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New species and records of the genus *Lispinus* with a key to the species from Peru (Coleoptera: Staphylinidae: Osoriinae)

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Abstract

Four new species of *Lispinus* from the premontane forest of the eastern slope of the Peruvian Andes are described and records of all other *Lispinus* species from Peru are given. The new species are: *L. blandus, L. minimus, L. speciosus,* and *L. peruanus*. A key to the known 21 Peruvian species is provided, habitat information is summarized and geographical distribution of species is discussed. The following six types of zoogeographic distribution can be differentiated for the Peruvian *Lispinus* species: endemic, eastern Andean, lowland Amazonian, Circum-Amazonian, northern South- and Central-American, and Pan-Neotropical.

Key words: Staphylinidae, *Lispinus*, systematics, new species, identification key, Neotropical Region, premontane rainforest, lowland Amazonian rainforest, biogeography

Introduction

With the beginning of intensive collecting at the research station of Panguana, Loreto, founded by H. Koepke in the 1970-ies and at different locations by scientists of the Natural History Museum and Biodiversity Centre, Lawrence, Kansas, USA, in 1989, our knowledge of the staphylinid fauna of the Peru increased dramatically. This is also true for the genus *Lispinus* Erichson, 1840 of the subfamily Osoriinae. Previously, 17 species of the genus have been recorded from Peru (Irmler 1994, 2001). New material collected by Robert Brooks contained 4 additional species, previously unknown to science, which expanded the number of Peruvian *Lispinus* species to 21. Nevertheless, the majority of specimens collected in the last decade belong to described species, and it can be assumed that a good part of species existing in Peru is known. As the *Lispinus* inventory of Peru seems to be near completion, a summary publication is appropriate to facilitate future identification of species of the country. Thus, this publication includes a description of four new species, a compilation of *Lispinus* records of the country and an identification key. Moreover, the up-to-date zoogeographic distribution of the Peruvian *Lispinus* species reflects the status including locations that have not been published so far.

Material

The material used in the current study is deposited in the following institutions:

SEMC	Snow Entomological Collections of the Natural History Museum of the University of Kansas, Lawrence, U.S.A. (Prof. DR. James S. Ashe)
ISNB	Institut royal des Sciences naturelles de Belgique, Brussels, Belgium (Dr. Didier Drugmand)
NHMW	Naturhistorisches Museum, Vienna, Austria (Dr. Harald Schillhammer)

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ZMHB Museum für Naturkunde der Humboldt-Universität, Berlin, Germany (Dr. Johannes Frisch)
UIC Ulrich Irmler personal collection

I thank the curators of the entomological departments for their continuous support.

Width was measured at the widest part of the respective tagmata, length was measured along the middle in head and pronotum and at shoulders in elytra.

Descriptions of new species

***Lispinus blandus* n. sp.**
Figs. 2A–2E, 6P, 6E, 9B

Type material. Holotype: PERU: Madre de Dios: male, Pantiacolla Lodge, 8 km NE Mirador, Alto Madre do Dios River (12°38'23"S, 71°16'23"W), 950 m elevation, 24 OCT 2000, leg. R. Brooks, #PERU1B00 083, collected under bark (SEMC). **Paratypes: PERU:** 11 females with same data as the holotype (SEMC, UIC).

Diagnosis. The new species resembles *L. bolivianus* and *L. peruanus* in the depressions at posterior angles of the pronotum having a matt surface. *Lispinus blandus* is distinctly larger than *L. bolivianus* and *L. peruanus*. The emargination at the posterior angles of the pronotum is similar to that of *L. peruanus*, but much more indistinct than that of *L. bolivianus*. Furthermore, the microsculpture of elytra and pronotum of *L. bolivianus* is denser and the surface is, thus, matter than in *L. blandus*.

Description. *Body length* 4.7 mm.

Body colour black with front margin of clypeus reddish and antennae and legs dark brown.

Head 0.75 mm long, 0.85 mm wide; eyes small and not prominent; temples twice as long as eyes; clypeus smoothly rounded and widely margined, in particular in outer parts; with two supraocular setae, on each side two setae on the front margin of clypeus, one seta on the disc and one seta on the neck; punctation fine and sparse; distance between punctures on average twice as wide as diameter of punctures; clypeus more densely punctate than disc, but the punctation equally fine; on disc, a sparse and fine micro-punctation between coarser punctures and a moderately deep microsculpture longitudinally reticulate; surface slightly shiny.

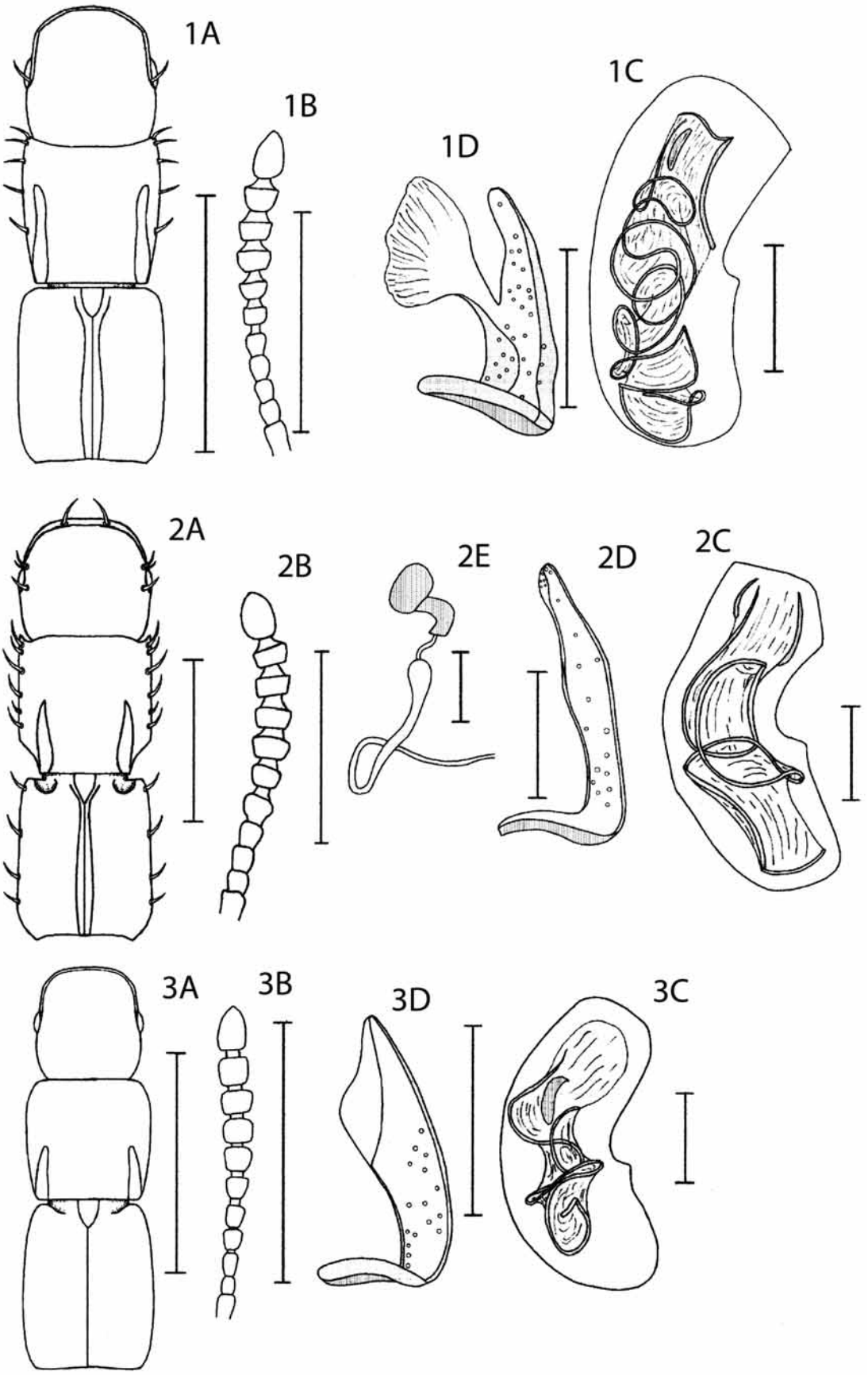
Antennae thick and stout, slightly longer than head; antennomere 2 1.5 times as long as wide; antennomere 3 conical and not longer than antennomere 2; antennomeres 4 to 7 more or less quadrate; the following antennomeres nearly twice as wide as long.

Pronotum 0.77 mm long, 0.87 mm wide; widest at anterior angles; straightly narrowed to posterior angles; front edge deeply emarginate and, therefore, front angles distinctly prominent; several setae along lateral margin; four of them much longer than the rest; another long seta at front edge near front angles; punctation much coarser and denser than on head; distance between punctures on average as wide as or shorter than diameter of punctures; a fine micro-punctation also present; a narrow midline without punctures; microsculpture deeper than on head, but longitudinally reticulate, too; surface less shiny than head; depressions at posterior angles deep and distinctly margined laterally; with microsculpture denser than on the disc, thus, rendering the depressions dull.

Elytra 1.05 mm long, 0.90 mm wide; punctation slightly finer and sparser than on pronotum, but larger and denser than on head; microsculpture deep and densely longitudinally reticulate; surface distinctly duller than in pronotum and head; with two short indistinct setae on the disc near suture, one in anterior half, one in posterior half.

Abdomen with punctation as dense and deep as on pronotum; microsculpture net-like reticulate; surface as shiny as in head; laterally with long yellow setae on each visible abdominal segment.

Etymology. The specific name is derived from the Latin word meaning nice.



FIGURES 1–3. Details of *Lispinus peruanus* (1), *L. blandus* (2) and *L. minimus* (3). A—fore body; B—antenna; C—median lobe of aedeagus in lateral aspect; D—paramera; E—spermatheca. Scale bars: 1 mm (A), 0.5 mm (B), 0.1 mm (C–E).

***Lispinus speciosus* n. sp.**
Figs. 4A–4E, 8E, 8P, 9D

Type material. Holotype: PERU: Madre de Dios: male, Pantiacolla Lodge, 8 km NE Mirador, Alto Madre do Dios River (12°38'23"S, 71°16'23"W), 950 m elevation, 24 OCT 2000, leg. R. Brooks, #PERU1B00 083, collected under bark (SEMC). **Paratypes: PERU:** 1 male, 3 females with same data as for holotype (SEMC, UIC).

Diagnosis. The species can scarcely be confused with any other Neotropical *Lispinus* species. The combination of sparse and fine punctation of the pronotum and the slightly developed depression at the posterior angles of the pronotum is not found in other *Lispinus* species. In particular, the shape of the paramera, with the separate transparent lobe at the apex, is unique among the Neotropical *Lispinus* species.

Description. *Body length* 4.8 mm.

Body colour black with antennae and legs brown.

Head 0.55 mm long, 0.75 mm wide; eyes not prominent, as long as temples; anterior edge smoothly rounded and slightly emarginate in the middle; with two fine supraocular setae; two short setae at the front margin of clypeus and four setae on the disc, the anterior pair of discal setae at level of anterior edge of eyes, the posterior pair at level of posterior edge of eyes; punctation fine and sparse; distance between punctures two to three times as wide as diameter of punctures; a fine micro-punctation present; microsculpture fine; on clypeus transversely reticulate, on disc longitudinally reticulate; surface shiny.

Antennae relatively long, slightly longer than head and half of pronotum combined; antennomere 2 short and quadrate; antennomere 3 nearly twice as long as antennomere 2; antennomere 4 still longer than wide, the following ones quadrate.

Pronotum 0.80 mm long, 0.95 mm wide; widest shortly behind anterior angles; front edge emarginate, but already slightly prominent in the middle; thus, anterior angles prominent; sides straightly narrowed to posterior angles; several short setae along lateral margin; punctation and micro-punctation as sparse and fine as on head; microsculpture fine, longitudinally reticulate; surface shiny; impunctate midline restricted to longitudinal space in middle of disc; depression at posterior angles scarcely developed, weak, short and more or less oval in shape.

Elytra 1.10 mm long, 1.05 mm wide; punctation still sparser and finer than on pronotum and head; distance between punctures more than three times the diameter of punctures; fine and dense micro-punctation present; microsculpture longitudinally reticulate; surface shiny.

Abdomen extremely finely and sparsely punctate; abdominal tergites dorsally with large impunctate spaces; microsculpture transversely reticulate; surface shiny; each visible tergite with several diagonal striae.

Etymology. The specific name is derived from the Latin word meaning wonderful.

***Lispinus peruanus* n. sp.**
Figs. 1A–1D, 5P, 5E, 9A

Type material. Holotype: PERU: Madre de Dios: male, Pantiacolla Lodge, 8 km NE Mirador, Alto Madre do Dios River (12°38'23"S, 71°16'23"W), 950 m elevation, 24 OCT 2000, leg. R. Brooks, #PERU1B00 083, collected under bark (SEMC). **Paratypes: PERU:** 6 males, 10 females with same data as the holotype (SEMC, UIC).

Diagnosis. *L. peruanus* resembles *L. bolivianus* in the small body size and the structure of the depressions at posterior pronotal angles. The shape of pronotum of *L. peruanus* is more or less quadrate, whereas that of *L. bolivianus* is distinctly wider than long. While the structure of the spiral endophallus resembles that of *L. bolivianus*, the paramera are distinctly different. Their stout shape with the separate transparent lobe is unique among the Neotropical *Lispinus* species.

Description. Body length 3.2 mm.

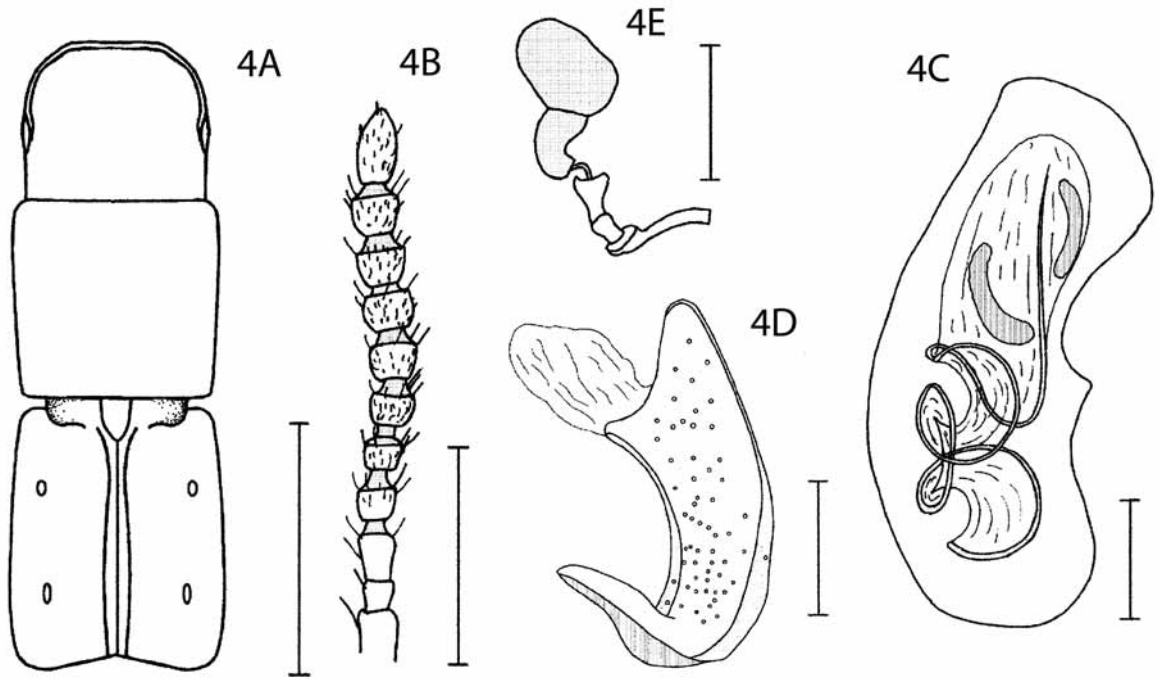
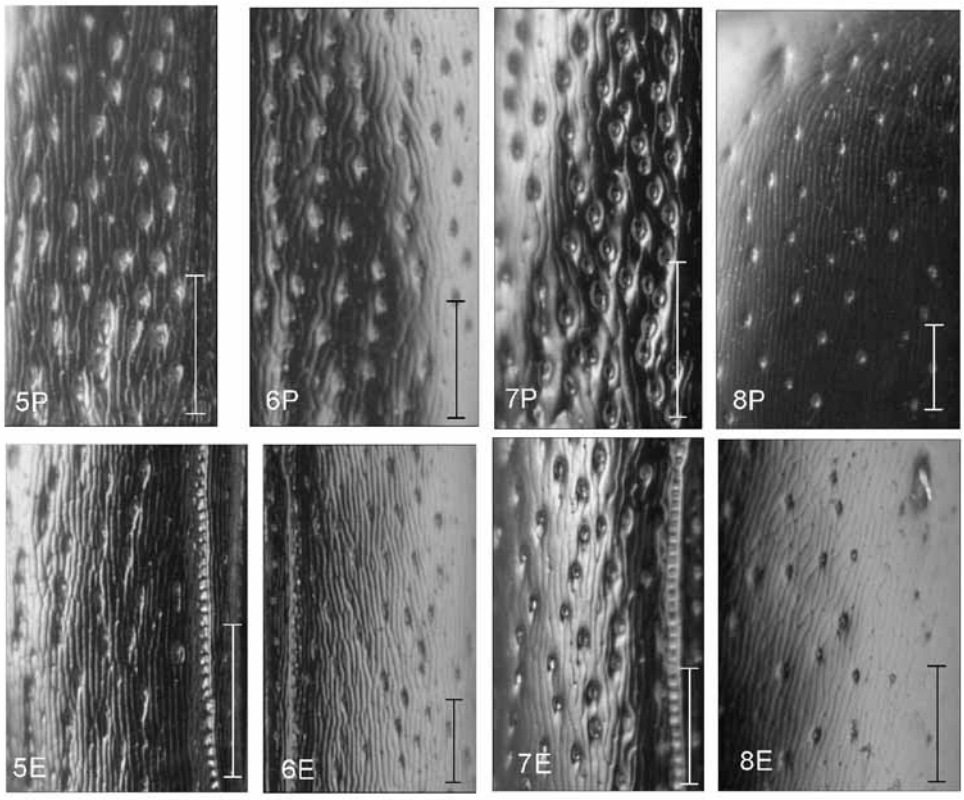


FIGURE 4. Details of *Lispinus speciosus* (4). A—fore body; B—antenna; C—median lobe of aedeagus in lateral aspect; D—paramera; E—spermatheca. Sscale bars: 1 mm (A), 0.5 mm (B), 0.1 mm (C–E).



FIGURES 5–8. Surface of pronotum (P) and elytra (E) of *Lispinus*. 5—*Lispinus peruanus*, 6—*L. blandus*, 7—*L. minimus*, 8—*L. speciosus*. Scale bar: 0.1 mm.

Body colour black with legs light brown and antennae dark brown; last abdominal tergite posteriorly reddish.

Head 0.45 mm long, 0.50 mm wide; eyes slightly prominent; front margin smoothly rounded; with two supraocular setae, two setae at the front margin and four setae on disc, two anterior discal setae at level of front edge of eyes, two posterior discal setae on neck; distance between posterior discal setae 1.5 times as wide as between anterior setae; punctation moderately fine and dense; distance between punctures on average about equal to diameter of punctures; a fine and sparse micro-punctation between the coarser punctures present; microsculpture distinct and dense, on clypeus net-like reticulate, on disc longitudinally reticulate; surface slightly shiny.

Antennae as long as head and half the pronotum combined; 2nd antennomere globular; 3rd antennomere conical and slightly longer than 2nd; 4th antennomere as wide and long as 2nd; the following antennomeres increasing in width; 5th and 6th quadrate, penultimate antennomere 1.5 times as wide as long.

Pronotum 0.50 mm long, 0.55 mm wide; sides more or less parallel in front of short emargination at posterior angles; front edge slightly emarginate; with two setae along the lateral margin; punctures slightly larger, but as dense as on head; a fine and sparse micro-punctation present; impunctate midline narrow; microsculpture dense, but not deep; surface slightly shiny; with an indistinct longitudinal depression on each side of the midline and laterally a deep longitudinal depression at posterior angles; the lateral depression distinctly margined on each side with dense ground microsculpture, thus, surface of depression dull.

Elytra 0.70 mm long, 0.60 mm wide; punctures as deep and large as on pronotum, but slightly sparser; distance between punctures on average 1.5 times the diameter of punctures; laterally each with two rows of dense, deeply coriaceous punctures forming indistinct longitudinal rows; with dense and deep partly net-like microsculpture, partly longitudinally reticulate; surface dull.

Abdomen with punctation as deep and dense as on pronotum; microsculpture net-like reticulate and distinctly weaker than on pronotum; surface distinctly more shiny than fore body.

Etymology. The specific name is derived from the country's name (Peru), where the species was collected.

***Lispinus minimus* n. sp.**
Figs. 3A–3D, 7P, 7E, 9C

Type material. Holotype: PERU: Madre de Dios: male Pantiacolla Lodge, 8 km NE Mirador, Alto Madre do Dios River (12°38'23"S, 71°16'23"W), 950 m elevation, 24 OCT 2000, leg. R. Brooks, #PERU1B00 083, collected under bark (SEMC). **Paratypes: PERU: Madre de Dios:** 2 females with same data as the holotype (SEMC, UIC); **Loreto:** 1 female, 1.5 km N Teniente Lopez (2° 35.66'S, 76° 06.92W), 22. July 1993, 210–240 m elevation, leg. Richard Leschen, # 169, ex: flight intercept trap (SEMC).

Diagnosis. The small size of this species resembles that of *L. granadensis*, *L. insularis*, *L. peruanus* and *L. bolivianus*. In contrast to *L. granadensis* and *L. insularis*, the depressions at the posterior angles of the pronotum are margined laterally as in *L. bolivianus* and *L. blandus*. It can be distinguished from *L. peruanus* and *L. bolivianus* by the absence of any emargination in front of posterior angles of pronotum and the shiny surface of the pronotal depressions.

Description. *Body length* 3.2 mm.

Body colour black with legs and antennae brown; visible abdominal tergite 6 reddish posteriorly.

Head 0.40 mm long, 0.55 mm wide; eyes long, slightly longer than temples; front edge of clypeus smoothly rounded; with two supraocular setae, two setae at the front margin and four short setae on the disc; punctation deep and dense, partly coriaceous; on average distance between punctures half as wide as diameter of punctures; microsculpture extremely weak; surface nearly polished.

Antennae short; only slightly longer than head; antennomere 2 longer than wide; antennomere 3 conical and shorter than antennomere 2; antennomeres 4 to 6 quadrate; the following antennomeres wider than preceding ones; penultimate antennomere at least 2 times wider than long.

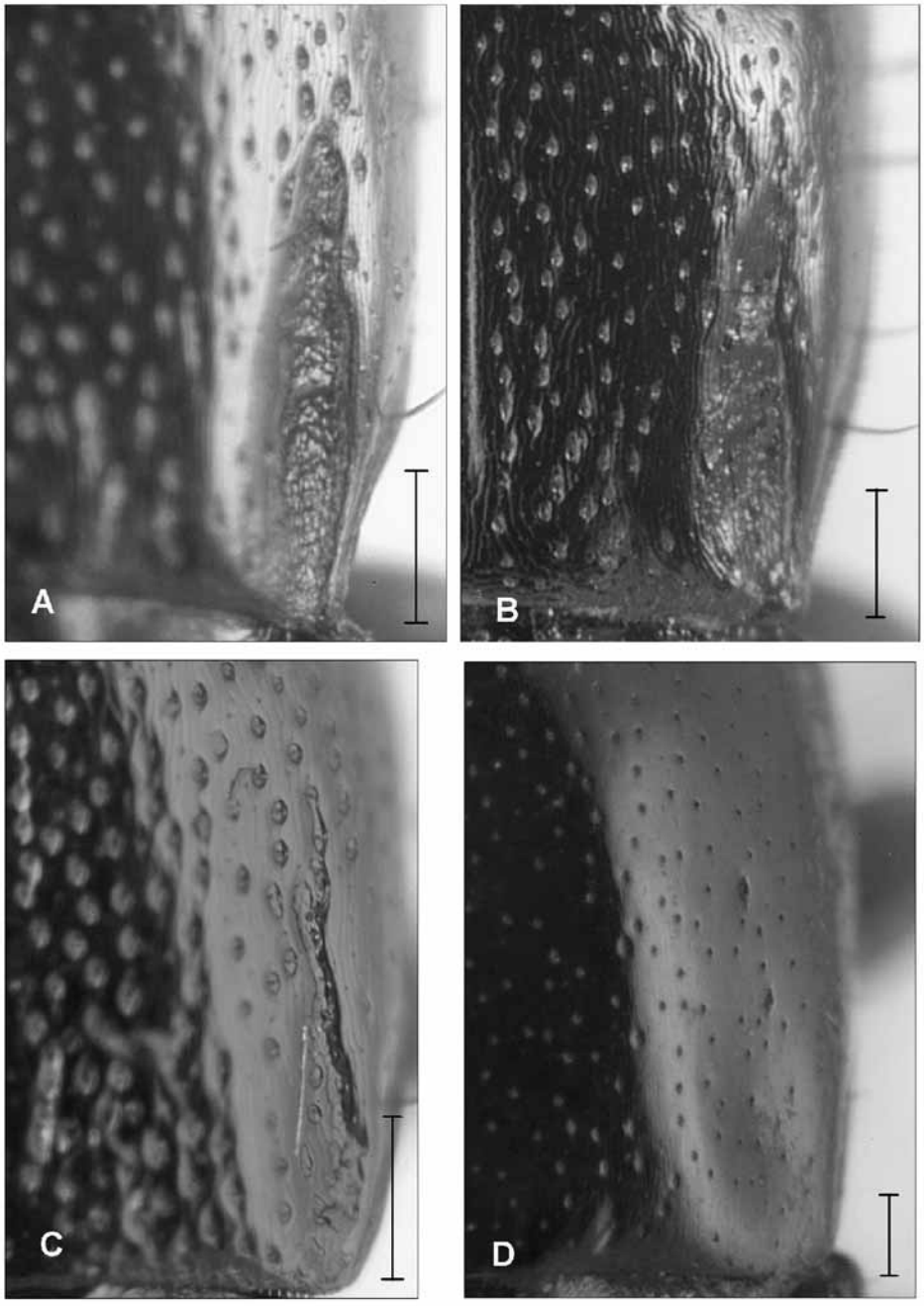


FIGURE 9. Shape of posterior angle of pronotum with depression showing punctation and microsculpture of *Lispinus peruanus* (A), *L. blandus* (B), *L. minimus* (C) and *L. speciosus* (D). Scale bar: 0.1 mm.

Pronotum 0.50 mm long, 0.60 mm wide; widest near the anterior angles; nearly straightly narrowed to posterior angles; front edge straight; with three long setae at lateral margin; with punctures deep and large; still larger than on head, but as dense as on head; distance between punctures on average half of diameter of punctures; near posterior edge with coriaceous punctation; a small impunctate midline restricted to short longitudinal space in middle of disc; without microsculpture, surface polished; depressions at posterior angles linear and deep; not reaching the middle of pronotum.

Elytra 0.67 mm long, 0.65 mm wide; punctation still larger and deeper than on pronotum, partly coriaceous; fine and sparse micro-punctation present; microsculpture extremely weak; surface polished.

Abdomen with coarse and dense punctation; on posterior tergites less dense than on anterior tergites; without microsculpture, surface polished.

Etymology. The specific name is derived from the Latin word meaning small and refers to the body size of the species.

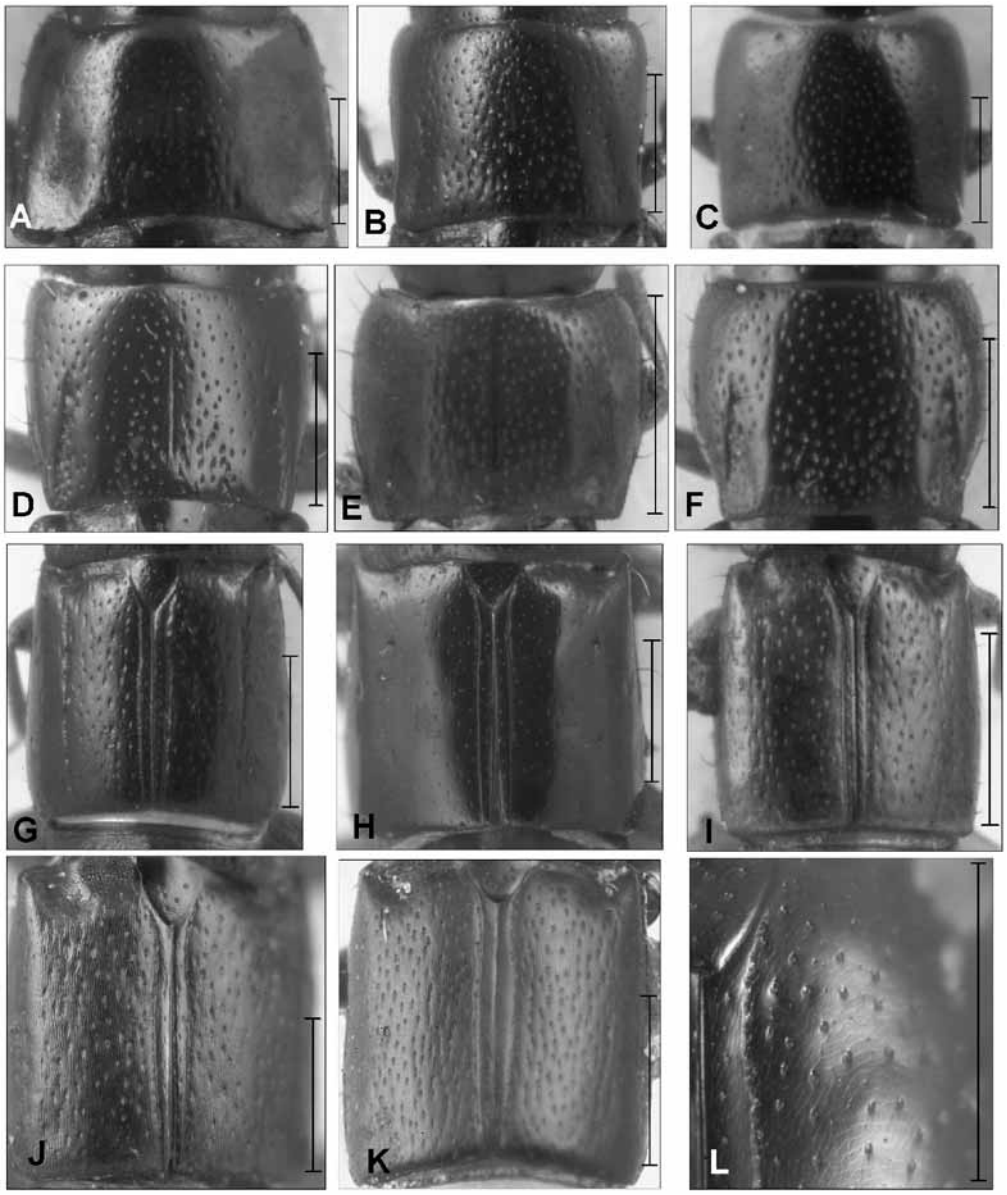


FIGURE 10. Pronotum (A–F) and elytra (G–L) of *Lispinus*. A—*Lispinus laticollis*, B, G—*L. striola*, C—*L. quadripunctulus*, D—*L. catena*, E—*L. bolivianus*, F—*L. sinuatocollis*, H—*L. laeviusculus*, I—*L. newtoni*, J—*L. listenbarthi*, K—*L. lunaris*, L—*L. lescheni*. Scale bar: 0.5 mm.

Additional records of previously described Peruvian species

Lispinus attenuatus Erichson, 1840

Lispinus attenuatus Erichson, 1840: 828; Irmler, 1994: 58.

Material examined. PERU: Madre de Dios: 25 specimens, Pantiacolla Lodge, 8 km NW El Mirador (71°16'23W, 12°38'23S), under bark, 950 m elevation, 24.X.2000, leg. R.W. Brooks (SEMC, UIC); 9 specimens, Pentiacolla Lodge, Monk Saki trail, under bark, 400 m elevation, 25.X.2000, leg. R.W. Brooks (SEMC, UIC); 2 specimens, Pantiacolla Lodge, Alto Madre de Dios River (71°13'W, 12°39'S), under bark, 26.X.2000, leg. R.W. Brooks (KNM); 9 specimens, Pantiacolla Lodge, 2–7 km NW El Mirador trail

(71°15'W, 12°39'S), under bark, 550 m elevation, 24.X.2000, leg. R.W. Brooks (SEMC, UIC); 2 specimens, Manu National Park, Pakitza Biol. Station (71°17'W, 11°56'S), wet mud near stream, 317 m elevation, 22.X.2000, leg. R.W. Brooks (SEMC); 1 specimen Manu National Park, Pakitza Biol. Station (71°17'W, 11°56'41S), 317 m elevation, flight intercept trap, 16.X.2000, leg. R.W. Brooks (SEMC); **Loreto:** 1 specimen, Panguana (74°56'W, 9°37'S), Rio Pachitea, 260 m elevation, 01.II.1976, leg. Listenbarth (UIC).

Lispinus bolivianus Bernhauer, 1929

Lispinus bolivianus Bernhauer, 1929: 346; Irmler, 1994: 60.
Lispinus opacipennis Bernhauer,1921: 66; Irmler, 1994: 60 (preoccupied; as synonym of *L. bolivianus*).

Material examined. PERU: Loreto: 5 specimens, Pebas (71°59'W, 3°20'S), without further data (INSB); 1 specimen, Panguana (74°56'W, 9°37'S), tropical rain forest, pitfall trap, 08.XII.1984, leg. M. Verhaagh (UIC); **Madre de Dios:** 1 specimen, Pentiacolla Lodge, Monk Saki trail, under bark, 400 m elevation, 25.X.2000, leg. R.W. Brooks (KNM); 7 specimens, Pantiacolla Lodge, Alto Madre de Dios River (71°13'55W, 12°39'22S), 26.X.2000, leg. R.W. Brooks (SEMC, UIC).

Lispinus catena Sharp, 1876

Lispinus catena Sharp, 1876: 412; Irmler, 1994: 58.
Lispinus boxi Blackwelder, 1943: 293; Irmler, 1994: 58 (as synonym of *L. catena*).

Material examined. PERU: Loreto: 1 specimen, San Antonio de Curaray (74°07'W, 2°20'S), without further data, leg. Ohaus (MNB); 1 specimen, Panguana (74°56'W, 9°37'S), Rio Pachitea, 260 m elevation, 01.II.1986, leg. Listenbarth (UIC); 2 specimens, Pebas (71°59'W, 3°20'S), without further data (INSB); 7 specimens, Manu National Park, Pakitza Biol. Station (71°17'W, 11°56'S), in wet mud near stream, 317 m elevation, 22.X.2000, leg. R.W. Brooks (SEMC, UIC); 36 specimens, Manu National Park, Cocha Otorongo (71°11'58W, 12°02'1S), under bark, 310 m elevation, 21.X.2000, leg. R.W. Brooks (SEMC); 7 specimens, Manu National Park, Pakitza Biol. Station, under bark, 15.X.2000, leg. R.W. Brooks (SEMC, UIC); 51 specimens, Manu National Park, Cashu, Biol. Stn, (71°24'24W, 11°53'45S), 350 m elevation, 17.X.2000, 18.X.2000, 19.10.2000, leg. R.W. Brooks (SEMC, UIC); 2 specimens, Manu National Park, Yanayaku Camp (71°35'W, 12°25'S), under bark, 22.X.2000, leg. R.W. Brooks (KNM); **Cuzco:** 1 specimen, (71°59'W, 13°23'S), under bark, 26.V.1995, leg. J.S. Ashe (KNM); **Madre de Dios:** 24 specimens, Puerto Maldonado (69°12'W, 12°37'S), under bark, 09.VII.1989, leg. R. Leschen (SEMC, UIC); 6 specimens, Pantiacolla Lodge, Alto Madre de Dios River (71°13'55W, 12°39'22S), 26.X.2000, leg. R.W. Brooks (SEMC, UIC); Pentiacolla Lodge, Capibara trail, under bark, 400 m elevation, 1 specimen 25.X.2000 and 1 specimen 26.X.2000, leg. R.W. Brooks (SEMC); 76 specimens, Pantiacolla Lodge, 8 km NW El Mirador (71°16'23W, 12°38'23S), 950 m elevation, under bark, 24.X.2000, leg. R.W. Brooks (SEMC, UIC).

Lispinus fungicola Irmler, 2001

Lispinus fungicola Irmler, 2001: 4.

Material examined. PERU: Madre de Dios: 4 specimens, Puerto Maldonado, from encrusting fungi, 30.06.1989, leg. J.S. Ashe (SEMC, UIC); 1 specimen, Cashu, Biol. Stn, Manu National Park (71°24'24W, 11°53'45S), in flight intercept trap, 20.10.2000, leg. R.W. Brooks (SEMC); **Loreto:** 1 specimen, Panguana (74°56'W, 9°37'S), cleared forest, in pitfall trap, 01.02.1984, leg. W. Hanagarth (UIC).

Lispinus laeviusculus Bernhauer & Schubert, 1910

Lispinus laeviusculus Bernhauer & Schubert, 1910: 22; Irmler, 1994: 61.
Lispinus laevigatus Bernhauer, 1906: 193; Irmler, 1994: 61 (preoccupied; as synonym of *L. laeviusculus*).

Material examined. PERU: Loreto: Panguana, Rio Yuyapichis (74°56'W, 9°37'S), 260 m elevation, 1 specimen 1.II.1986 2 specimens 1.VI.1986, leg. Listenbarth (NHMW, UIC); **Cuzco:** 1 specimen, 9.VII.1989, leg. R. Leschen (KNM); **Madre de Dios:** 1 specimen, Manu National Park, Pakitza Biol. Station, wet mud near stream (71°17'W, 11°56'S), 317 m elevation, 22.X.2000, leg. R.W. Brooks (SEMC); 19 specimen, Manu National Park, Cocha Otorongo (71°11'58W, 12°02'1S), under bark, 310 m elevation, 21.X.2000, leg. R.W. Brooks (SEMC, UIC); 20 specimens, Cashu, Biol. Stn, Manu National Park (71°24'W, 11°53'S), 350 m elevation, under bark, 17–18.X.2000, leg. R.W. Brooks (SEMC, UIC); 1 specimen, Pantiacolla Lodge, Alto Madre de Dios River (71°13'W, 12°39'), 400 m elevation, under bark, 26.X.2000, leg. R.W. Brooks (SEMC); 1 specimen, Pantiacolla Lodge, 8 km NW El Mirador (71°16'23W, 12°38'23S), 950 m elevation, under bark, 24.X.2000, leg. R.W. Brooks (SEMC).

Lispinus laticollis Erichson, 1840

Lispinus laticollis Erichson, 1840: 828; Irmler, 1994: 58.

Material examined. PERU: Ica: 1 specimen, Chanchamayo (75°18'W, 11°12'S), 1500 m elevation, without further data, leg. Heyne (ZMHB).

Lispinus lescheni Irmler, 2001

Lispinus lescheni Irmler, 2001: 6.

Material examined. PERU: Madre de Dios: 4 specimens, Puerto Maldonado (69°12'W, 12°37'S), at *Schizopora* fungus, 200 m elevation, 09.07.1989, J.S. Ashe (SEMC, UIC).

Lispinus linearis Erichson, 1840

Lispinus linearis Erichson, 1840: 829; Irmler, 1994: 59.
Lispinus punctatus Sharp, 1876: 414; Irmler, 1994: 59 (as synonym of *L. linearis*).
Lispinus cognatus Sharp, 1876: 415; Irmler, 1994: 59 (as synonym of *L. linearis*).
Lispinus modestus Sharp, 1876: 415; Irmler, 1994: 59 (as synonym of *L. linearis*).
Lispinus aremicus Blackwelder, 1943:131; Irmler, 1994: 59 (as synonym of *L. linearis*).

Material examined. PERU: Loreto: 1 specimen, Rio Pachitea, without further data, leg. Bang-Haas (ZMHB).

Lispinus listenbarthi Irmler, 1994

Lispinus listenbarthi Irmler, 1994: 66.

Material examined. PERU: Loreto: 2 specimens, Panguana, Rio Pachitea, 260 m elevation, 01.II.1986, leg. Listenbarth (NHMW, UIC); **Cuzco:** 4 specimens, 09.VII.1989, leg. R. Leschen (SEMC); **Madre de Dios:** 1

specimen, Puerto Maldonado, Reserva Cuzco Amazonica, light trap, 19.VII.1989 leg. R. Leschen (KNM); 1 specimen, Pantiacolla lodge, Alto Madre de Dios River (71°13'W, 12°39'S), under bark, 400 m elevation, 26.VII.2000, leg. R.W. Brooks (SEMC).

Lispinus lunaris Irmler, 1994

Lispinus lunaris Irmler, 1994: 70.

Material examined. PERU: Madre de Dios: 2 specimens, Pantiacolla lodge, Alto Madre de Dios River (71°13'W, 12°39'S), 400m elevation, under bark, 24.X.2000, leg. R.W. Brooks (SEMC).

Lispinus newtoni Irmler, 1994

Lispinus newtoni Irmler, 1994: 66.

Material examined. PERU: Madre de Dios: 1 specimen, Cashu, Biol. Stn, Manu National Park (71°24'W, 11°53'S), 350 m elevation, under bark, 17.X.2000, leg. R.W. Brooks (SEMC); 1 specimen, Pentiacolla Lodge, Monk Saki trail, 400 m elevation, under bark, 25.X.2000, leg. R.W. Brooks (SEMC).

Lispinus quadripunctulus Fauvel, 1865: 49

Lispinus quadripunctulus Fauvel, 1865: 49; Irmler, 1994: 61.
Lispinus terminalis Sharp, 1876: 413; Irmler, 1994: 61 (as synonym of *L. quadripunctulus*).

Material examined. PERU: Loreto: 1 specimen, Pebas (71°46’W, 3°10S), without further data, (ISNB); Monte Rico (75°28'W, 4°58'S), without further data, leg. Jelsky (ISNB); **Madre de Dios:** 4 specimens, Puerto Maldonado, under bark, 9.VII.1989, leg. R. Leschen (SEMC); 1 specimen, Pantiacolla Lodge (71°13'W, 12°39'S), 26.X.2000, leg. R.W. Brooks (SEMC).

Lispinus sinuatocollis Bernhauer, 1942

Lispinus sinuatocollis Bernhauer, 1942: 2; Irmler, 2006: 1.
Lispinus costaricensis Irmler, 1994: 64; Irmler, 2000: 83; Irmler, 2006: 1 (as synonym of *L. sinuatocollis*).

Material examined. PERU: Loreto: 1 specimen, Pebas (71°46’W, 3°10S), without further data (ISNB).

Lispinus socialis Irmler, 1994

Lispinus socialis Irmler, 1994: 65.

Material examined. PERU: Madre de Dios: 1 specimen, Pantiacolla lodge, 2–7 km NW El Mirador trail (71°15'W, 12°39'S), 550 m elevation, under bark, 24.XI.2000, leg. R.W. Brooks (SEMC).

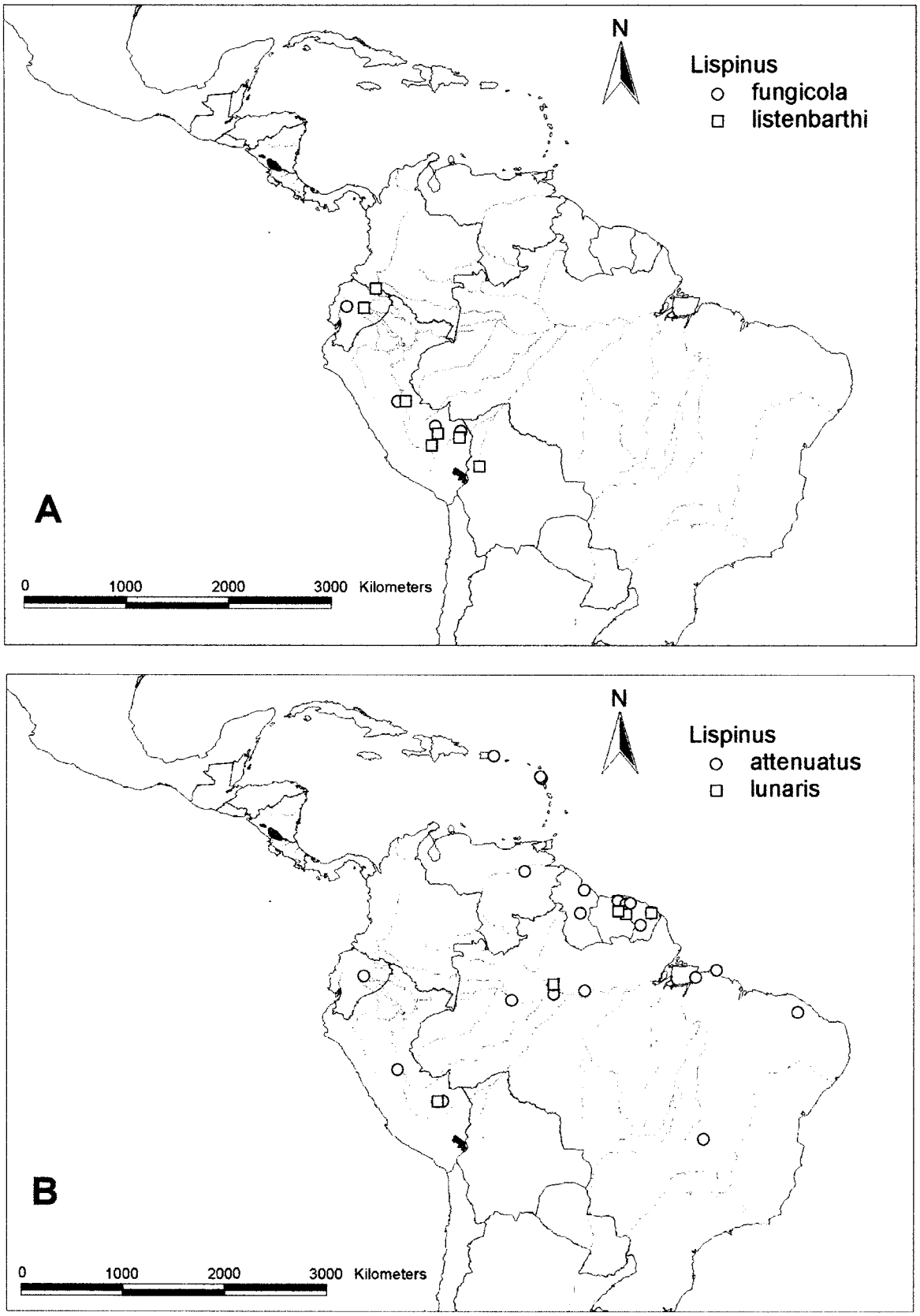
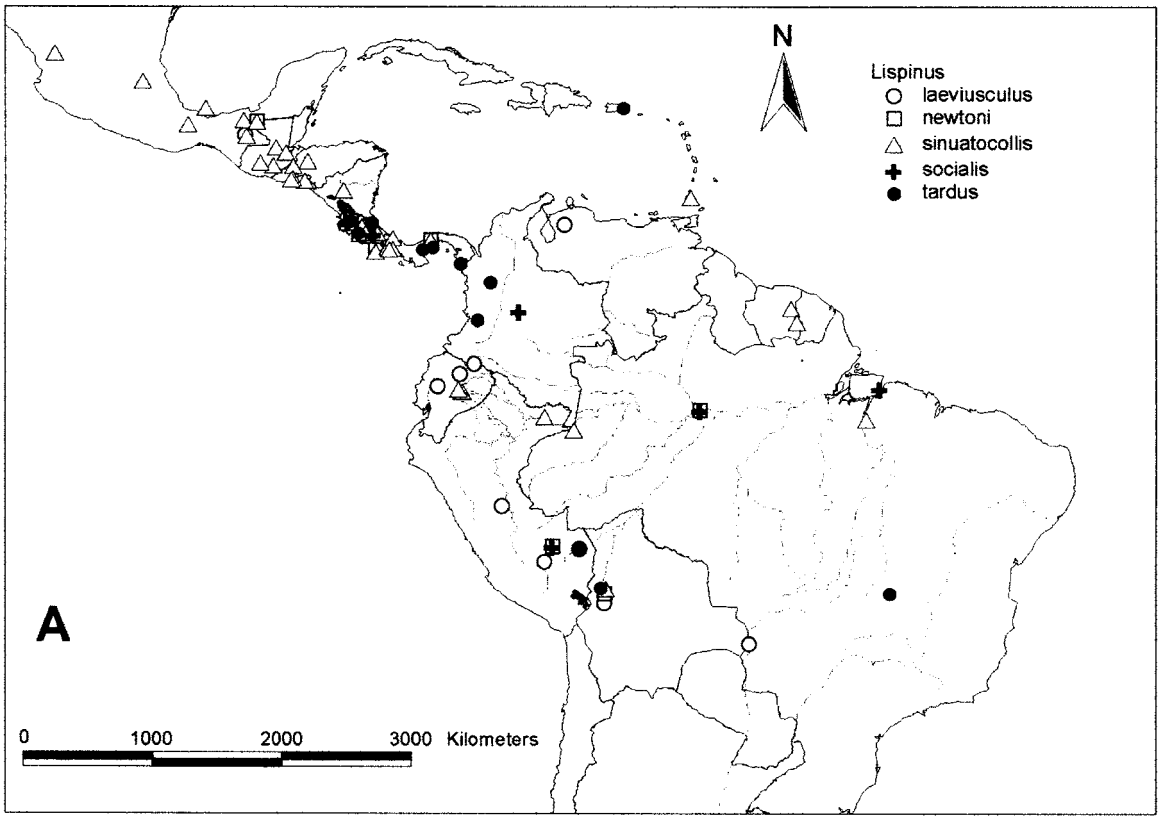
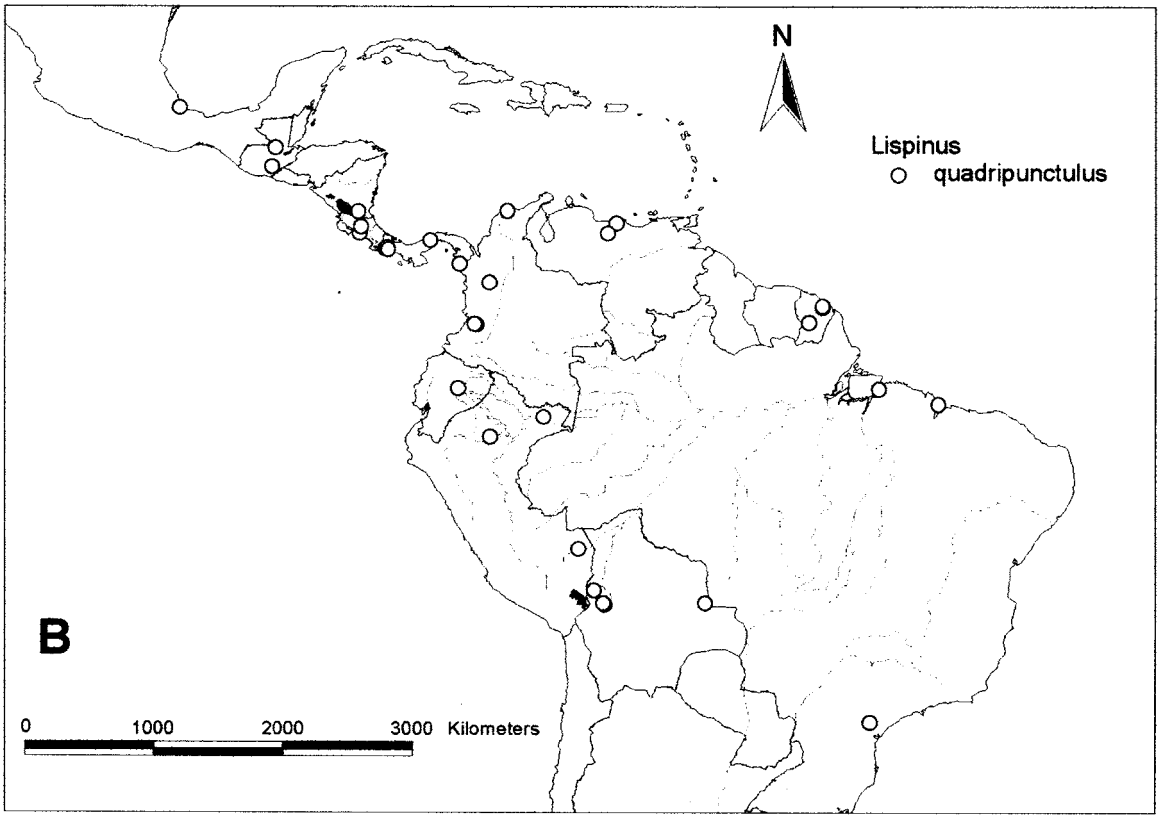


FIGURE 11. Distribution of the eastern Andean (A) and the lowland Amazonian (B) zoogeographic groups.





FIGURES 12. Distribution of the northern Neotropical (A) and the Circum-Amazonian (B) zoogeographic groups.

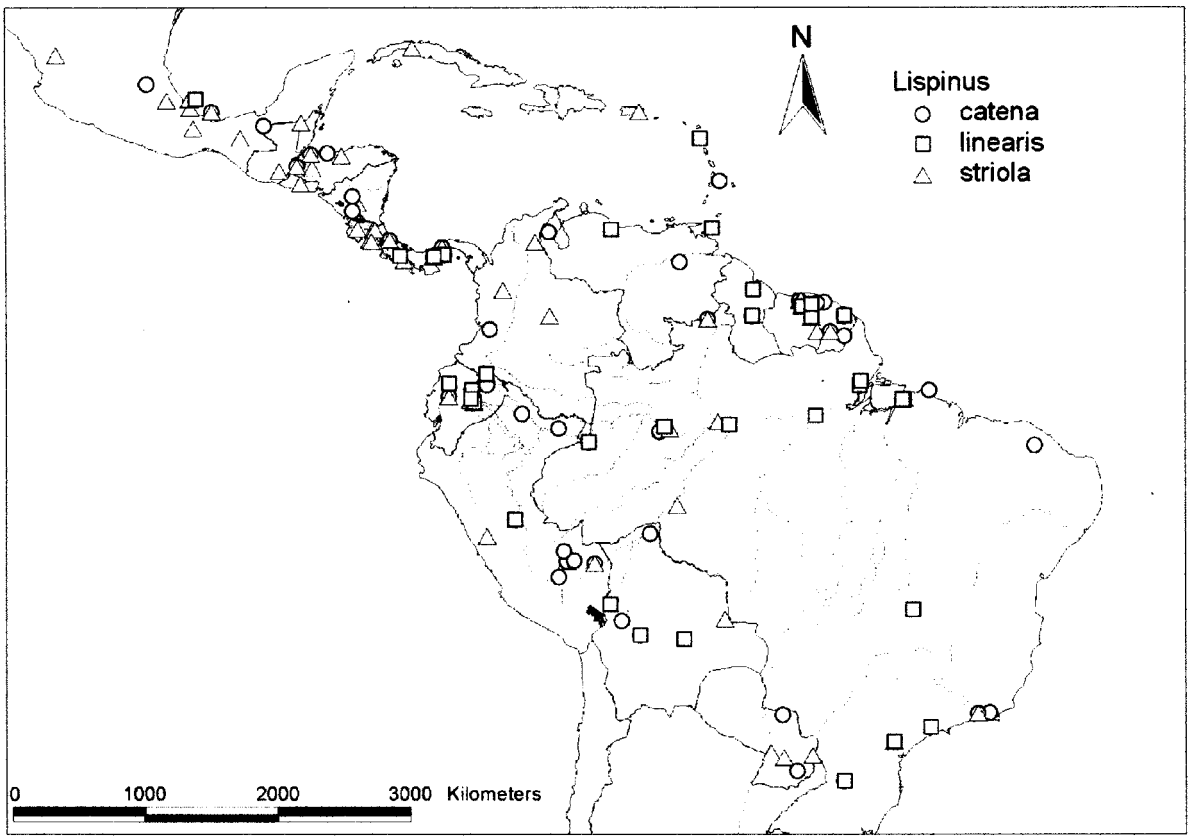


FIGURE 13. Distribution of the Pan-Neotropical zoogeographic group.

Lispinus striola Erichson, 1840

Lispinus striola Erichson, 1840: 829; Irmler 1994: 57.

Material examined. PERU: Loreto: 1 specimen without further data, leg. Bang-Haas (ZMHB); **Madre de Dios:** 1 specimen, Pantiacolla lodge, 8 km NW El Mirador (71°16'23W, 12°38'23S), 950 m elevation, under bark, 24.X.2000, leg. R.W. Brooks (SEMC).

Lispinus tardus Sharp, 1887

Lispinus tardus Sharp, 1887: 719; Irmler, 1994: 60.

Material examined. PERU: Madre de Dios: 4 specimens, Puerto Maldonado, under bark, 1.VII.1989, 9.VII.1989, 17.VII.1989, 19.VII.1989, leg. R. Leschen (SEMC).

Key to *Lispinus* species of Peru

1. Sides of pronotum dilating posteriad or parallel, without distinct emargination anteriad posterior angle (Figs. 10A, 10B) 2
- Sides of pronotum narrowing to posterior angles or with distinct emargination anteriad posterior angle (Figs. 10C–10F) 5
2. Sides of pronotum dilating posteriad, pronotum nearly twice as wide as long (Fig. 10A); 3rd antennomere nearly 3

times as long as 2nd ..... *L. laticollis* Erichson, 1840
- Sides of pronotum in front of posterior angles parallel, pronotum slightly wider than long (Fig. 10B); 3rd antennomere not more than 2 times as long as 2nd. 3
3. Each elytron with lateral furrow on disc (Figs. 5–7); pronotum slightly narrowed at middle, but parallel in front of posterior angles; microsculpture of elytra closely and longitudinally reticulate, iridescently shiny ..... *L. striola* Erichson, 1840
- Elytra without lateral furrows on disk, only with two large setiferous punctures each; microsculpture of elytra net-like reticulate and not iridescently shiny 4
4. Elytra very finely and sparsely punctate (Fig. 10H); 3rd antennomere less than twice as long as 2nd, paramera of aedeagus trilobed ..... *L. laeviusculus* Bernhauer, 1910
- Elytra densely and distinctly punctuate; 3rd antennomere twice as long as 2nd; paramera of aedeagus bilobed ..... *L. attenuatus* Erichson, 1840
5. Pronotum straightly narrowed to posterior angles, without emargination in front of posterior angels (Fig. 10C) 6
- Pronotum distinctly emarginate in front of posterior angles, emargination short in some species (Figs. 10D–10F). 12
6. Body larger, 5.4–5.7 mm; elytra with net-like reticulate microsculpture, fine punctation and on disc with two large setiferous punctures each ..... *L. quadripunctulus* Fauvel, 1865
- Body smaller, <5.0 mm 7
7. Body smaller, 3.8–4.0 mm; elytra with weak, longitudinally reticulate microsculpture, surface shiny 8
- Body larger, 4.5–4.8 mm, with more distinct microsculpture of elytra 9
8. Elytra quadrate, their punctation sparser, distance between punctures about the same as diameter of punctures (Fig. 10I) ..... *L. newtoni* Irmler, 1994
- Elytra longer than wide, their punctation denser and deeper, distance between punctures much less than diameter of punctures (Fig. 7E) ..... *L. minimus* n.sp.
9. Elytra with weak net-like reticulate microsculpture (Fig. 8E); pronotum with fine and sparse punctation, distance between punctures twice as wide as diameter of punctures, surface of pronotum and elytra slightly shiny (Fig. 8P)... ..... *L. speciosus* n.sp.
- Ground sculpture of elytra dense and longitudinally reticulate, surface of elytra dull 10
10. Posterior angles of pronotum obtusely rounded; endophallus of aedeagus with one torsion ... . *L. tardus* Sharp, 1887
- Posterior angles of pronotum rectangular; endophallus of aedeagus with more than one torsion 11
11. Both elytra and pronotum wider than long ..... *L. listenbarthi* Irmler, 1994
- Both elytra and pronotum longer than wide ..... *L. lunaris* Irmler, 1994
12. Depressions at posterior angles of pronotum deeply margined at outer side and with dense reticulation, their surface dull 13
- Depressions at posterior angles not deeply margined at outer side, smoothly depressed, their surface not distinctly differing from surface of disc 15
13. Body larger, 4.7 mm ..... *L. blandus* n.sp.
- Body smaller, <4 mm 14
14. Sides of pronotum rounded anteriad posterior emargination, widest in middle (Fig. 10E) ..... *L. bolivianus* Bernhauer, 1929
- Sides of pronotum more or less parallel anteriad posterior emargination, widest near front angles (Fig. 1) ..... *L. peruanus* n.sp.
15. Each elytron with a row of deeply impressed punctures forming more or less fine deep furrow similar to the one in *L. striola* ..... *L. catena* Sharp, 1876
- Elytra without furrows, on disc of each elytron often with one or two deeper and larger setiferous punctures than normal punctation 16
16. Punctures of pronotum and elytra deep and dense, distance between punctures less than half diameter of punctures, surface shiny, sparsely covered by short undulate micro-striae ..... *L. socialis* Irmler, 1994
- Punctures of pronotum and elytra less deep and sparser, their ground sculpture more distinct and dense, their surface only slightly shiny 17
17. Elytra with transversely reticulate ground sculpture (Fig. 10L) ..... *L lescheni* Irmler, 2001
- Elytra with longitudinally reticulate ground sculpture 18
18. Elytra about as long as wide; abdominal tergites laterally with strigae; body smaller ≤3.5 mm ..... *L. linearis* Erichson, 1840
- Elytra longer than wide; abdominal tergites without strigae; body larger, 4.0–4.3 mm 19
19. Microsculpture of pronotum and elytra distinct and dense, their surface dull; depression at posterior angles of pronotum flat ..... *L. fungicola* Irmler, 2001
- Microsculpture of pronotum and elytra weaker, their surface shiny; depression at posterior angles of pronotum deep (Fig. 10F) ..... *L. sinuatocollis* Bernhauer, 1942

Discussion, ecological and zoogeographical remarks

At present, records of *Lispinus* in Peru originate only from the eastern slopes of the Andes in an altitudinal range of 200–1500 m, from the lowland rain forest to lower limit of the montane forest. Only *L. laticollis* was found at elevation higher than 1000 m. The separation between the humid Amazonian lowland and the montane forest within the Amazonian drainage at 1000–1500 m is well documented for several animal groups, e.g. bats and birds (Koopman 1978, Terborgh 1977), and its upper limit coincides with the lower limit of the eastern cloud forest. Thus, only one record of Peruvian *Lispinus* originate from the cloud forest zone, while the majority of species was found in the humid Amazonian lowland forest. The absence of records from the western slopes of the Andes can be referred to the generally low rainfall, particularly in the south-west region. But also the poor collection efforts are certainly a reason for the lacking records in the north-western region with higher rainfall, i.e. the Tumbesian region, or the higher elevated cloud forest on the eastern Andean slope.

Similar to Costa Rican *Lispinus* (Irmler 2006), the Peruvian species were collected mainly under bark: more than 50% of the examined specimens were labelled with this habitat. Few specimens were collected by flight intercept traps, pitfall traps, or Malaise traps. Four specimens of *L. fungicola* and all specimens of *L. lescheni* were collected in fungi and some specimens of *L. laeviusculus* and *L. catena* were found in wet mud near rivers.

Although the number of *Lispinus* records is still low in regard to the large area of the South American Neotropics, it allows, nevertheless, a rough overview of the zoogeographic groups or segments represented by the Peruvian *Lispinus* species. The *Lispinus* species of Peru can be attributed to 6 types of zoogeographic distributions.

At present, 5 species have been recorded from Peru only. They can be assumed to be endemic. These are the four species described in the present paper and *L. lescheni*. The four new species were found in the premontane forest at an elevation of 950 m. In contrast, *L. lescheni* was recorded at a *Schizopora* fungus in the lowland rainforest at an elevation of 200 m. Regarding the overall distribution pattern of endemic species in Peru, a higher collecting effort in the montane forest is desirable. For plant species, the highest density of endemic species was found between 1500 and 3000 m (van der Werffl & Consiglio 2004), which seems to be also true for insects (Pyrcz 2004). If this gradient of species richness is also true for *Lispinus* species, as the 4 new species indicate, more endemic species can be expected for the Peruvian Andes.

A group of two species, *L. fungicola* and *L. listenbarthi*, shows a wide distribution that includes the eastern Andean slope from Ecuador to northern Bolivia. Only one record *of L. fungicola* originates from the western slope in Ecuador near S. Domingo (Fig. 11A). The registered localities of these two species ranged between an elevation of 250 and 400 m.

The third group includes two species, *L. attenuatus* and *L lunaris*, and seems to represent a lowland Amazonian rainforest segment (Fig. 11B). *Lispinus attenuatus* is recorded from the Amazonian and the central Brazilian rainforest including their eastern parts at the Atlantic coast up to Guyana and the Venezuelan lowland rainforest. It also occurs on the West Indian islands with Guadeloupe as northernmost location. In Peru, it was found only on the eastern Andean slope up to an elevation of 950 m. Records of *L. lunaris* are sparser, which may be referred to its general rarity.

Five species have a wide distribution from southern Mexico to Central Brazil (Fig. 12A). Of these five, *L. sinuatocollis* and *L. laeviusculus* have the widest distribution ranging from southern Mexico to central Brazil, whereas northernmost records of *L. newtoni*, *L. socialis* and *L. tardus* are from Costa Rica.

Another type is represented only by *L. quadripunctulus*, which is found over most of the Neotropical area, from South Mexico as the northernmost location to South Brazil, Boa Porta, as the southernmost location, excluding the Amazon Basin (Fig. 12B). In South America, records are available from the eastern area along the Atlantic coast from Venezuela, Guyana and Brazil and from the western area along the Andean range, the Bolivian lowlands to South Brazil. However, no records were made from the Amazon Basin, in spite of

intensive collections in this area. This species represents the Circum-Amazonian distribution segment. Such a distribution pattern has already been frequently found in birds (Remsen *et al*. 1991).

The last group, which includes 5 species, can be described as the Pan-Neotropical distribution segment as they are found nearly over the whole Neotropical area from southern Mexico to southern Brazil, including the Amazon Basin (Fig. 13). Additionally, these species are common in nearly all collections from the Neotropics. In particular, *L. catena*, and *L. striola* are the most frequently found *Lispinus* species in Central and South America.

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