

**New enigmatic species of ground beetles  
from stream margins and scree in the Andes of South America  
(Carabidae, Trechitae, *Andinodontis* n. gen.)**

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**Abstract:** The newly described Andean genus *Andinodontis* ERWIN & TOLEDANO, n. gen. contains four new species: *Andinodontis guzzettii* TOLEDANO & ERWIN, n. sp. from Bolivia, *Andinodontis moreti* ERWIN & TOLEDANO, n. sp. and *Andinodontis muellermotzfeldi* TOLEDANO & ERWIN, n. sp. both from Ecuador, and *Andinodontis maveetyae* ERWIN & MADDISON, n. sp. from Perú; *A. muellermotzfeldi* TOLEDANO & ERWIN, n. sp. is the type species of this genus. Adults of these species inhabit stream sides and scree at middle to high altitudes in habitats such as Andean Cloud Forest, Paramo, and Puna. They are similar in many regards to *Tasmanitachoides* ERWIN, 1972, *Bembidarenas* ERWIN, 1972, and *Argentinatachoides* SALLENAVE, ERWIN & ROIG, 2008. While these four genera are clearly members of the supertribe Trechitae, they show a mixture of the traits of Bembidiini and Trechini, and thus do not clearly belong to any existing tribe as currently defined. A key to known species of the genus *Andinodontis* ERWIN & TOLEDANO, n. gen., and a map of their distributions is included, as well as notes on their ways of life and potential dispersal capabilities.

**Zusammenfassung:** Neue, rätselhafte Laufkäfer von Flüssen und Geröllhalden der Anden Südamerikas (Carabidae, Trechitae, *Andinodontis* n. gen.). – Die neue Gattung *Andinodontis* ERWIN & TOLEDANO, n. gen. aus den Anden umfasst vier neue Arten: *Andinodontis guzzettii* TOLEDANO & ERWIN, n. sp. aus Bolivien, *Andinodontis moreti* ERWIN & TOLEDANO, n. sp. und *Andinodontis muellermotzfeldi* TOLEDANO & ERWIN, n. sp. aus Ecuador sowie *Andinodontis maveetyae* ERWIN & MADDISON, n. sp. aus Peru. *Andinodontis muellermotzfeldi* TOLEDANO & ERWIN, n. sp. ist die Typusart der Gattung. Adulte dieser Arten leben an Flussufern und in Geröllhalden mittlerer und oberer Höhenlagen der Anden, z.B. in Nebelwäldern, im Paramo und in der Puna. In mehrfacher Hinsicht sind die Arten ähnlich denen aus den Gattungen *Tasmanitachoides* ERWIN, 1972, *Bembidarenas* ERWIN, 1972, und *Argentinatachoides* SALLENAVE, ERWIN & ROIG, 2008. Diese vier Gattungen gehören zwar eindeutig in die Supertribus Trechitae, sie besitzen aber sowohl Merkmale der Bembidiini als auch der Trechini. Sie gehören damit zu keiner der beiden existierenden Tribus gemäß ihrer aktuellen Definition. Ein Bestimmungsschlüssel der bekannten Arten der Gattung *Andinodontis* ERWIN & TOLEDANO, n. gen., eine Verbreitungskarte sowie Bemerkungen zur Biologie und zur potentiellen Ausbreitungsfähigkeit sind hinzugefügt.

**Resumen:** El recientemente descrito genero Andino, *Andinodontis* ERWIN & TOLEDANO, n. gen. contiene cuatro especies nuevas: *Andinodontis guzzettii* TOLEDANO & ERWIN, sp. nov. de Bolivia, *Andinodontis moreti* ERWIN & TOLEDANO, sp. nov. y *Andinodontis muellermotzfeldi* TOLEDANO & ERWIN, sp. nov. de Ecuador y *Andinodontis maveetyae* ERWIN & MADDISON, sp. nov. de Perú; *A. muellermotzfeldi* TOLEDANO & ERWIN, sp. nov. es la especie tipo del genero. Los adultos de estas especies habitan en margenes de quebradas y talud de hábitats de altura como los Bosques Nublados, el Páramo y la Puna. Las especies de este genero son muy similares en varios aspectos a *Tasmanitachoides* ERWIN, 1972, *Bembidarenas* ERWIN, 1972, y *Argentinatachoides* SALLENAVE, ERWIN & ROIG, 2008. Sin embargo aunque estos cuatro géneros son miembros de la supertribu Trechitae, *Andinodontis* n. gen. tambien presenta una combinación de características de Bembidiini y Trechini, y por ende no pertenece a ninguna tribu descrita actualmente. Se incluye una clave para la identificación de las especies y los mapas de distribución, así como notas sobre su forma de vida y capacidades de dispersión.

**Key words:** Carabidae, Trechitae, *Andinodontis*, new genus, new species, Ecuador, Bolivia, Perú, Andes, streams, scree, cloud forests, Paramo, Puna

## Introduction

On the gravel and sandy shores of streams and rivers in temperate South America and Australia are found small beetles of an enigmatic group belonging to the supertribe Trechitae. These carabids share some character states with Bembidiini and some with Trechini, but do not clearly belong to either tribe. Two of the described genera in this group, *Tasmanitachoides* ERWIN, 1972 (Australia) and *Argentinatachoides* SALLENAVE, ERWIN & ROIG, 2008 (Argentina), have been assigned to the bembidiine subtribe Tachyina; the third, *Bembidarenas* ERWIN, 1972 (Argentina and Chile), to Bembidiina. To this apparent clade, which we informally call the "*Bembidarenas* group", we add a new genus, *Andinodontis* n. gen., described herein, from the Andes of Bolivia, Ecuador and Perú which dwell along streams, on moss-covered stones, and in scree of upland and mountainous road cuts.

These four genera share the primary derived character state of Bembidiini, subulate apical palpomeres. However, there are conflicting data that suggest alternative phylogenetic placements. Their lack of apically notched front tibiae, a synapomorphy of Tachyina, excludes the beetles from that subtribe. They do not have the apparently derived full recurrent groove of the elytral apex characteristic of most Tachyina + Xystosomina. They show no obvious synapomorphies with any members of Bembidiina. While their subulate palps might suggest that they belong to Bembidiini, perhaps as a novel subtribe, there is contradictory evidence. In particular, adults have deep frontal furrows, a derived feature of Trechini (although that found in members of this quartet of genera are more parallel and differently engraved), and males have a dorsally open phallobasid as do members of the trechine subtribe Trechodina. Evidence from an analysis of DNA sequences of *Tasmanitachoides* (MADDISON & OBER in prep.) suggested placement with Trechini, which has been supported by larval structure (GREBENNIKOV 2008). DAVID R. MADDISON (DRM) and colleagues are currently conducting more thorough molecular analyses of this group of genera. Pending the outcome of those studies, and given the conflicting data, we prefer to treat the four genera in the *Bembidarenas* group as incertae sedis within Trechitae, and not assign them to any particular tribe.

Our intention here is to make known the three new species discovered by LUCA TOLEDANO (LT) in collections and sent to TERRY L. ERWIN (TLE) for checking to determine if they were assignable to the Tachyina; upon seeing pictures of the beetles, DRM realized that they belonged to this enigmatic Southern Hemisphere group mentioned above. Subsequently, an additional species was very recently discovered in Perú. We therefore describe the new genus and these four remarkable, small, and enigmatic minute Andean beetles, members of which were collected at seven different locations in the Andes of Bolivia, Ecuador, and Perú. There is little doubt in our minds that numerous species have yet to be discovered in the Andean Cordilleras from Santa Marta in Colombia to northern Chile and Argentina. In this paper, we honor a remarkable contributor to the study of Carabidae, our friend GERD MÜLLER-MOTZFELD, accomplished specialist in the phylogeny of Palearctic Bembidiina, who suddenly died last year during a scientific expedition to Central Asia.





Fig. 1: Habitus, dorsal aspect of *Andinodontis guzzettii* TOLEDANO & ERWIN, n. sp. (ADP116824; Arque, Cochabamba, Bolivia, female). Fig. 2: Habitus, dorsal aspect of *Andinodontis moreti* ERWIN & TOLEDANO, n. sp. (ADP116821; La Bonita, Sucumbios, Ecuador, female). Fig. 3: Habitus, dorsal aspect of *Andinodontis muellermotzfeldi* TOLEDANO & ERWIN, n. sp. (ADP116830; La Bonita, Sucumbios, Ecuador, female).

### Methods and Materials

Species boundaries were estimated by examination of external structural features of adults, as well as their male reproductive attributes. Species concepts follow those previously described for carabid beetles (ERWIN & KAVANAUGH 1981, KAVANAUGH & ERWIN 1991).

Forty-one specimens of this new taxon were examined for this study. Specimens were borrowed from the following institutions: CGTI, PIERMAURO GIACHINO collection, Turin, Italy; CMNH, Carnegie Museum of Natural History, Pittsburgh, PA, ROBERT DAVIDSON, Collection Manager; CMTF, PIERRE MORET collection, Toulouse, France; CSMI, RICCARDO SCIACKY collection, Milano, Italy; CTVR, LUCA TOLEDANO collection, Verona, Italy; SARAH MAVEETY (Wake Forest University) obtained a large series of *A. maveetyae* from her ecological study transects in Perú and made these available to us. They will be deposited in part in Perú: MHN-UNSAAC, Museo de Historia Natural de la Universidad Nacional San Antonio Abad del Cusco; part in NMNH, National Museum of Natural History, Washington,

DC; part in OSAC, Oregon State Arthropod Collection, Corvallis, OR; and part in CTVR, LUCA TOLEDANO collection; as noted below. MAURIZIO GUZZETTI (Tradate, Italy) collected the type of *A. guzzettii* in Bolivia and asked us to deposit it in MSNV, Museo Civico di Storia Naturale, Verona, Italy, LEONARDO LATELLA, Curator; SEMC, Kansas University Natural History Museum, Lawrence, KS, ZACK FALIN, Manager.

The habitus and close-up images of the adults of *Andinodontis guzzettii* n. sp. were made with a Nikon DSFi1 digital camera controlled by Nikon DS-L2 stand alone remote controller mounted on a Leica Z6 microscope equipped with a customized motorized stand constructed by one of the junior authors (LT), then processed on a Apple MacBook Pro computer with Helicon Focus ® 3.61 program and then optimized with Photoshop® Elements 3.0 on the same computer; those of *A. moreti* n. sp., *A. muellermotzfeldi* n. sp. and *A. maveetyae* n. sp. were taken with a Visionary Digital™ high resolution imaging system. Figure captions include an "ADP" number, which is a unique identification number for the specimen that was illustrated, or imaged, and links the specimen and associated illustrations and/or images to additional information in electronic databases at the NMNH.

Length and width measurements follow the conventions suggested by BALL (1972) and KAVANAUGH (1979). Apparent body length (ABL) is measured from apex of labrum to apex of longer elytron. Standardized body length (SBL) is the sum of the lengths of the head (measured from the apex of the clypeus to a point on midline at level of the posterior edge of the compound eyes), pronotum (PL - measured from apical to basal margin along midline), and elytron (EL - measured from apex of scutellum to apex of the longer elytron). Total width (TW) is a measure across both elytra at their widest point; often elytra are separated during collection or preparation out of alcohol and in this case the measure is taken of each elytron separately and added together.

Geographical data are presented for species based on all known specimens available at the time of manuscript preparation. Georeferences have been determined from locality information provided on specimen labels; we have estimated the georeferences as closely as possible from place names, mileage, etc. listed on the labels and then searched with Google Earth Pro. Latitude and longitude are reported in decimal degrees. A distribution map is provided for the species (Fig. 14). Here, English vernacular names are proposed because such common names are becoming increasingly used in conservation and agricultural applications, and on the Encyclopedia of Life (<http://www.eol.org>); because these species occur in Latin America we also offer common names in Spanish.

## Species Accounts

Members of the *Bembidarens* group share the following attributes. Head markedly bilaterally sulcate medial to eyes; clypeus with four dorsal setae; ultimate palponeres subulate. Pronotum with anterior lateral setae far forwards. Elytron with three fixed setae adherent to interneur 3. Abdomen microsciticous. Male phallobase open dorsally, consisting of two equal length symmetrical struts; parameres scitiferous. The genera can be identified using the following key.



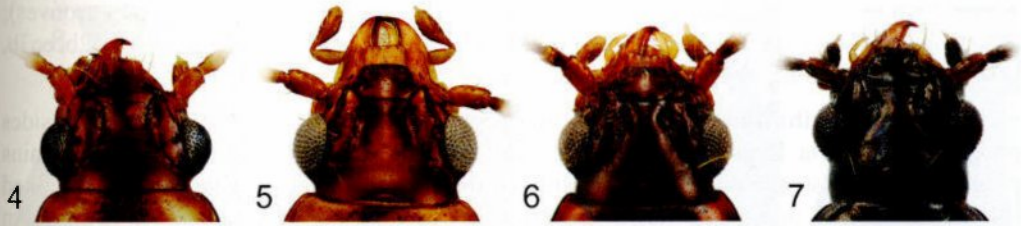


Fig. 4: Head, dorsal aspect of *Andinodontis guzzettii* TOLEDANO & ERWIN, n. sp. (ADP116824; Arque, Cochabamba, Bolivia, female). Fig. 5: Head, dorsal aspect of *Andinodontis moreti* ERWIN & TOLEDANO, n. sp. (ADP116821; La Bonita, Sucumbios, Ecuador, female). Fig. 6: Head, dorsal aspect of *Andinodontis muellermotzfeldi* TOLEDANO & ERWIN, n. sp. (ADP116830; La Bonita, Sucumbios, Ecuador, female). Fig. 7: Head, dorsal aspect of *Andinodontis maveetyae* ERWIN & MADDISON, n. sp. (ADP124815; Rocotal, Perú, female).

### Provisional key to the known genera of the “*Bembidarenas* group”

- 1 Specimen from Australasia: Interneur 5 markedly sulcate, at least at humerus.  
..... *Tasmanitachoides* ERWIN, 1972
- 1\* Specimen from South America: Interneur 5 not sulcate ..... 2
- 2 Pronotum with five large fovea in basal transverse impression.  
..... *Andinodontis* ERWIN & TOLEDANO, n. gen.
- 2\* Pronotum without fovea in basal transverse impression ..... 3
- 3 Dorsal surface glabrous, only fixed setae present. .... *Bembidarenas* ERWIN, 1972
- 3\* Dorsal surface with scattered microsetae.  
..... *Argentinatachoides* SALLENAVE, ERWIN, & ROIG, 2008

#### *Andinodontis* ERWIN & TOLEDANO, n. gen.

Minute Andean Streamside & Serec Beetles

Escarabajos Andinos diminutos de quebradas y talud

**Type species.** *Andinodontis muellermotzfeldi* TOLEDANO & ERWIN, n. sp., here designated.

**Derivation of generic name.** The genus is named after the Andes mountains of South America in which the species reside, combined with “-odontis” derived from the Greek root meaning “tooth,” in reference to the toothed pronotal hind angle of the pronotum in three of the four species, and the toothed humerus of two of the four species. Masculine, singular.

**Diagnosis.** Bembidiiform, very small. Frontal furrow somewhat trechiform, slightly arcuate, markedly sulcate, extended from clypeus to posterior margin of eye; palpi markedly subulate; frons (preocular) carinate at anterior margin of eye; antennae moderately and progressively larger distally. Prothorax lobed basally, transverse impression sulcate, 5-foveate; posterior angle right (Fig. 11) or acute, produced (Figs. 8-10); anterior lateral seta far forward at apical fourth. Elytron with scutellar interneur absent, seta ed2 absent; humerus slightly or markedly toothed at base of effaced interneur 5; interneur 2 or 3 with three discal slightly foveate setigerous pores adhered to interneur, apical one (if present) slightly more

lateral than in other genera, apex of elytron with two setose sulci (false recurrent grooves); elytral chaetotaxy with fixed setigerous pores at ed1, ed3a, ed5a, ed6b, ed8d, col b, eo2b, eo3b, eo4a, eo5a, eo6b, eo8a, eo9.

**Geographic distribution.** Members of this genus are currently known from stream sides and scree in Bolivia, Ecuador, and Perú at middle and high altitudes in the Andean mountains (Fig. 14). There is little doubt that, because of their small size, they have been overlooked by collectors and that many more species will be found, and perhaps also in northern Argentina and Chile, and in the Andes of Colombia.

**Note.** ERWIN (1972, 1974) provided a summary of elytral chaetotaxy for Tachyina species which we here apply more generally to Trechitae. The species of *Andinodontis* have added another position to that summary. Seta ed6, when present, is intermediate between ed6a and ed6b, thus here it has been designated ed6d.

**Key to the known species of *Andinodontis* n. gen.**

- 1 Humerus without well developed tooth (Figs. 8, 11) ..... 2
- 1\* Humerus with well developed tooth (Fig. 9, 10) ..... 3
- 2 Posterior angle of pronotum acuminate, produced posteriorly (Fig. 8).  
..... *Andinodontis guzzettii* TOLEDANO & ERWIN, n. sp.
- 2\* Posterior angle of pronotum normal, a right angle, not directed posteriorly (Fig. 11).  
..... *Andinodontis maveetyae* ERWIN & MADDISON, n. sp.
- 3 Elytra elongate with lateral margins subparallel (Fig. 5).  
..... *Andinodontis moreti* ERWIN & TOLEDANO, n. sp.
- 3\* Elytra short, ovoid with lateral margins markedly arcuate (Fig. 6).  
..... *Andinodontis muellermotzfeldi* TOLEDANO & ERWIN, n. sp.

*Andinodontis guzzettii* TOLEDANO & ERWIN, n. sp. (Figs. 1, 4, 8, 14)

**Holotype.** Boliva: Cochabamba, Arque, 17.8232° S, 66.4022° W, 2714 m, 26 October 1995 (L. GUZZETTI) (MSNV: ADP116824, female).

**Derivation of specific epithet.** The species is dedicated to MAURIZIO GUZZETTI of Tradate, Italy, collector of the type specimen.

**Proposed English vernacular name.** Guzzetti's Minute Andean Streamside Beetle.

**Proposed Spanish vernacular name.** Escarabajos Andinos diminutos de quebradas de Guzzetti.

**Diagnosis.** With the attributes of the genus as described above and humeral tooth very small, elytra ovoid, interneurs 1-4 traceable.

**Description.** Figs. 1, 4, 8.

Size: Minute, ABL = 2.56 mm, SBL = 2.45 mm, TW = 1.01 mm. Elytron ratio (L/W): 2.97.

Color: Rufous, appendages testaceous.

Luster: Dorsal surface very shiny.

Microsculpture: Dorsal surface without sculpticells.



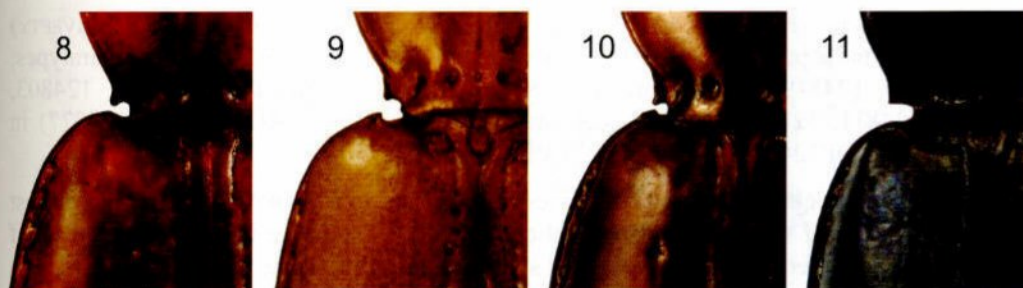


Fig. 8: Pronotum and elytral humerus, dorsal aspect of *Andinodontis guzzettii* TOLEDANO & ERWIN, n. sp. (ADP116824; Arque, Cochabamba, Bolivia, female). Fig. 9: Pronotum and elytral humerus, dorsal aspect of *Andinodontis moreti* ERWIN & TOLEDANO, n. sp. (ADP116821; La Bonita, Sucumbios, Ecuador, female). Fig. 10: Pronotum and elytral humerus, dorsal aspect of *Andinodontis muellermotzfeldi* TOLEDANO & ERWIN, n. sp. (ADP116830; La Bonita, Sucumbios, Ecuador, female). Fig. 11: Pronotum and elytral humerus, dorsal aspect of *Andinodontis maveetyae* ERWIN & MADDISON, n. sp. (ADP124815; Rocotal, Perú, female).

Head: Fig. 1, 4. Eye not setiferous, facets large, convex. Clypeal suture entire, impressed. Frons markedly convex between frontal furrows, supraorbital setigerous pores at middle and posterior edge of eye.

Prothorax: Pronotum (Fig. 4) shallowly convex, wider than long, cordiform, hind angle acute, setose; lateral margin narrowly beaded; posterior margin lobed; disk with longitudinal shallowly impressed line.

Pterothorax: Elytron (Fig. 1) with first interneur coarsely punctuate in basal third, deeply striate thereafter. Metepisternum slightly wider than long. Metasternum sparsely setiferous at middle. Metathorax brachypterous.

Abdomen: Sterna sparsely setiferous, in addition to the fixed paired ambulatory setae; female with two pairs of setae on sternum VII.

Male genitalia: Unknown.

**Dispersal potential.** The holotype is brachypterous and hence not capable of flight.

**Way of life.** The holotype of *A. guzzettii* n. sp. was collected at a mountainous altitude on moss near a sulphureous spring in the prepuna vegetation zone in the semi-arid mountains of west central Bolivia.

**Other specimens examined.** None, the female holotype is the only specimen we have seen.

**Geographic distribution.** Fig. 14. This species is currently known only from the type locality in Bolivia.

*Andinodontis maveetyae* ERWIN & MADDISON, n. sp. (Figs. 7, 11, 13, 14, 15, 16, 17)

**Holotype.** Perú: Cusco, Rocotal, 3.2 km E Tres Cruces, 13.1123° S, 71.5834° W, 2082 m, 27 June 2010 (S. MAVEETY) (MHN-UNSAAC: ADP124815, male). **Paratypes.** Perú: Cusco, Fin de la Trocha, 31.7 km E Tres Cruces, 13.04114°S, 71.3323°W, 1733m, 10 June 2010 (S. MAVEETY & H.F. JAQUEHUA CALLO) (MHN-UNSAAC: ADP124775, 124777, 124779, 124789, 124793, 124869, male paratypes, ADP1248732, 124871, female paratypes);

Rocotal, 3.2km E Tres Cruces, 13.1123° S, 71.5834° W, 2082m, 27 June 2010 (S. MAVEETY) ADP124817, male paratype, (H.F. JAQUEHUA CALLO) ADP124809, 124811, male paratypes, ADP124803, 124819, female paratypes. Six of these paratypes (ADP124789, 124803, 124809, 124811, 124817, 124819) deposited in NMNH; two (ADP124775, 124877) in OSAC; two (ADP124779, 124793) in CTVR.

**Derivation of specific epithet.** The species is dedicated to SARAH MAVEETY, Wake Forest University doctoral student working on the ecology of Carabidae in the cloud forests of Perú, who discovered and kindly collected specimens for this study.

**Proposed English vernacular name.** Maveety's Minute Andean Scree Beetle.

**Proposed Spanish vernacular name.** Escarabajos Andinos diminutos de talud de Maveety.

**Diagnosis.** With the attributes of the genus as described above and pronotal hind angles not produced as in other species; humeral tooth rudimentary, margin barely reflexed to base of interneur 3; elytra ovoid as in *Andinodontis moreti* n. sp.; only sutural interneur traceable to near apex, the second interneur markedly effaced in basal half.

**Description.** Figs. 7, 11, 13, 17.

Size: Minute, ABL = 2.19 – 2.56 mm, SBL = 1.84 – 2.29 mm, TW = 0.84 - 1.00 mm. Elytron ratio (L/W): 1.33 – 1.41.

Color: Piceous, appendages testaceous.

Luster: Dorsal surface very shiny.

Microsculpture: Dorsal surface lacking microsculpture except on elytra, which have irregularly isodiametric sculpticells.

Head: Fig. 7. Eye not setiferous, facets large, convex. Clypeal suture entire, impressed. Frons markedly convex between frontal furrows, supraorbital setigerous pores at middle and just anterior to posterior edge of eye.

Prothorax: Pronotum (Fig. 11) shallowly convex, wider than long, cordiform, hind angle right, apex very slightly directed posteriorly (not produced), setose laterally and at posterior corner, lateral seta at basal fifth; lateral margin narrowly beaded, slightly and narrowly reflexed; posterior margin broadly lobed; disk with longitudinal shallowly impressed line.

Pterothorax: Elytron (Fig. 17) with interneur 1 moderately punctuate in basal third, moderately striate thereafter, interneur 2 barely traceable in apical half. Metepisternum longer than wide. Metasternum short, sparsely setiferous at middle. Metathoracic wing a small pad about the length of two abdominal terga.

Abdomen: Sterna sparsely setiferous, in addition to the fixed paired ambulatory setae; female with four setae on sterna 7, male with two.

Male genitalia: Fig 13. Phallus spatulate, slightly arcuate to the right in ventral aspect, apex broadly truncate, ventral margin slightly arcuate basally, otherwise straight; phallobase open, bilaterally symmetrical with basally arcuate struts. Parameres (Fig. 13) in ventral aspect left shorter than right and somewhat narrower, distal margins of both narrowly acute, each multisetose, left with 5 setae, right with 5 setae.



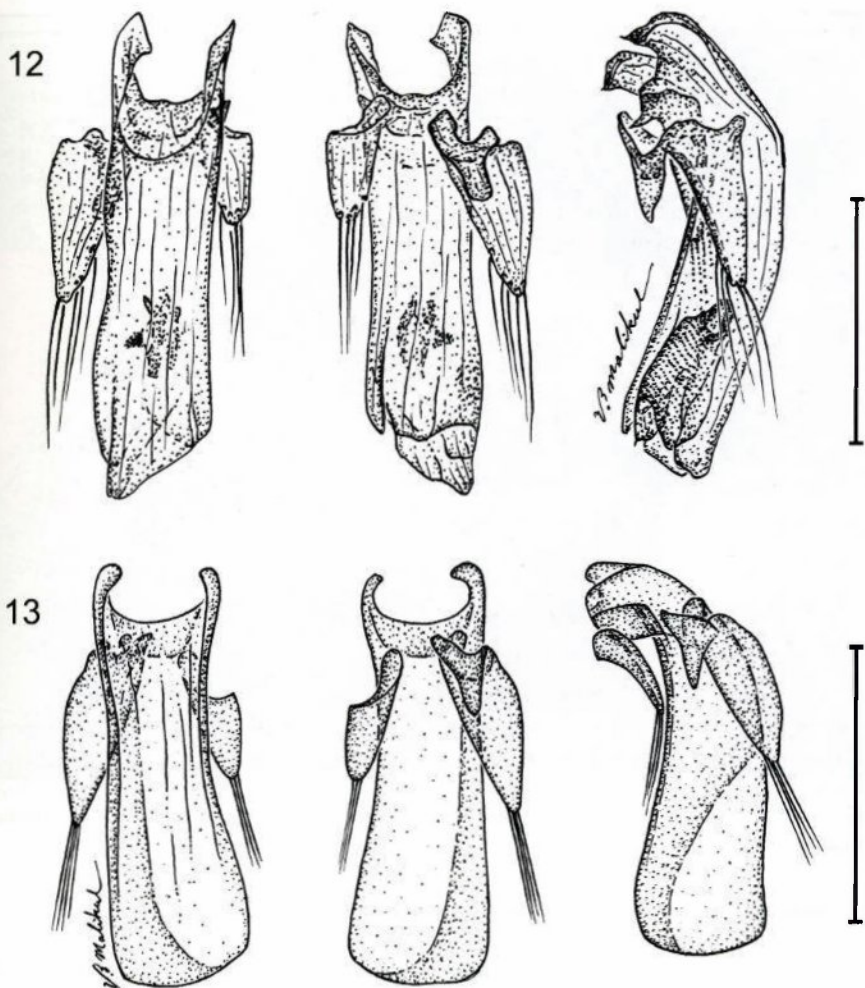


Fig. 12: Male genitalia of *Andinodontis muellermotzfeldi* TOLEDANO & ERWIN, n. sp. (ADP116819, La Bonita, Sucumbios, Ecuador). A. Ventral aspect. B. Dorsal aspect. C. Left lateral aspect. Fig. 13: Male genitalia of *Andinodontis maveetyae* ERWIN & MADDISON, n. sp. (ADP124821; Fin de la Trocha, Perú). A. Ventral aspect. B. Dorsal aspect. C. Left lateral aspect.

**Dispersal potential.** These beetles are brachypterous and hence not capable of flight. They are quick runners.

**Way of life.** Members of *A. maveetyae* n. sp. occur at upland altitudes in Cloud Forests of Perú (Figs. 15, 16). Adults are active in June, which is in the moderately wet season in this area. Adults occur in great numbers in scree along a road cut in loose talus (Fig. 16) without vegetative cover. Some teneral beetles have been found in June along with fully pigmented and hardened specimens.

**Geographic distribution.** Fig. 14. This species is currently known from the type locality in Perú and another locality a few kilometers to the east of it.



Fig. 14: Distribution map of the species of *Andinodontis* ERWIN & TOLEDANO n. gen.: *Andinodontis guzzettii* Toledano & Erwin, n. sp. (open circle); *Andinodontis moreti* ERWIN & TOLEDANO, n. sp. (open square); *Andinodontis muellermotzfeldi* TOLEDANO & ERWIN, n. sp. (closed circles); *Andinodontis maveetyae* Erwin & Maddison, n. sp. (closed squares).

***Andinodontis moreti* ERWIN & TOLEDANO, n. sp.** (Figs. 2, 5, 9, 14)

**Holotype.** Ecuador: Sucumbíos, La Bonita, 0.4600° N, 77.50533° W, 2000 m, 1 January 1999 (G. ONORE) (CMNH: ADP116821 & SNO151146, female).

**Derivation of specific epithet.** The species is dedicated to PIERRE MORET, good friend and accomplished specialist in the Carabidae of Ecuador, who kindly loaned us his specimen for study.

**Proposed English vernacular name.** Moret's Minute Andean Streamside Beetle.

**Proposed Spanish vernacular name.** Escarabajos Andinos diminutos de quebradas de Moret.

**Diagnosis.** With the attributes of the genus as described above and humeral tooth very large, acute; elytra elongate and more parallel sided than in the other two Ecuadorian species; only sutural interneur traceable to near apex, the second interneur markedly effaced in basal third.

**Description.** Figs. 2, 5, 8.

Size: Minute, ABL = 2.84 mm, SBL = 2.55 mm, TW = 1.03 mm. Elytron ratio (L/W): 3.12.





Fig. 15: Landscape of *Andinodontis maveetyae* ERWIN & MADDISON, n. sp., Fin de la Trocha, Perú.

Color: Unknown, the single specimen is teneral.

Luster: Dorsal surface very shiny.

Microsculpture: Dorsal surface without sculpticells.

Head: Fig. 5. Eye not setiferous, facets large, convex. Clypeal suture entire, impressed. Frons markedly convex between frontal furrows, supraorbital setigerous pores at middle and just anterior to posterior edge of eye.

Prothorax: Pronotum (Fig. 9) shallowly convex, longer than wide, cordiform, hind angle acute, setose; lateral margin narrowly beaded; posterior margin lobed; disk with longitudinal shallowly impressed line.

Pterothorax: Elytron (Fig. 2) with interneur 1 coarsely punctuate in basal third, deeply striate thereafter, interneur 2 barely traceable on disc. Metepisternum much longer than wide. Metasternum sparsely setiferous at middle. Metathoracic wing fully developed.

Abdomen: Sterna sparsely setiferous, in addition to the fixed paired ambulatory setae; female with four setae on sterna 7.

Male genitalia: Unknown.



Fig. 16: Microhabitat of *Andinodontis maveetyae* ERWIN & MADDISON, n. sp., Fin de la Trocha, Perú.

**Dispersal potential.** The holotype is macropterous and probably capable of flight.

**Way of life.** Members of *A. moreti* n. sp. occur at upland altitudes in Cloud Forests of Ecuador. Adults are active in January; the moderately wet season in this area.

**Other specimens examined.** None, the holotype is the only specimen we have seen.

**Geographic distribution.** Fig. 14. This species is currently known only from the type locality in Ecuador.

***Andinodontis muellermotzfeldi* TOLEDANO & ERWIN, n. sp.** (Figs. 3, 6, 10, 12, 14)

**Holotype.** Ecuador: Napo, 4.8 km NW El Chaco, road to Oyacachi, 0.3066° S, 77. 8424° W, 1619 m, 7 November 1999 (Z.H. FALIN) (KUNHM: ADP116827 & SNO151146, male).

**Paratypes.** Ecuador: Cotopaxi, Otonga, 0.4181° S, 79.0044° W, 2000 m, 1 May 1997 (J. GIL) (CMTF, CTVR: ADP116825, 116828, male paratypes); Napo, 4.8 km NW El Chaco, road to Oyacachi, 0.3066° S, 77. 8424° W, 1619 m, 7 November 1999 (Z.H. FALIN) (KUNHM: ADP116823 & SNO352851, male paratype); Cotopaxi, Baeza, 0.4563° S, 77.8826° W 1500 m [1750 m], 16-17 May 1987 (J. ACORN) (UASM: ADP124875, 124877, male paratypes, ADP124879, 124881 female paratypes); Cotopaxi, Cuyuja, 0.4002° S, 78.0000° W, 3395 m, 15 November 1996 (G. ONORE) (CGTI: ADP117165, male); Pichincha, Via Lloa-Mindo, 0.2468° S, 78.5775° W, 3045 m [2800 m], 23 July 2006 (G. ONORE) (QCAZ: QCAZ16411, QCAZ 16412, QCAZ17791, QCAZ17793, male paratypes, QCAZ17797, QCAZ16413, female paratypes) (CMTF: QCAZ 16414, QCAZ17795, male paratypes, QCAZ16417, QCAZ17799, female paratypes); Sucumbios, La Bonita, 0.4600° N, 77.50533° W, 2000 m, 1 January 1994 (G. ONORE) (CMNH: ADP116819, 116830 male paratypes, 116826, 116829, female paratypes) (CSMI: ADP124883, male paratype).





Fig. 17: Habitus, dorsal aspect of *Andinodontis maveetyae* ERWIN & MADDISON (ADP124815; Rocotal, Perú, female).

**Derivation of specific epithet.** The species is named in memory of GERD MÜLLER-MOTZFELD, one of the most important contributors to the knowledge of Palearctic Bembidiini, and recalled by his colleagues as a very nice and kind man, and helpful colleague.

**Proposed English vernacular name.** Gerd's Minute Andean Streamside Beetle.

**Proposed Spanish vernacular name.** Escarabajos Andinos diminutos de quebradas de Gerd.

**Diagnosis.** With the attributes of the genus as described above and humeral tooth very large, acute; elytra ovoid, only interneurs 1-2 traceable to at least basal third, sutural interneur traceable from base to near apex.

**Description.** Figs. 3, 6, 10, 12.

Size: Minute, ABL = 2.2 to 2.4 mm, SBL = 2.31 mm (n=3), TW = 0.88 mm. Elytron ratio (L/W): 3.0.

Color: Rufous, appendages testaceous.

Luster: Dorsal surface very shiny.

Microsculpture: Dorsal surface without sculpticells.

Head: Fig. 6. Eye not setiferous, facets large, convex. Clypeal suture entire, impressed. Frons markedly convex between frontal furrows, supraorbital setigerous pores at middle and in line with posterior edge of eye.

Prothorax: Pronotum (Fig. 10) shallowly convex, longer than wide, cordiform, hind angle acute, setose; lateral margin narrowly beaded; posterior margin lobed; disk with longitudinal shallowly impressed line.

Pterothorax: Elytron (Fig. 3) with interneur I coarsely punctuate in basal third, deeply striate thereafter. Metepisternum much longer than wide in winged individuals, slightly wider than long in brachypterous individuals. Metasternum sparsely setiferous at middle. Metathoracic wing fully developed, or individual brachypterous.

Abdomen: Sterna sparsely setiferous, in addition to the fixed paired ambulatory setae; male with two setae on sternum 7, females with two pairs.

Male genitalia: Fig. 12. Phallus spatulate, slightly arcuate to the right in ventral aspect, apex broadly truncate, ventral margin slightly arcuate basally, otherwise straight; phallobase open, bilaterally symmetrical with basally arcuate struts. Parameres (Fig. 12) in ventral aspect left shorter than right and somewhat narrower, distal margins of both narrowly acute, each setose, left with 3 setae, right with 4 setae.

**Dispersal potential.** The holotype is brachypterous, hence was not capable of flight, however, some of the paratypes are fully winged and possibly capable of flight.

**Way of life.** Adults are found on mossy stream banks and under stones or debris on sandy stream sides in wet mountainous cloud forests. Members of *A. muellermotzfeldi* n. sp. occur at upland to mountainous altitudes in the Cloud Forests and Paramo of Ecuador. Adults are active in January, May, July, and November; these months include both the dry and rainy seasons in these areas.

**Geographic distribution.** Fig. 14. This species is currently known from several localities in Ecuador.

**Notes.** The altitude given on J. ACORN's labels for Baeza is too low; they are likely from about 1750 m.

## Discussion

Discovery is the essence of taxonomy; it happens in the field and in museum collections and it takes astute observation and knowledge of a higher taxon to know when something is not quite right. This was the case when LT discovered these *Bembidion*-like beetles in several collections and then realized that they were species not assignable to *Bembidion*, on which he is a specialist. Upon subsequent examination, TLE did not agree they were Tachyina either, one of his taxonomic specialties. Later consultation with DRM, who also is a specialist in bembidiines, resulted in his suggestion, after viewing an image of them, that they fell into an area of enigmatic bembidiine-like and trechine-like taxa; his DNA data (unpublished) suggests that these taxa do not fit in the current Carabidae classification. Because of the Maddison team's ongoing research in this incertae sedis group, we have deferred from going



beyond describing the four species of which specimens are in our possession and a genus to contain them. Now that this remarkable new lineage is known, we hope that collectors will scour the Andes in search of new localities and new species. Turning stones and sifting wash-up debris in and along upper altitude stream beds, in roadside scree, as well as hand fogging mossy rocks on the stream sides with canister foggers should produce specimens.

### Acknowledgements

In addition to the Collection Managers named above, we heartily thank KARIE DARROW, WARREN STEINER, CHARYN MICHELI, and VICHAI MALIKUL, all of the Smithsonian Institution's Department of Entomology for images, dissection, specimen preparation, and illustration, respectively. We also thank GEORGE E. BALL for helping us settle on an appropriate title for this article and GRACE SERVAT for preparing the Resumen and translating the species common names into Spanish. H. F. JAQUEHUS CALLO is credited for the photo in Fig. 15 and S. MAVEETY for Fig. 16.

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# Entomologische Blätter

für Biologie und Systematik  
der Käfer

**106** Dezember 2010

## Sonderband

zum Gedenken an  
Prof. Dr. GERD MÜLLER-MOTZFELD

## Contributions to Biology and Systematics of Beetles

dedicated to the Memory of  
Prof. Dr. GERD MÜLLER-MOTZFELD

*Edited by*

BERNHARD KLAUSNITZER

JOACHIM SCHMIDT

TERRY L. ERWIN

WISSENSCHAFTLICHER VERLAG PEKS



ISSN 0013-8835

