Descriptions of new Neotropical Lycoperdininae (Coleoptera: Endomychidae) and their phylogenetic placement

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Abstract. Two new genera and three new species of Lycoperdininae (Coleoptera: Endomychidae) from South America, are described and illustrated based on adults: Hylaperdina n. g., along with H. brevicornis n. sp. from Ecuador and H. costariciensis n. sp. from Costa Rica, and Chileanus n. g., along with C. talca n. sp. from Chile. Their most likely placement within the Lycoperdininae is discussed. A key to genera of the neotropical Lycoperdininae is provided.


Keywords: Taxonomy, South America, Cucujoidea.

The endomychid subfamily Lycoperdininae is generally regarded as well-defined and monophyletic. Phylogenetic analyses of the family based on adult and larval morphology (Tomaszewska 2000, 2005), as well as analyses of molecular sequence evidence (Robertson et al. 2008), have repeatedly confirmed the monophyly of this group. The suprageneric relationships within Lycoperdininae, however, are far from being fully resolved. Using cladistic analyses, Tomaszewska (2005) discovered five evolutionary lineages of Lycoperdininae which she consequently recognized as separate generic groups.

Recent study of additional available material of Endomychidae yielded two new genera of Lycoperdininae from Central and South America: Hylaperdina gen. nov., including two new species, H. brevicornis sp. nov. and H. costariciensis sp. nov., and Chileanus gen. nov., with a single new species, C. talca sp. nov.

These new genera are here regarded as members of the most basal clade of Lycoperdininae, the Daulis-group (Tomaszewska 2005).

The subfamily currently includes 41 genera distributed worldwide (Shockley et al. 2009), including 6 endemic to the Neotropics.
consisting of short appressed setae and long, erect bristles. This feature is also found in the Australian *Daulis* Erichson and *Daulotypus* Lea, from which *Chileanus* can be separated by having the prosternal process at least 0.5 times as broad as procoxal cavity, the mesoventral process pentagonal and widely separating the mesocoxae, the lateral margins of the pronotum not crenulate, and the hind wings absent.

**Description.** Body (figs. 1, 2, 7) elongate oval, moderately convex, strongly shiny, distinctly but sparsely setose; dorsal vestiture double, consisting of appressed setae originating from punctures and distinctly longer, erect bristles originating from small tubercles; confusedly punctured; interspaces smooth and shiny. Yellowish brown with infuscated areas on pronotum and elytra.

Head (figs. 3, 4) visible from above, weakly transverse. Eyes moderately large, oval in outline, prominent, coarsely faceted. Occiput with finely ridged, narrow, stridulatory area. Gular modemerly large, oval in outline, prominent, coarsely faceted. Head (figs. 3, 4) visible from above, weakly transverse. Eyes moderately large, oval in outline, prominent, coarsely faceted. Occiput with finely ridged, narrow, stridulatory area. Gular moderately large, oval in outline, prominent, coarsely faceted.

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Figures 2–13
Chilenius talca n. g., n. sp. 2, body, dorsal view; 3, head and prothorax, antero-dorsal view; 4, head, ventral view; 5, pronotum; 6, pro- and mesothorax, ventral view; 7, body, ventral view; 8, connection between prothorax and elytra; 9, metathorax, ventral view; 10, antenna; 11, tarsus; 12, abdomen, male, ventral view; 13, apices of male abdomen and male genital segment
New Neotropical Lycoperdininae

tarsus densely setose; tibia weakly widening apically, without apical spurs; tarsi (fig. 11) pseudotrimerous with tarsomeres 1 and 2 narrowly flattened and ventrally lobed; tarsomere 3 very short; claws simple.

Abdomen (fig. 12) with intercoxal process wide; five freely articulated ventrites. Ventricle I longer than ventrites II–IV combined; ventrites II–IV equal in length. Ventricle V simple, rounded at apex. Male abdominal segment VIII with sternite narrow, emarginate apically, tergite large rounded apically. Male genital segment (figs. 13, 40) with apical margin of sternite irregularly/asymmetrically sinuate; paired apophyses fused basally and extending anteriorly, appearing as a single apophysis; dorsal plate undivided.

Aedeagus (fig. 39) rather slender, moderately long, sclerotized, resting on its right side when retracted. Penis straight along most of its length, curved basally. Terminalia placed near base, short, ring-shaped; parameres fused; tegminal strut flat and short.

Female unknown.

Chileanus talca n. sp.

Etymology. The specific epithet refers to the Talca Province, the region of Chile where the type specimens were collected.

Description. Length 2.15 mm. Body 1.95 times as long as wide; pronotum 0.65 times as long as wide; elytra 1.2 times as long as wide; 2.35 times longer than pronotum, 1.2 times wider than pronotum. Colour yellowish brown; pronotum partly infuscate medially and laterally, and each elytron with more or less distinct two, transverse, dark brown maculae; strongly shiny. Ventiture pale, about as dense ventrally as on dorsum. Pronotum with lateral edges smooth, with base nearly as broad as base of elytra; punctures unisetiferous, sparse on disk, slightly denser along lateral margins. Intercostal process of mesoventrite as broad as coxal diameter. Elytra with punctures larger than those of pronotum, evenly scattered, unisetiferous. Aedeagus as in fig. 39.

Female unknown.

Type Material. Holotype (male): “Chile: Talca Pr.: R.N. Altos del Lircay, Sendero Laguna del Alto, 1330 m, 35.36.95, 71.03.7W, 26.XII.2002, Nothofagus spp./ open to dense understorey; FMHD #2002-097,” belr., leaf & log litter, Newton, Solodovnikov, 1072, Field Mus. Nat. Hist./ Holotype Chileanus talca Tomaszewska” (FMNH).

Paratype (male), same data as holotype (dissected on slide: MIZ).

Distribution. Chile.

Hylaperdina n. g.

Type species. Hylaperdina costaricensis n. sp.

Etymology. The generic name is a combination of the genera Hylaea Chevrolat and Lycoperdina Latreille, which it superficially resembles. Gender feminine.

Diagnosis. Among neotropical Lycoperdininae Hylaperdina resembles Hylaea and Lycoperdina, but is distinguished by the female abdominal segment VIII free (not fused or solidly connected to coxites) and the coxites separated. However, Hylaperdina may be separated from all other similar genera by the following features: the mesosomal cavities closed laterally, the antennomeres 5 and 7 enlarged, dorsum covered with both appressed suberect setae and sparse erect hairs along lateral margins.

Description. Body (figs. 14, 15, 20, 26, 27, 32) elongate, moderately convex, shiny, densely and coarsely punctured with interspaces smooth and shiny; punctures on elytra as large as those on pronotum; dorsum covered mostly with suberect setae, sparse erect hairs present on antennae and along lateral margins of pronotum and elytra. Uniformly brown.

Head (figs. 21, 24, 28, 33) transverse, partially retracted in prothorax, eyes entirely visible dorsally. Eyes large, oval in outline, prominent, coarsely faceted. Occiput with finely ridged, narrow, somewhat triangular stridulatory area. Gular sutures absent. Antenna (figs. 16, 17, 29, 30, 31) 11-segmented, less than 0.3 times as long as body length, stout with 3-segmented, weakly flattened and moderately wide club; antennomeres 4–8 at most subquadrate; antennomeres 5 and 7 more or less distinctly broader than neighbouring segments; antennomeres 9 and 10 asymmetrically produced inwardly. Clypeus transverse, flat, widest at base, convergent from base to about mid length, then subparallel. Labrum sclerotized with submembranous apex; transverse, finely punctured, covered with long setae (more distinct laterally); anterior edge emarginate medially; tormae elongate, with mesal arms straight; labral rods parallel.

Mandible with sharp, long apical tooth and small subapical tooth; mola well-developed, finely ridged; prostheca narrow, submembranous, covered with moderately dense and fine setae. Maxilla (figs. 24, 28) with terminal palpomere long and conical; galea large, broadly triangular, densely setose; lacinia rather short and narrow, weakly tapering towards apex, fringed with comb of stiff setae on inner edge, with row of stout, long spines on dorsal surface and two longest spines below them; digitus absent. Labium (figs. 24, 28) with palpi nearly contiguous; palpomere 2 transverse; terminal palpomere transversely oval; mentum transverse, widest near mid length with triangular, raised ridge, covered with moderately long, sparse setae; prementum short, moderately sclerotized with ligula produced into distinct, lateral lobes, scarcely emarginate at apex.

Prothorax transverse, widest near mid length. Pronotum (figs. 18, 21, 33, 34) narrowly bordered laterally and posteriorly; anterior margin with strongly reduced stridulatory membrane (fig. 22); basal sulcus absent, lateral sulci somewhat triangular, subparallel, deep and moderately long; anterior angles scarcely produced, subacute; posterior angles right-angled or weakly acute; lateral margin subparallel or gently rounded with edges crenulate; pronotal disc comparatively convex. Prosternum with pair of small pits anterior of procoxal cavities; prosternal process (figs. 23, 35) narrow and vestigial; procoxae prominent and contiguous, circular in outline; their cavities externally open, internally widely closed. Trochantin concealed.

Meso- and metathorax. Scutellum (figs. 18, 36) small, strongly transverse, punctured and setose, weakly angulate near base and widely rounded at apex. Mesoventrite (figs. 23, 35) with a pair of large, deep pits near anterior margin; intercoxal process carinate, with sharp, median ridge; narrowly separating mesocoxae, extending to about half of their length. Mesocoxae...
circular in outline; mesocoxal cavities outwardly closed (figs. 19, 37); trochantin concealed. Meso-metaventral junction with internal knobs. Metaventrite large, transverse, hardly punctured, sparsely setose, comparatively convex, scarcely narrowing anteriorly; anterior margin bordered and raised, with two pairs of postcoxal pits; discrmen extending along about half length of metaventrite. Metacoxae transverse, moderately widely separated. Metendosternite with stalk nearly as long as broad with widely separated anterior arms and tendons. Elytra (fig. 15, 27) widest near mid length, weakly narrowing apically; comparatively strongly convex with punctures dense, very coarse and irregular (fig. 36); anterior edge simple; humeri weakly prominent; lateral margin narrowly flattened and hardly visible from above; epipleuron very narrow, obsolete apically (figs. 20, 32). Hind wing with anal lobe, one anal vein and one anal cell; medial bridge present; medial fleck moderately large, oval, undivided; radial cell reduced.

Legs long and relatively slender; trochanterofemoral attachment subheteromeroid (figs. 19, 23). Femur widest near apical third, densely setose; ventral surfaces of pro- and mesofemora bear somewhat irregular rows of obliquely directed, erect, short spines; tibia and tarsus densely setose; tibia weakly widening apically, without apical spurs; tarsomeres 1 and 2 rather narrowly flattened and ventrally lobed; terminal tarsomere at least 4 times longer than tarsomere 3. Claws simple, empodium small, bisetose.

Abdomen (figs. 25, 38) with intercoxal process relatively narrow; five freely articulated ventrites. Ventrite I almost as long as ventrites II–V combined, with two postcoxal pits; in male with patch of short setae medially; ventrites II–IV equal in length. Ventrite V simple in both sexes. Abdominal segment VIII simple in both sexes, with sternite and tergite both rounded apically. Male genital segment (figs. 42, 45) with apical margin of sternite irregularly-shaped; paired apophyses fused apically; dorsal plate divided into two, lateral plates. Aedeagus (figs. 41, 44) moderately stout, straight along most of its length, curved at base, moderately sclerotized, resting on its right side when retracted. Penis without apical ramification. Tegmen placed near mid length, moderately large, ring-shaped; parameres fused; tegminal strut short and flat.

Female genitalia (fig. 43). Ovipositor moderately sclerotized, with coxites well developed, separated, densely setose apically; styli terminal. Spermatheca small, rounded, membranous; accessory gland minute, rounded, membranous; sperm duct short, slender; bursa copulatrix elongate, membranous with apical outlet of sperm duct.

**Hylaperdina costaricensis** n. sp.

**Etymology.** The specific epithet refers to the country of origin of this species.

**Diagnosis.** This species is distinguished from *H. brevicornis* by its more oval body, dorsum covered with longer, semi-erect setae (those along lateral margins less distinct), pronotum with deep lateral sulci, the antennomere 3 longer than wide, and antennomeres 4–8 weakly transverse.

**Description.** Length 2.72–2.75 mm. Body 1.95–2.00 times as long as wide; pronotum 0.64–0.67 times as long as wide; elytra 1.38–1.42 times as long as wide; 2.62–2.65 times longer than pronotum, 1.25–1.30 times wider than pronotum. reddish brown; body shiny. Vestiture pale, dense, long and semi-erect, those along lateral margin not much longer than remaining vestiture. Antenna about 0.4 times as long as body; scape simple anteriorly; antennomere 3 slightly longer than wide; antennomeres 4–8 weakly transverse to subquadrat; antennomeres 5 and 7 distinctly broader than neighboring antennomeres. Pronotum with lateral edges distinctly crenulate, base scarcely narrower than base of elytra; lateral sulci deep, extending along nearly 1/3 of pronotal length; hind angles acute; punctures setiferous, coarse and slightly denser than those on elytra, 1.0–1.5 diameters apart. Elytra with lateral margins weakly rounded; with punctures as large as the pronotal ones, 1–2 diameters apart, setiferous. Female genitalia as in fig. 43. Aedeagus as in fig. 41.
Figures 15–25
*Hylaperdina costaricensis* n. g., n. sp. 15, body, dorsal view; 16–17, antenna; 18, pronotum; 19, lateral closure of mesocoal cavity; 20, body, ventral view; 21, head and prothorax, antero-dorsal view; 22, head and anterior part of pronotum, dorsal view; 23, pro- and mesothorax, ventral view; 24, head, ventral view; 25, abdomen, male, ventral view.


Hylaperdina brevicornis n. sp.

Etymology. The specific epithet refers to its short antennae with most segments very short and transverse.

Diagnosis. This species differs from H. costariciensis by its more parallel-sides body, dorsal vestiture of appressed setae with erect hairs along lateral margins more distinct, pronotum with lateral sulci less developed, antennomere 3 at most subquadrate, and antennomeres 4–8 strongly transverse.

Description. Length 2.60–2.65 mm. Body 2.15–2.17 times as long as wide; pronotum 0.65 times as long as wide; elytra 1.55–1.60 times as long as wide; 2.65–2.68 times longer than pronotum, 1.10–1.15 times wider than pronotum. Reddish brown; body shiny. Vestiture pale, dense, moderately long and appressed with lateral erect hairs distinct. Antenna about 0.3 times as long as body; scape with antero-medial projections; antennomere 3 weakly transverse and antennomeres 4–8 very short, strongly transverse; antennomeres 5 and 7 distinctly broader than neighboring segments. Pronotum with lateral edges weakly crenulate, with base as broad as base of elytra; lateral sulci moderately deep, extending along about 1/5 of pronotal length; hind angles right-angled; punctures setiferous, as coarse as and denser than those on elytra, 0.5–1.0 diameters apart. Elytra with lateral margins almost parallel; with punctures 1.0–1.5 diameters apart, setiferous. Aedeagus as in fig. 44.

Female unknown.

Type Material. Holotype (male): “Ecuador, Napo, Yasuni, Yasuni National Park, Yasuni Biological Station, 0.40.32S 76.23.50W/ 27.VI.1999 CEC #27, Sendero Peru, Berlese of rotten sticks, Chris E. Carlton/ LSAM0019694/ n. gen., n. sp., det. R.A.B. Leschen/ Holotype Hylaperdina brevicornis Tomaszewska” (LSAM).

Paratype. (male), same data as holotype, but LSAM0019695 (dissected on slide: MIZ).

Distribution. Ecuador.

Key to genera of Neotropical Lycoperdininae

1. Dorsum apparently glabrous ........................................ 2
   – Dorsum distinctly pubescent ........................................ 3

2. Body smaller; labial palpmere 2 semilunar; pronotum without basal sulci; mandible with apical tooth sharp; widely distributed from Honduras to Argentina ...................... Acinaeces Gerstaecker
   – Body larger; labial palpmere 2 not as above; pronotum with basal sulci; mandible with apical tooth chisel-shaped; widely distributed from Mexico to Argentina ........................................ Corynomalus Chevrolat

3. Prosternal process at least as broad as half of coxal diameter and distinctly reaching beyond procoxae; procoxae distinctly separated; hind wings absent .............................................. 4
   – Prosternal process narrow and vestigial, procoxae contiguous; hind wings usually present ................................ 5

4. Dorsum covered with pubescence consisting of both short appressed setae and long, erect bristles (figs. 2, 8); anterior margin of labrum deeply emarginate medially; ..................... Chile Chileanus n. g.

Figure 26
Hylaperdina brevicornis n. g. n. sp. Habitus, dorsal.
Figures 27–38
Hylaperdina brevicornis n. g., n. sp. 27, body, dorsal view; 28, head, ventral view; 29–31, antenna; 32, body, ventral view; 33, head and prothorax, anterodorsal view; 34, pronotum; 35, pro-, meso- and anterior part of metathorax, ventral view; 36, surface of elytra and scutellum; 37, lateral closure of mesocoxal cavity; 38, abdomen, male, ventral view.
- Dorsum covered with pubescence consisting of short appressed setae only; anterior margin of labrum at most scarcely emarginate medially; Ecuador

Correspondingly, _Achuarmychus_ Tomaszewska & Leschen

5. Antennae short, antennomeres 5 and 7 enlarged (figs. 16, 17, 29–31); pronotal base nearly as broad as base of elytra; mesocoxal cavities closed laterally (figs. 19, 37); mandible with apical tooth large; erect bristles present along lateral margins of pronotum and elytra; Costa Rica, Ecuador

Correspondingly, _Hylaperdina_ n. g.

- Antennae long, antennomeres 5 and 7 simple; pronotal base much narrower than elytral base; mesocoxal cavities open laterally; mandible with apical tooth very small; erect bristles absent from lateral margins of pronotum and elytra; widely distributed from Mexico to Argentina

Correspondingly, _Archipines_ Strohecker

**Phylogeny and Systematics.**

Cladistic analyses based on adult characters (Tomaszewska 2000) and on adult and larval characters combined (Tomaszewska 2005) supported monophyly of Lycoperdininae based on the following adult synapomorphies: the presence of an occipital file on the head, the maxillary lacinia with mesal edge and dorsal surface covered with regular rows of setae and/ or spinulae, the stridulatory membrane on anterior margin of the pronotum, and sternite of male genital segment (abdominal segment IX) with apical margin at least weakly emarginate or sinuate (although simple in _Daulotypus_ Lea and one species of _Daulis_ Erichson). The initial analysis (Tomaszewska 2000) suggested that the fused coxites of the ovipositor was an apomorphy of Lycoperdininae, but the subsequent analysis did not support this notion. Separated coxites occur in _Daulis, Daulotypus, Archipines_ Strohecker (Tomaszewska 2002) and _Achuarmychus_ Tomaszewska & Leschen 2002, all of which are the most plesiomorphic genera of the subfamily, but this feature is also present in more derived genera such as _Mycetina_ Mulsant and _Ancylopus_ Costa.

The neotropical Lycoperdininae now includes six endemic genera: _Acinaces_ Gerstaecker, _Corynomalus_ Chevrolat (=Amphix Laporte), _Archipines_ Strohecker,
Achuarmychus, Hylaperdina gen. nov. and Chileanus gen. nov. Corynomalus and Acinaces are included within the Amphix-group, closely related to the oriental genera Beccariola Arrow, Dryadites Frivaldszky, Cymbachus Gerstaecker, Sinocymbachus Strohecker & Chûjô and Pseundalnus Arrow, the neartic genus Aphorista Gorham, and to Mycetina, which is widely distributed in Holarctic, Oriental and Afrotropical regions (Tomaszewksa 2005).

The Daulis-group, which includes the neotropical genera Achuarmychus and Archipines and the Australian genera Daulis and Daulotypus, is supported by a single larval synapomorphy: prostheca well-developed, divided into two separated parts, as well as by the presence of an epicranial stem, a character shared with other Lycoperdininae. The Daulis-group has been supported as the most basal clade of the subfamily, sister to the remaining Lycoperdininae. Within the Daulis-group of Lycoperdininae, the preferred cladogram of analysis of Tomaszewska (2005) indicated Daulis and Daulotypus as most closely related to each other based on the double body vestiture and pronotum with coarsely crenulate lateral margins, with Archipines as sister taxon to this clade. The cladecomprising Archipines + (Daulis + Daulotypus) was further supported by the reduction of coxites, with Achuarmychus as its sister taxon.

Within this group, Hylaperdina is most similar to Achuarmychus by having the body uniformly brown and covered with dense setae. Achuarmychus, however, differs from Hylaperdina in having a less elongate body, mandible without subapical tooth, the prosternal process well-developed and reaching distinctly beyond front coxae, the intercoxal process of mesoventrite flat without carinae, and the hind wings absent. Compared to other Lycoperdininae, Hylaperdina is superficially similar to setose species of Lycoperdinia Latreille, which is widely distributed in Holarctic and Afrotropical regions, and to species of the Palearctic genus Hylatia Chevrolat (both belonging to the Lycoperdinia-group), in overall body appearance and by the presence of a single median carina on the intercoxal process of the mesoventrite. However, simple antennomeres 5 and 7, ovipositor with coxites fused at least basally, abdominal sternite VIII compactly connected with ovipositor, and mentum at most weakly raised across middle readily separate Lycoperdinia and Hylatia from Hylaperdina. The laterally closed mesocoxal cavities separate Hylaperdina from all other genera of “higher” Endomychidae. This feature is more characteristic of basal endomychid subfamilies such as Merophysinae, Pleganophorinae and Anamorphinae.

Within the Daulis-group, Chileanus is most similar to Daulis and Daulotypus, sharing the double dorsal vestiture of shorter suberect setae originating from the punctures and long, erect bristles arising from small tubercles. However, having a pronotum distinctly narrower than the base of the elytra with its lateral margins coarsely crenulate, a narrow prosternal process and well-developed hind wings readily separate Daulis and Daulotypus from Chileanus.

In order to examine relationships of Hylaperdina and Chileanus to other Lycoperdininae, they were included in the original data matrix, and subjected to cladistic analyses using combined adult and larval data with larval data coded as missing “?” when larvae were unknown. Expanded matrix included 96 adult and larval characters scored for 71 taxa. The re-analyses of the data were performed using the same procedures as in Tomaszewska (2005).

Similarly to 2005 analyses, the preferred cladogram was chosen after successive weighting, which resulted in obtaining one tree (L = 213; CI = 55; RI = 87).

The present analyses recovered a monophyletic Daulis-group clade that included Hylaperdina and Chileanus. The close relationship of Chileanus to Daulis and Daulotypus is confirmed, and the double body vestiture is a synapomorphy for these genera. Hylaperdina was recovered as sister taxon to (Archipines + (Chileanus + (Daulis + Daulotypus)), supported by absence of the gular sutures. Achuarmychus remained at the most basal position within the Daulis-group.

Asymmetry of antennomeres 5 and 7 is a unique character for Hylaperdina. Chileanus is not similarly defined by any single character, only by combination of characters.

Acknowledgements. The following colleagues brought these curious and beautiful beetles to my attention, after their studies of the material from the following collections (museum acronyms and names of curators in parentheses): Rich Leschen (LSAM, Chris Carlton), Adam Slipiński (FMNH, Alfred Newton), Emmanuel Arriaga-Varela (INBIO, Angel Solis). I am indebted to the curators of these museums for the loan of these specimens. I thank very much Floyd Shockley and Adam Slipiński for reading a draft of this paper, and Rich Leschen and Joe McHugh for reviewing the manuscript. All colleagues made many helpful suggestions. Magdalena Kowalewska-Groszkowska (MIZ) helped with SEM photographs and Malwina Roszkowska (MIZ) with habitus photographs.

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