and H. Burdsall).

MEASUREMENTS OF HOLOTYPE: Total length 14.1 mm., head 3.6 mm. long \times 3.2 mm. wide, pronotum 3.1 mm. long \times 3.6 mm. wide, pronotum 2.9 mm. wide at apex and 2.5 mm. wide at base, elytra 7.5 mm. long \times 4.4 mm. wide, antenna 6.7 mm. long, aedeagus 2.4 mm. long.

DISTRIBUTION: In addition to the type series from the southern Nantahala Mountains, Macon County, North Carolina, I have taken five specimens from Teyahalee (=Joanna) Bald, .7 mile east-northeast of Tatham Gap at the head of Panther Creek, elevation 4200 feet, Graham County, North Carolina. This site is 50 miles west of the type locality, and extends the known range of the species from the Nantahalas to the Snowbird Mountains. The species is certainly more widely distributed, but occurs in such cryptic habitats that it has been previously overlooked. The Teyahalee Bald specimens show no obviously significant differences from those taken at Coweeta Hydrologic Laboratory. A single specimen was taken at the head of Dirty John Creek, elevation 4800 feet, Nantahala Mountains, Macon County, North Carolina, June 27, 1970.

DISCUSSION: In a review of the endemic carabids of the southern Appalachians (Barr, 1969), I pointed out that the species of *Cylindrocharis* are the most subterranean of the Appalachian subgenera of *Pterostichus*. The discovery of *P. hypogeus*, a paler, more slender, and more depressed species with minute eyes, supports this generalization. All the specimens I collected were taken under large, deeply embedded rocks on the sloping floor of a cool, hardwood forest, although Harold Burdsall took two late teneral from beneath a huge rotten log. The eyes, although very small, have a number of facets and are presumably functional, at least

to the point of distinguishing between light and darkness. The behavior of *P. hypogeus* differs from that of *rostratus* and *acutipes*; when disturbed the larger species are active, burrowing into the soil, but *P. hypogeus* remains motionless for several minutes (in the manner of *Maronetus* spp.). The discovery of *hypogeus* occurred while I was collecting anilline carabids and pselaphids of the eyeless genus *Arianops*, which are abundant at both Big Butt and Teyahalee Bald.

Pterostichus hypogeus is probably an obligate dweller in deep soil (edaphobite), although not as highly modified in this direction as the species of *Anilloferonia* Van Dyke or some other subterranean pterostichines. It seems related more closely to *acutipes* than to *rostratus* by virtue of its small eyes, rounded tempora, punctured posttemporal grooves, and acuminate metatrochanters. *Pterostichus acutipes* occurs under the same rocks with *hypogeus* and is somewhat more abundant at the type locality. As some indication of the relative abundance of *hypogeus*, I can indicate that a full day's collecting at the type locality on August 19, 1969, produced only 10 specimens, although more than 150 large rocks and logs were moved in the search.

SUMMARY

Cylindrocharis Casey, a subgenus of *Pterostichus* Bonelli, includes three species: *P. (C.) rostratus* (Newman), ranging from southeastern Canada to the southern Appalachian Mountains of Tennessee and North Carolina; *P. (C.) acutipes*, new species, from central Kentucky and Tennessee to the mountains of Tennessee, North Carolina, and northeast Georgia; and *P. hypogeus*, new species, from the Nantahala and Snowbird mountains, North Carolina. The central Kentucky populations of *acutipes* are described as a distinct subspecies, *P. (C.) a. kentuckensis*.

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