Natural History of the Carabid Beetles at
the BIOLAT Biological Station, Río
Manu, Pakitza, Peru Supplement I.
Additional records.

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ABSTRACT
The occurrence and natural history of carabid beetles previously recorded at Pakitza are amplified with the addition of new tribal and generic records; additional keys and illustrations are provided for aid in identification of these. Six newly recorded generic-level taxa are presented in terms of number of species and their size ranges (overall length), microhabitats, food, season, and trail localities. New records include two new tribes: Pseudomorphini — Pseudomorpha (1 sp) and Paussini (Eohomopterini) — Homopterus (1 sp); and new genera in previously recorded tribes, Ctenodactylini — Amblycoleus (2 spp) and Lebiini — Cryptobatis (1 sp) and a new genus and species treated here as insertae sedis (1 sp). A discussion of the measure of effort to acquire the Pakitza carabid inventory is presented in terms of scientific and conservation-oriented biodiversity assessment, survey, and inventory projects.

Key words: Coleoptera, Carabidae, Peru, Amazon Basin, Rio Manu, biodiversity, microhabitats, natural history, conservation.

INTRODUCTION
The BIOLAT Biological station at Pakitza is the richest local area ever recorded for this family of beetles; the number of species now totals over 600 species arrayed in 124 genera. This is nearly as many species as in all of New Guinea or Sri Lanka, but in only 4000 hectares. Since the publication of the first report on the area’s carabid beetles (Erwin, 1991). I have sampled an additional 6 man-weeks with the aid of Felipe and Ejido Pfuño and Michael Pogue in September-October, 1991, July 1992, and June, 1993. Many new species were discovered and
Fig. 1. Habitus, dorsal aspect, Homopterus subcordatus Darlinton, Panamá
among these were new tribal and generic records. The latter are the subject of this paper; an account of the new species in previously recorded genera will be presented separately. Even with these many new records, however, the current knowledge of this family at Pakitza does not include those species restricted to nearby oxbow lakes which are not yet in the station’s repertoire of habitats, nor has much sampling been done in the uplands 7 km north of Pakitza, at the end of the Tachigali Trail, nor in the deeply dissected upper stream valley of the Rio Fortaleza. Such inclusions would likely substantially raise the current inventory by scores of species, particularly in the intervalley ridgetop forest where two rare wingless species, indicating an unusual lowland fauna, were discovered and reported on previously.

**NEW RECORDS OF CARABID BEETLES AT PAKITZA**

**SUPERTRIBE PSEUDOMORPHITAE**

_Pseudomorphini_

_Pseudomorpha_, 1 sp (size range: 6.0mm to 7.0mm); these very blattoid-like carabids are among the more interesting of the family both in their form and habits. They live with ants and are modified accordingly in their external structure. The myrmecophilous larvae were described of a North American species (Erwin, 1981) and this was later amplified by Liebherr and Kavanaugh (1985) who showed that species of this genus have oviviparous young. Six specimens were found at P/24-25 (October, 1991) in dead fronds of _Astrocaryum macrocalyx_ using insecticidal fog. The ants with cohabited which they have not yet been identified.

**SUPERTRIBE PAUSSITAE**

_Paussini_

_Eohomopterus_, 1 sp (size: 5.0mm); virtually nothing is known about this genus of beetles. The single specimen from Pakitza was collected by fogging bamboo (_Elynostachys_ sp.) near T/38. Undoubtedly they live with ants as do other members of the tribe, and are markedly modified in their external structure for this. The fact that their tarsal articles do not fold back into a tibial groove indicates that these beetles are far more primitive than those in the following genus.

_Homopterus_, 1 sp (size: 7.0mm); as in Fig. 1; these beetles have been reported from numerous localities, but most especially in Central America. Darlington (1950) reviewed what is known of them. The single specimen from Pakitza was collected at light in the clearing, as were those I got at Pacaya-Samiria National Reserve in northern Peru. They live with ants as do other members of the tribe, and are markedly modified in their external structure for this.
Fig. 2.— Habitus, dorsal aspect. Askalaphium depressum (Bates), Tambopata, Perú.
SUPERTRIBE CTENODACTYLITAE

Ctenodactylini

Askalaphium Liebke, Fig. 2. The illustration, loaned to me by Dr. Nigel Stork of The Natural History Museum in London, and drawn by Geffroy Kibby, was not available for my first report on the Pakita carabids (Erwin 1991), so I have included it here.

Amblycoleus, 2 spp (size range: 6.5mm to 9.0mm); these beetles were collected with insecticidal fog blown into suspended dry leaves and dry leaves mixed with bamboo (Guadua weberbaueri) in old alluvial terrace forest both near the Manu and at T/47 in forest where there is no bamboo. Considering the large volume of dry leaves fogged in these areas between 1990 and 1993, and only 5 specimens of two species were collected, members of this genus must be quite rare.

SUPERTRIBE LEBIITAE

Lebiini

Cryptobatis, 1 sp (size range: 8.5 to 9.2mm); a single individual was collected by fogging suspended dry fronds of the palm, Astrocaryum macrocalyx, in upper floodplain forest near the Rio Manu. These beetles probably are associated with fungi on fallen logs, a microhabitat not yet well explored at Pakita.

Insertae sedis, sp 1 (size range: 4.5mm to 6.0mm); this new species and genus has been found at Tambopata by fogging the crown of a leguminous tree and fogging the general canopy in both upper floodplain forest and terra firme forest. At Pakita, they were fogged from the crown leaves of the bamboo Guadua weberbaueri. The lineage is related to Hyboptera and is under study by G. E. Ball and me.

DISCUSSION

In 23 man-weeks of collecting from 1987 to 1993, more than 600 species of carabid beetles were vouchered and their microhabitats recorded. No absolute measure of species accumulation versus effort expended was recorded, thus it is unknown whether the end of new records is in sight or not.

A measure of effort to acquire the Pakita carabid inventory would have been desirable in terms of scientific and conservation-oriented biodiversity assessment, survey, and inventory projects, but I can say that now only in hindsight. However, I conclude that beetles, like some vertebrate and plant groups, are suitable for such projects in the future because a sound methodology has been developed for their
rapid and efficient collecting, preparation, and interim identification. Thus, inclusion of beetles in conservation biology can provide a degree of resolution for environmental assessment and management not available from larger organisms because so many species can be inventoried in short order and their distribution across microhabitats known.

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LITERATURE CITED


APPENDIX 1.

Revised keys to some genera of carabid tribes occurring at Pakitza, Peru. *Pseudomorpha*, the only described genus of Pseudomorphini in tropical America, was keyed in the Key to Tribes in Erwin (1991).

**Paussini** (Eohomopterini, sensu Negal, 1987)
1. Tarsi not retractable into apex of tibia ........ **Eohomopterus** Wassman
1'. Tarsi fully retractable into apex of tibia ........ **Homopterus** Westwood

**Ctenodactylini**
1. Tarsal claws markedly denticulate; body markedly depressed or not ................................................................. 2
1'. Tarsal claws, at most, with one basal tooth or lobe; body not depressed ............................................................... 3
2. Body markedly depressed; elytra black, in contrast to rufous head and prothorax .................. **Askalaphium** Liebke
2'. Body convex, elytra and forebody black ........ **Ctenodactyla** Dejean
3. Fourth tarsomere bilobed, lobes connected throughout their length by a thin membrane, elytron apically obliquely truncate .... **Calophaena** Klug
3'. Fourth tarsomere bilobed, lobes separated; elytron apically rounded, or narrowly truncated in females......................................................... 4
4. Inner margin of eye with longitudinal carina ........................................... 5
4'. Inner margin of eye without longitudinal carina ....................................... 6
5. Head and pronotum smooth, shiny .................. **Leptotachela** Liebke
5'. Head and pronotum densely punctate ........ **Amblycoleus** Chaudoir
6. Mentum without a tooth .................. **Pionycha** Chaudoir
6'. Mentum with a tooth .................. **Teukrus** Liebke

**Lebiini**
1. Head ventrally without subortital setigerous punctures .................. 2
1'. Head ventrally with at least one pair of suborbital setigerous punctures ........................................................................ 18
2. Penultimate setigerous puncture of elytron umbilicate series displaced laterally ........................................... **Apenes** LeConte
2'. Penultimate setigerous puncture of elytron umbilicate series not displaced laterally, OR displaced medially ................................................................. 3
3. Posterior tibial spurs markedly unequal, margins serrate, inner spur al most as long as tarsomere 1; markedly narrowed, head pedunculate ....................................................................... **Nemotarsus** LeConte
3'. Posterior tibial spurs subequal, their margins smooth; neck not markedly narrowed, head not pedunculate ............................................... 4
4 Mandible widened near base, scrobe wide, lateral margin markedly rounded .................................................. 5

4' Mandible not conspicuously widened near base, scrobe narrowed, lateral margin not markedly rounded ........................................... 19

5 Head markedly narrowed and prolonged behind eyes; prothorax more or less tubular, without lateral flange at least at middle .................................................................................. Agra Fabricius

5' Head normal, not prolonged behind eyes; pronotum wider than long, or as wide as long, not narrowed anteriorly, not tubular, with lateral flange .................................................................................. 6

6 Ultimate palpomere oval, not truncate at apex ........... Ogygium Liebke

6' Ultimate palpomere not oval; that of labial palpus more or less secuiform .................................................. 7

7 Mentum with tooth .......................................................................................................................... 8

7' Mentum without tooth .................................................................................................................. 15

8 Ligula with four apical setae; tarsomere 4 deeply emarginate, but not bilobed ........................................... 9

8' Ligula with two apical setae ........................................................................................................... 11

9 Tooth of mentum well developed ........ Plochionus Latreille and Dejean

9' Tooth of mentum a slight, but evident, emargination ........................................................................ 10

10 Pronotum with base broadly lobed .......... Aspasiola Chaudoir

10' Pronotum with base more or less straight .......................................................... 11

11 Anantennomere 2 only slightly shorter than 3, flagellar articles flattened and wide .......................................................... Epikastea Liebke

15 Tarsomereres dorsally sulcate ................................................................................................... 16

15' Tarsomereres dorsally smooth ..................................................................................................... 18

16 Elytron with intervals 3 and 5 with 2 small setigerous pores at about the middle and at the apical third; intervals flat .......... Onota Chaudoir

16' Elytron with intervals 3 and 5 with a series of large setae in setigerous pores that are somewhat tuberculante .................................................................................................................. 17

17 Elytron with more or less flat interval, only the swollen setal bases obvious; side margin markedly reflexed throughout .... insertae sedis

17' Elytron with disc markedly uneven, setae on raised callouses; side margin broadly reflexed near middle only ........ Hyboptera Chaudoir

18 Head and pronotum punctate .............. Cylindronotum Putzeys

18' Head and pronotum smooth ...................... Pseudotoglossa Mateu

19 Penultimate setigerous puncture of elytron umbilicate series displaced medially; tarsomere broad, dilated, with tarsomere 4 bilobed .... ................................................................. Lebia Latreille

19' Penultimate setigerous puncture of elytron umbilicate series not displaced laterally, OR displaced medially ........ Negrea Mateu

20 Labrum cordiform; elytral intervals 3, 5, 7 each with a series of long setae ................................................................. Thoasia Liebke
20' Labrum quadrate or rectangulate; elytral intervals 3, 5, 7 asetose ... 21
21 Elytral apex obliquely truncate, lateral corner rounded; elytral surface finely and densely punctulate, almost imperceptibly costate; penultimate setigerous puncture of elytral umbilicate series displaced proximo-medially; tarsomere 4 of all legs deeply bilobed with fine spatulate setae beneath .......... Gallericidia Chaudoir
21' Combination of characteristics no as above 22
22 Labrum normal, wider than long; penultimate setigerous puncture of elytron umbilicate series not displaced laterally ................................. Euproctinus Leng and Mutchler
22' Labrum narrow, as long or longer than wide, or markedly convex; penultimate setigerous puncture of elytron umbilicate series displaced laterally ........................................ 23
23 Body markedly depressed; integument brown .......................................................... Hansus Ball and Shpeley
23' Body not depressed; integument various, often with brassy sheen, or partly metallic, or pure black .................. 24
24 Labrum markedly convex, inflated ......................... Eucheila* Dejean
24' Labrum flat ........................................................... 25
25 Elytral intervals densely and coarsely punctulate .......... Inna Putzeys
25' Elytral intervals smooth ........................................ 26
26 Mentum with tooth .................................................. 27
26' Mentum without tooth ........................................... 28
27 Hind tibia dorsally caniculate, the sulcus extended the length of the tibia .......................................................... Catascopus Kirby
27' Hind tibia not caniculate, surface smooth or strigulose ........................................ Stenognathus Chaudoir
28 Mentum with lateral lobes subtruncate .................. Eurycoleus Chaudoir
28' Mentum with lateral lobes pointed or narrowly rounded apically ... 29
29 Pronotum lobed basally ........................................... Stenoglossa Chaudoir
29' Pronotum straight basally ................................. Coptodera Dejean