2014

Revision of Anacaena THOMSON, 1859 XI. Republic of the Philippines (Coleoptera: Hydrophilidae)

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Koleopterologische Rundschau	84	235–276	Wien, September 2014

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Abstract

The species of *Anacaena* THOMSON, 1859 (Coleoptera: Hydrophilidae) of the Republic of the Philippines are revised. Fifteen new species are described: *Anacaena albay* sp.n., *A. amplocomata* sp.n., *A. apo* sp.n., *A. balabag* sp.n., *A. cordillera* sp.n., *A. davao* sp.n., *A. destructa* sp.n., *A. emergens* sp.n., *A. hemisphaerica* sp.n., *A. levistriata* sp.n., *A. philippina* sp.n., *A. princesa* sp.n., *A. quezona* sp.n., *A. sulcata* sp.n., and *A. zamboangana.* All species are endemic to the Philippines, twelve are aquatic, the habitat of three species is unknown. All Philippine species are morphologically similar to other species of the eastern Oriental Region and probably do not form a monophyletic group. Morphological details are illustrated and a key to the species is presented.

Key words: Coleoptera, Hydrophilidae, *Anacaena*, taxonomy, revision, key to species, new species, Oriental Region, Philippines.

Introduction

The Republic of the Philippines is situated in the western Pacific Ocean, between Taiwan in the north, Vietnam in the west and the Indonesian islands of Borneo and Sulawesi in the south, covering an area of almost 300,000 square kilometers and about 7,100 islands. The Philippines are politically divided into 17 regions and 80 provinces. The smaller administrative divisions comprise 138 cities, about 1,500 municipalities and more than 42,000 minor units ("Barangay").

The Philippine Archipelago belongs to the Oriental Biogeographical Region. It is biogeographically divided by "Huxley's Line" (HUXLEY 1868), a modification of Wallace' faunal delineation at its northern course, demarcating the Sunda Islands and "Greater Palawan" in the west and the other Philippine islands known as the Philippine [Sub-]Region in the east.

Despite the fact that the Philippine Islands are known for their high biodiversity, only a comparatively small number of approximately 80 hydrophilid species is recorded from there, 50−58 of them supposedly aquatic (FREITAG et al., in prep.).

Identified species of the tribe Anacaenini (sensu SHORT & FIKÁČEK 2013) were not recorded from the Philippines yet. Only very few specimens of *Anacaena* collected before 1989 were found in museum collections.

Most of the material studied by the authors was collected in the last 25 years mainly by M.A. Jäch, H. Schillhammer, S. Schödl (NMW, Austria), and H. Freitag & C.V. Pangantihon (Ateneo de Manila University, Philippines). Their collecting efforts yielded about 340 specimens of *Anacaena* from the islands of Busuanga, Leyte, Luzon, Mindanao, Mindoro, Palawan, and Tinaga. In total 15 new species of *Anacaena* are described from the Philippines below.

Material and methods

About 350 specimens of *Anacaena* from the Philippines were examined.

Mouthparts, thoracic structures and male genitalia were dissected, placed in concentrated lactic acid and investigated several hours later. The specimens were examined using a binocular Leica MZ 12.5 with diffuse and focused light sources, and a light microscope Olympus BX 41. Multilayer photographs were performed by using a Color View IIIu camera, CellD software (Olympus), consolidated by Zerene stacker and processed with Corel Photo Paint X5. Measurements were taken using a micrometric eyepiece, and drawings were made using CorelDRAW X4. The morphological terminology is based on KOMAREK (2004). Within the precisely cited label data, "/" indicates the change of line, "\" the change of label.

Abbreviations

E.I.	Elytral index (= largest elytral length / largest elytral width)
BMH	Bishop Museum, Honolulu (Hawaii, USA)
CFM	Collection Hendrik Freitag, Manila, currently at Ateneo de Manila University (Philippines)
FMC	Field Museum, Chicago (Illinois, USA)
ISNB	Institut National des Sciences Naturelles, Bruxelles (Belgium)
NMW	Naturhistorisches Museum Wien (Austria)
PCSD	Palawan Council for Sustainable Development, Puerto Princesa City (Philippines)
PNM	Philippine National Museum Manila (Philippines)
UPLB	University of the Philippines Los Baños, Museum of Natural History (Philippines)

Checklist of the species of *Anacaena* of the Philippines

1. *Anacaena albay* sp.n.	Luzon Isl.: Albay Prov.
2. *Anacaena amplocomata* sp.n.	Luzon Isl.: Mountain Prov.
3. *Anacaena apo* sp.n.	Mindanao Isl.: Davao Prov.
4. *Anacaena balabag* sp.n.	Mindanao Isl.: Cotobato Prov.
5. *Anacaena cordillera* sp.n.	Luzon Isl.: Ifugao and Mountain Prov.
6. *Anacaena davao* sp.n.	Mindanao Isl.: Davao Prov.
7. *Anacaena destructa* sp.n.	Leyte Isl.: Leyte Prov., Mindanao Isl.: Davao Prov.
8. *Anacaena emergens* sp.n.	Palawan and Busuanga Isl.: Palawan Prov., Mindoro Isl.: Oriental Mindoro Prov., Tinaga Isl.: Camarines Norte Prov.
9. *Anacaena hemisphaerica* sp.n.	Mindanao Isl.: Misamis Occidental Prov.
10. *Anacaena levistriata* sp.n.	Luzon Isl.: Mountain and Rizal Prov.
11. *Anacaena philippina* sp.n.	Luzon Isl.: Mountain, Benguet, and Laguna Prov., Mindoro Isl.: Oriental Mindoro Prov., Mindanao Isl.: Agusan del Sur Prov., Leyte Isl.: Leyte Prov.
12. *Anacaena princesa* sp.n.	Palawan Isl.: Palawan Prov.
13. *Anacaena quezona* sp.n.	Luzon Isl.: Quezon Prov.
14. *Anacaena sulcata* sp.n.	Luzon Isl.: Mountain and Benguet Prov.
15. *Anacaena zamboangana* sp.n.	Mindanao Isl.: Zamboanga del Sur Prov.

Anacaena albay sp.n.

TYPE LOCALITY: Philippines, Luzon Island, Albay Province, Mount Mayon, 16 km NW of Legazpi.

TYPE MATERIAL: **Holotype** ♂ (BMH): "P.I., Albay Prov. / Mt. Mayon (volc.) / 16 km NW of Lagaspi [Legazpi] / 900-1000 m, 18.V.[19]62 \ H.M. Torrevillas / Collector / Bishop". **Paratypes**: 1 ♂, 2 ♀♀ (BMH, NMW): same sampling data.

DIFFERENTIAL DIAGNOSIS: Habitus short-oval (Fig. 1). Similar to *A. davao*, *A. destructa*, and particularly to *A. apo*, in shape and coloration of the maxillary palpi; differs from *A. davao* and *A. destructa* in short clypeus with merging antero-lateral margins. Can be distinguished from all species of *Anacaena* from the Philippines by the aedeagus, from *A. apo* particularly by the shape of the apex of the parameres, which are inflated.

DESCRIPTION: Total length 1.8−2.0 mm; maximum width 1.0−1.3 mm; E.I. 1.0. Habitus (Figs. 1–2): short oval, strongly convex; elytra about 4.7 × as long as pronotum in dorsal view.

Head: Labrum and clypeus brown, indistinctly brighter on preocular regions in some individuals. Punctures obsolete; series of densely arranged punctures along inner margin of eyes absent. Clypeus short, shorter than diameter of eyes, anterior and lateral margins merging. Eyes not constricted anteriorly; dorsal and ventral portion of almost equal size. Frontoclypeal suture indistinct but visible in its entire length. Antenna with nine antennomeres; intermediate segments minute; antennomere 3 not distinctly elongated. Maxillary palpomeres (Fig. 38) stout; palpomere 2 distinctly inflated; palpomere 4 widest at midlength, with slightly biconvex margins; palpomeres 1−4 yellow, without infuscation. Mentum with slightly convex lateral margins; anterior margin with median incision; ventral punctures obsolete; labial palpi moderately slender, not longer than lateral edge of mentum.

Thorax: Pronotum dark brown with decreasing intensity of coloration towards lateral margins; punctation obsolete; lateral margins distinctly curved, without setae; posterolateral corners broadly rounded. Prosternum flat. Elytra dark brown (male holotype) or lighter brown with indistinct infuscations (female paratype); setae absent; shoulder regions not accentuated; punctures very fine, very widely spaced, arrangement irregular; some coarse, serially arranged, punctures present laterally. Mesoventrite distinctly elevated medially, with pointed protuberance.

Legs light brown like ventrites; spine-like setae on procoxa absent; metafemur (Fig. 58) with pubescence on anterior half of ventral face; hairline horizontal; metatarsus slightly shorter than metatibia.

Aedeagus (Fig. 73): Phallobase about as long as parameres, manubrium forming a nearly parallel-sided lobe, distinctly separated from main portion of phallobase; median reinforcement or pigmented line absent; borderline between pigmented and unpigmented part of ventral face of phallobase not visible. Lateral margins of parameres slightly sigmoid; apical region distinctly inflated, asymmetrical, slightly pointing mesad; mesal margin of parameres almost straight; distance between lateral margins of parameres as wide as diameter of phallobase; basal portion as wide as apical part; ventral portion of base very indistinct; dorsal portion reaching weakly into phallobase. Main portion of median lobe moderately slender, longer than wide, almost as long as parameres, corona in apical position; basal apophyses reaching to halflength of main piece of phallobase. Base of median lobe indistinctly connected with parameres by a mesal tooth.

ECOLOGY: Unknown.

DISTRIBUTION: Philippines, Luzon Island.

ETYMOLOGY: The name of the epithet refers to the province of Albay and is used as noun in apposition.

Anacaena amplocomata sp.n.

TYPE LOCALITY: Philippines, Luzon Island, Cordillera Administrative Region, Mountain Province, Bangaan Barangay, Bomod-ok waterfall.

TYPE MATERIAL: **Holotype** ♂ (NMW): "PHILIP.: Luzon, 22.2.1989 / Mountain Prov., NE Sagada / Banga'an, Bomod-ok waterf. / leg. Schödl (19)".

DIFFERENTIAL DIAGNOSIS: Shares the extended metafemoral pubescence with round hairline with *Anacaena zamboangana*, differs from all other known species from the Philippines in the slightly protruding eyes (Fig. 3) and in the shape of the parameres, which are evenly converging towards the acuminate apex (Fig. 74).

DESCRIPTION: Total length 2.2 mm; maximum width 1.2; E.I. 1.14. Habitus (Figs. 3–4) oblong oval, weakly convex; elytra about 3.1 × as long as pronotum in dorsal view.

Head (Fig. 39): Labrum yellowish brown, clypeus and frons black; distinct, large, triangular preocular patches present, basally as wide as diameter of eye. Irregular punctures fine, separated by about 2 × the diameter of punctures; setae absent; series of densely arranged punctures along inner margin of eyes absent. Clypeus large, straight anteriorly, with distinct antero-lateral angles. Eyes large, not constricted anteriorly, slightly protruding; dorsal and ventral portion of almost equal size. Frontoclypeal suture visible as a fine line. Antenna with nine antennomeres; antennomere 3 not distinctly elongated. Maxillary palpomere 2 distinctly inflated; palpomere 4 widest at midlength, with almost straight inner margin and distinctly convex outer margin; palpomeres 1−4 yellow, without infuscations. Mentum with fine setae on lateral margins; anterior margin with distinct median incision; setiferous ventral punctures present on anterior portion; labial palpi slender, not distinctly longer than lateral edge of mentum; palpomere 3 about as long as palpomere 2.

Thorax: Pronotum with wide yellow lateral portions and dark brown central patch, reaching inner margin of eyes, contacting anterior and posterior pronotal margin; punctation very fine, very widely spaced; lateral margins weakly curved, without setae; posterolateral corners narrowly rounded. Prosternum not reinforced in anterior half. Elytra dark brown, with indistinct brighter areas and with dark brown spots situated on and around punctures; setae absent; shoulder regions not accentuated; irregular punctures fine; interspaces 2 × as wide as punctures; depressions or rows of coarser punctures on lateral portion absent. Mesoventrite distinctly elevated medially, with sharply pointed protuberance.

Legs: Femora brown, with lighter distal portions; tibiae with similar light brown coloration; spine-like setae of procoxa absent; metafemur (Fig. 59) pubescent on ventral face, except on distal fifth, with rounded hairline; metatarsus as long as metatibia.

Aedeagus (Fig. 74): Phallobase as long as parameres, slightly longer than wide; manubrium shaped like a short conical lobe, indistinctly separated from main portion of phallobase; median reinforcement or pigmented line absent; ventral face of phallobase unpigmented. Lateral margin of parameres continuously narrowing towards acuminated apex; apical part straight; distance between lateral margins of parameres as wide as diameter of phallobase; basal portion distinctly wider than apical part; ventral portion very indistinct; dorsal portion of base slightly curved, slightly reaching into phallobase. Median lobe slender, slightly shorter than parameres, bottle-shaped, with concave margins in anterior third, corona in apical position; basal apophyses reaching less than one third of main piece of phallobase. Base of median lobe not distinctly connected with parameres by a mesal tooth.

ECOLOGY: Collected at a waterfall.

DISTRIBUTION: Philippines, Luzon Island.

ETYMOLOGY: Amplus (Latin) = wide; comatus (Latin) = pubescent. The epithet refers to the extended pubescence of the metafemur and is used as an adjective.

Anacaena apo sp.n.

TYPE LOCALITY: Philippines, Mindanao Island, Davao Province, Mount Apo, Galog River.

TYPE MATERIAL: **Holotype** ♂ (FMC): "Mindanao / IX.7.30 [handwritten] P.I. \ Galog Riv. / Mt. Apo \ Altitude / 6000 Ft. \ Coll. by / C.F. Clagg \ Field Mus. \ (F. Psota Coll.)". **Paratypes**: 2 ♀♀ (FMC): Mindanao, Davao Province, eastern slope of Mt. Apo, "Mainit", 4300 ft. a.s.l., original forest, XI.1946, "CNHM-Philippine Zool. Exped. 1946−47", leg. H. Hoogstraal.

ADDITIONAL MATERIAL EXAMINED: Two females (BMH) from Mindanao, Bukidnon Province, Mount Katanglad, 1,420 m a.s.l., collected by C.M. Yoshimoto, 31.X.1959, probably belong to *A. apo*. They differ from the types in the very dark coloration of head, pronotum and elytra and are therefore not designated as paratypes.

DIFFERENTIAL DIAGNOSIS: Belongs to the species with short oval habitus (Fig. 5). Similar to *A. davao* and *A. destructa* in shape and coloration of maxillary palpi, differing from these species in the following features: distinct preocular patches absent, clypeus short with merging antero-lateral margins, pronotal punctation obsolete, dorsal coloration light brown, median lobe much shorter, parameres differently shaped (Fig. 75). Can be distinguished from the other species with very short median lobe (*A. quezona* and *A. princesa*), by the shape of the parameres, and the basal lobe.

DESCRIPTION: Total length 2.1 mm; maximum width 1.2 mm; E.I. 1.18. Habitus (Figs. 5–6): short oval, moderately convex; elytra about 4.3 × as long as pronotum in dorsal view.

Head: Labrum, clypeus and frons light brown, indistinctly brighter on preocular regions. Punctures almost obsolete; series of densely arranged punctures along inner margin of eyes absent. Clypeus short, anterior and lateral margins merging. Eyes not constricted anteriorly; dorsal and ventral portion of almost equal size. Frontoclypeal suture indistinct but visible in its entire length. Antenna with nine antennomeres; intermediate segments minute; antennomere 3 not distinctly elongated. Maxillary palpomeres (Fig. 33) stout; palpomere 2 distinctly inflated; palpomere 4 widest at midlength, with slightly biconvex margins; palpomeres 1−4 yellow, without infuscation. Mentum (Fig. 49) weakly sclerotized, with fine setae on slightly convex lateral margins; anterior margin with distinct median incision; ventral punctures very fine, evenly distributed; palpomeres as long as lateral edge of mentum, palpomere 2 moderately slender, palpomere 3 stout and longer than palpomere 2.

Thorax: Pronotum light brown with very indistinct infuscations; punctation obsolete; lateral margins distinctly curved, without setae; posterolateral corners broadly rounded. Prosternum not reinforced. Elytra light brown with indistinct infuscations; setae absent; shoulder regions not accentuated; punctures very fine, very widely spaced, arrangement irregular; some coarse punctures present laterally. Mesoventrite distinctly elevated medially, with pointed protuberance.

Legs light brown like ventrites; spine-like setae on procoxa absent; metafemur (Fig. 60) with pubescence on mesal and anterior half of ventral face; hairline oblique, convex mesally, horizontal in lateral portion; metatarsus slightly shorter than metatibia.

Aedeagus (Fig. 75): Phallobase as long as parameres, longer than wide; manubrium forming a conical lobe, distinctly separated from main portion of phallobase; median reinforcement or pigmented line absent; borderline between pigmented and unpigmented part of ventral face of phallobase not visible. Lateral margin of parameres slightly sigmoid; apex narrowly rounded, asymmetrical; apical region straight; mesal margin of parameres almost straight; distance between lateral margins of parameres as wide as diameter of phallobase; basal portion wider than

apical part; ventral portion of base very indistinct; dorsal portion almost straight, reaching slightly into phallobase. Main portion of median lobe slender in apical half, longer than wide, distinctly shorter than parameres, bottle-shaped; corona in apical position; basal apophyses reaching less than halflength of main piece of phallobase. Base of median lobe not distinctly connected with parameres by a mesal tooth.

ECOLOGY: Collected in a river in primary forest.

DISTRIBUTION: Philippines, Mindanao Island.

ETYMOLOGY: The name of the epithet refers to the sampling locality at Mount Apo, and is used as noun in apposition.

Anacaena balabag sp.n.

TYPE LOCALITY: Philippines, Mindanao Island, Cotobato Province, Kidapawan (City), Balabag (Barangay), Paniqui River, 7°02'N 125°13'E.

TYPE MATERIAL: **Holotype** ♂ (NMW): "PHIL.: Mindanao, Kidapawan, Balabag / ca. 1.1 km E Mawreg; Paniqui Riv., calm side / creek, prim. forest, ca. 950 m a.s.l. / 14. IV. 1995, leg. Freitag (36b)M". **Paratypes**: 1 ♂, 2 ♀♀ (CFM, NMW): same sampling data.

DIFFERENTIAL DIAGNOSIS: Shares similar features of the aedeagus with *A. amplocomata* and *A. levistriata* (evenly converging parameres with tapering apex, Fig. 76), differs from them distinctly in its habitus (Fig. 7); shares a stout habitus with *A. apo*, *A. davao*, *A. destructa*, and *A. quezona*, and can be separated from these species by the combination of slender maxillary palpomeres (Fig. 40), very dark brown coloration of the head with distinct, large, triangular preocular patches, black elytra, and by features of the aedeagus.

DESCRIPTION: Total length 1.9–2.5 mm; maximum width 1.2–1.3 mm; E.I. 1.08−1.09. Habitus (Figs. 7–8) rather broadly oval, with greatest width at midlength; elytra about 3.4−3.5 × as long as pronotum in dorsal view.

Head (Fig. 40): Labrum, clypeus and frons dark brown to black, with distinct, large, yellow, triangular preocular patches, of equal width as diameter of eyes. Irregular punctures very fine, widely separated; setae absent; series of densely arranged punctures along inner margin of eyes absent. Clypeus moderately large, straight anteriorly, with merging lateral and anterior edges. Eyes not constricted anteriorly; dorsal and ventral portion of almost equal size. Frontoclypeal suture present on lateral part of head. Antennae with nine antennomeres; antennomere 3 not distinctly elongated. Maxillary palpomere 2 moderately inflated; palpomere 4 widest at midlength, slender, with very slightly convex inner margin and distinctly convex outer margin; color of palpomeres yellow, without infuscation. Mentum with fine setae on lateral margins; anterior margin with distinct median incision; ventral punctures very fine, very widely spaced; labial palpi rather stout, not longer than lateral edge of mentum; palpomere 3 about as long as palpomere 2.

Thorax: Pronotum black with wide yellow lateral margins; punctation very fine, very widely spaced; lateral margins slightly curved, without setae; posterolateral corners rather narrowly rounded. Prosternum indistinctly reinforced by a short median bulge on anterior half. Elytra black, with indistinctly demarcated dark brown lateral margins and posterior region of varying extension; setae absent; shoulder regions not accentuated; punctures fine, but coarser than on head; arrangement irregular; interspaces about 1−2 × as wide as punctures; indistinct, short; lateral areas with subseriate rows of coarser, more densely arranged punctures. Mesoventrite distinctly elevated medially, with pointed protuberance.

Legs light to dark brown; procoxa with some spine-like setae; metafemur (Fig. 61) pubescent in mesal portion and on anterior half with horizontal hairline; metatarsus about as long as metatibia or slightly shorter.

Aedeagus (Fig. 76): Phallobase about as long as parameres, longer than wide; manubrium distinctly separated from main portion of phallobase; median reinforcement or pigmented line absent; borderline between pigmented and unpigmented part of ventral face of phallobase very indistinct. Lateral and mesal margins of parameres converging in evenly convex lines; apex very narrowly rounded, blunt, straight; distance between lateral margins of parameres as wide as diameter of phallobase; basal portion distinctly wider than apical part; ventral portion very indistinct; dorsal portion slightly curved, moderately deeply reaching into phallobase. Median lobe slender, shorter than parameres, bottle-shaped with distinctly concave margins in apical half; corona in apical position; basal apophyses not reaching halflength of main piece of phallobase. Base of median lobe not distinctly connected with parameres by a mesal tooth.

ECOLOGY: Collected in a creek in a remnant of primary forest at 950 m altitude.

DISTRIBUTION: Philippines, Mindanao Island.

ETYMOLOGY: The name of the epithet refers to the sampling locality and is used as noun in apposition.

Anacaena cordillera sp.n.

TYPE LOCALITY: Philippines, Luzon, Cordillera Administrative Region, Mountain Province, Sagada, 17°05'N 120°54'E.

TYPE MATERIAL: **Holotype** ♂ (NMW): "N Luzon, Mountain Prov. / Sagada, Underground River / downstream of cave / c. 1450 m c. 17°05'N 120°54'E / 14. 3. 95, leg. FREITAG (5)". **Paratypes**: 68 exs. (CFM, NMW, PNM, UPLB): same sampling data; 1 ♀ (NMW): same data, "upstream of cave, 13. III. 1995, leg. H. Freitag (4)"; 37 exs. (NMW): Luzon, Mountain Province, Gonogon Chico River, ca. 900 m a.s.l., 21.II.1989, leg. Schödl "18"; 28 exs. (NMW): Luzon, Mountain Province, NE Sagada, Bangaan, Bomod-ok waterfall, 22.II.1989, leg. Schödl "19"; 3 exs. (NMW): Luzon, Mountain Province, Balitian River, ca. 5 km S Bontoc Bagnen, 27.II.1989, leg. Schödl "24"; 4 ♂♂ (NMW): N Luzon, Cordillera [Administrative Region], Ifugao Prov., Banaue, Batad, Tapiyah Fall, ca. 750 m a.s.l., ca. 16°56'N 121°09'E, 11. III. 1995, leg. H. Freitag "3"; 1 ♀ (NMW): N Luzon, Cordillera, Ifugao Prov., Banaue, 3 km to Batad, Guihob natural pool, ca. 1200 m a.s.l., ca. 16°54'N 121°05'E, mountain creek, 10.III.1995, leg. H. Freitag "1"; 6 ♀♀ (NMW): Luzon, Cordillera, Ifugao Prov., Banaue, 4.V.1994, leg. C.-F. Lee.

DIFFERENTIAL DIAGNOSIS: Can be identified by the combination of an oblong oval habitus (Fig. 9), presence of distinct preocular patches, a distinct apical infuscation of maxillary palpomere 4 (Fig. 34), black coloration of the dorsal side, and strong punctation of pronotum and elytra. Differs from all other species from the Philippines in features of the aedeagus (Fig. 77), notably the very distinct sigmoid lateral margins of the parameres and the median spine-like structure of the manubrium, terminating in a dorsally bent knob.

DESCRIPTION: Total length 2.6–3.1 mm; maximum width 1.5–1.8 mm; E.I. 1.14−1.27. Habitus (Figs. 9–10): oblong oval, with greatest width at midlength, rather weakly convex; elytra about 2.9−3.9 × as long as pronotum in dorsal view.

Head: Labrum, clypeus and frons black; distinct, yellow, preocular patches present, usually smaller than diameter of eye in most cases but reduced to a narrow strip on lateral margin in some individuals. Irregular punctures moderately fine, distinctly impressed; interspaces on average about as large as punctures; setae absent; series of indistinct, minute, densely arranged punctures along inner margin of eyes very indistinct. Clypeus large, straight anteriorly, with distinct blunt angles between lateral and anterior portion. Eyes not constricted anteriorly; dorsal and ventral portion of almost equal size. Frontoclypeal suture very indistinct or absent. Antennae

with nine antennomeres; antennomere 3 not distinctly elongated. Maxillary palpomere 2 slightly inflated; palpomere 4 widest slightly distal to midlength, slender, with almost straight inner margin and convex outer margin; distinct infuscation present on distal half or extended to more than distal half in rare cases, but never on entire palpomere 4 (Fig. 34). Mentum (Fig. 50) with fine setae on lateral margins; anterior margin with deep median incision; ventral punctures widely spaced, arranged on anterior portion; labial palpi slender, longer than lateral edge of mentum; palpomere 3 as long as palpomere 2.

Thorax: Pronotum black with narrow yellow lateral margins; punctation distinctly finer than on head, weakly impressed, slightly denser towards lateral margins; lateral margins slightly curved, without setae; posterolateral corners rather narrowly rounded. Prosternum slightly reinforced by an indistinct short median bulge on anterior third. Elytra entirely black or in some individuals dark brown, with lighter brown portions mainly along lateral margins; long, fine setae present on apex; shoulder regions not accentuated; punctures coarser than on head, strongly impressed; arrangement irregular; some subseriate rows of coarser punctures present on lateral areas, confluent on some places; interspaces on elytral disc about as wide as punctures. Mesoventrite distinctly elevated medially, with sharply pointed protuberance.

Legs dark brown to black; procoxa with some spine-like setae; metafemur (Fig. 62) pubescent on mesal portion and on anterior half with horizontal hairline; metatarsus about as long as metatibia.

Aedeagus (Fig. 77): Phallobase about as long as parameres, longer than wide; manubrium not demarcated, evenly converging towards blunt proximal end reinforced by short median anchor-like structure; borderline between pigmented and unpigmented part of ventral face of phallobase indistinct. Lateral margin of parameres distinctly sigmoid; mesal margin straight; distance between lateral margins of parameres as wide as diameter of phallobase; apex wide, asymmetrical; basal portion distinctly wider than apical part; ventral portion of bases not fused, not reaching into phallobase; dorsal portion slightly reaching into phallobase. Median lobe almost reaching apex of parameres, with distinctly concave margins in apical half; corona in apical position of median lobe; basal apophyses not reaching halflength of main piece of phallobase. Base of median lobe not distinctly connected with parameres by mesal tooth.

ECOLOGY: Collected in streams, creeks, near a waterfall, and in a natural pool. All collection sites are at higher altitudes between 750 m and 1,450 m a.s.l.

DISTRIBUTION: Philippines, Luzon Island.

ETYMOLOGY: The name of the epithet refers to the Administrative Region where the specimens were collected. Used as noun in apposition.

Anacaena davao sp.n.

TYPE LOCALITY: Philippines, Mindanao Island, Davao Province, eastern slope of Mount McKinley.

TYPE MATERIAL: **Holotype** ♂ (FMC): "E-slope Mt. McKinley / Davao Province, Mindanao / Elev. 3200 ft., Lot #54 / IX, 7−8, 1946; beating \ CNHM-Philippine / Zool. Exped. 1946−47 / F.G.Werner leg.". **Paratype**: 1 ♂ (NMW): Mindanao, Davao Province, E-slope Mt. McKinley, 3000 ft. a.s.l., stream, 24.VIII.1946, "CNHM-Philippine Zool. Exped.1946−47", leg. F.G. Werner.

DIFFERENTIAL DIAGNOSIS: One of the species with a short-oval habitus (Fig. 11; see diagnosis of *A. balabag*). The aedeagi differ in both species: apex of parameres wide, manubrium narrow in *A. davao* (Fig. 78). Differs from *A. apo*, *A. balabag*, and *A. quezona* by the combination of a dark brown coloration of the dorsal side, distinct preocular patches, stout maxillary palpi, and the absence of coarser lateral serial punctures on the elytra.

DESCRIPTION: Total length 1.8−1.9 mm; maximum width 1.1 mm; E.I. 1.00−1.10. Habitus (Figs. 11–12): short oval, moderately convex; elytra about 3.0−3.2 × as long as pronotum in dorsal view.

Head: Labrum light to dark brown, clypeus and frons dark brown; clypeus with distinct yellow preocular patches. Irregular punctures fine, very weakly impressed; interspaces about as wide as diameter of punctures; setae absent; series of densely arranged punctures along inner margin of eyes very indistinct or absent. Clypeus large, straight anteriorly, with indistinct, blunt antero-lateral angles. Eyes not constricted anteriorly; dorsal and ventral portion of almost equal size. Frontoclypeal suture visible laterally. Antennae with nine antennomeres, with minute intermediate segments; antennomere 3 not distinctly elongated. Maxillary palpomeres (Fig. 35) stout; palpomere 2 distinctly inflated; palpomere 4 widest at midlength, with convex inner and outer margins; palpomeres 1−4 yellow, without infuscation. Mentum (Fig. 51) with fine setae on distinctly convex lateral margins; anterior margin with distinct median incision; ventral punctures very fine; labial palpi stout, slightly longer than lateral edge of mentum; palpomere 3 not distinctly longer than palpomere 2.

Thorax: Pronotum with dark brown central patch extending to mesal margin of eyes; wide yellowish brown margins present; punctation very fine, widely spaced, weakly impressed; lateral margins weakly curved, setae absent; posterolateral corners broadly rounded. Prosternum not distinctly reinforced. Elytra with extensive dark brown coloration but light brown towards lateral margins and posterior region; setae absent; shoulder regions not accentuated; punctures fine, coarser than on head, interspaces about 2 × as wide as punctures, arrangement irregular; rows of coarse lateral punctures absent. Mesoventrite distinctly elevated mesally, with pointed protuberance.

Legs light brown like ventrites or slightly brighter; spine-like setae on procoxa absent; metafemur (Fig. 63) with pubescence restricted to mesal portion and anterior half with horizontal hairline; metatarsus about as long as metatibia or slightly shorter.

Aedeagus (Fig. 78): Phallobase as long as parameres, longer than wide; manubrium forming a narrow lobe, distinctly separated from main portion of phallobase; median reinforcement or pigmented line absent; borderline between pigmented and unpigmented part of ventral face of phallobase not visible. Lateral margin of parameres very slightly sigmoid; apex broadly rounded, asymmetrical, slightly pointing mesad; mesal margin of parameres very slightly sigmoid; distance between lateral margins of parameres as wide as diameter of phallobase; basal portion about as wide as apical part; ventral portion very indistinct; dorsal portion slightly curved, reaching into phallobase. Main portion of median lobe slender in apical half, longer than wide, about as long as parameres, bottle-shaped, with distinctly concave margins at midlength, almost parallel-sided in apical third; corona in apical position; basal apophyses reaching halflength of main piece of phallobase. Base of median lobe not distinctly connected with parameres by a mesal tooth.

ECOLOGY: Collected in a stream and by beating.

DISTRIBUTION: Philippines, Mindanao Island.

ETYMOLOGY: The name of the epithet refers to the province of Davao where the specimens were collected and is used as noun in apposition.

Anacaena destructa sp.n.

TYPE LOCALITY: Philippines, Leyte Island, Leyte Province, Lake Danao.

TYPE MATERIAL: **Holotype** ♂ (FMC): "3 mi. E of L. Danao / NE Leyte I., P.I. / VIII:3:1945 \ series (5) / on moist / Rock by / mountain stream \ coll. & pres. by C.L.Remington". **Paratypes**: 2 ♀♀ (FMC, NMW): same sampling data lacking ecological remarks; 1 ♂ (FMC): "Meran, E-slope Mt. Apo / Davao Province / Mindanao / 6000 ft. XI. 7. 46 \ original forest \ CNHM-Philippine / Zool. Exped. (1946−47), H. Hoogstraal leg.".

DIFFERENTIAL DIAGNOSIS: Belongs to the morphological group of species with a short-oval habitus (Fig. 13). Very similar to *A. davao,* can be separated from this species by maxillary palpi (Fig. 36) and features of the aedeagus (Fig. 79). Differs from *A. apo*, *A. balabag*, and *A. quezona* in the combination of a dark brown coloration of the dorsal side, distinct preocular patches, and the absence of coarser lateral serial punctures on the elytra.

DESCRIPTION: Total length 1.7−2.0 mm; maximum width 1.1−1.3; E.I. 1.04−1.06. Habitus (Figs. 13–14) short oval, strongly convex; elytra about 2.9−3.5 × as long as pronotum in dorsal view.

Head: Labrum light to dark brown, clypeus and frons dark brown; clypeus with distinct yellow preocular patches. Irregular punctures fine, very weakly impressed; interspaces about as wide as diameter of punctures; setae absent; series of densely arranged punctures along inner margin of eyes very indistinct. Clypeus large, straight anteriorly, with indistinct, blunt antero-lateral angles. Eyes not constricted anteriorly; dorsal and ventral portion of almost equal size. Frontoclypeal suture visible laterally. Antennae with nine antennomeres; with minute intermediate segments; antennomere 3 not distinctly elongated. Maxillary palpomere 2 (Fig. 36) distinctly inflated, palpomere 4 slender, widest at midlength, with slightly convex inner and outer margin; palpomeres 1−4 yellow, without infuscation. Mentum (Fig. 52) with fine setae on distinctly convex lateral margins; anterior margin with distinct median incision; ventral punctures very fine, more densely arranged on anterior half; labial palpi stout, not distinctly longer than lateral edge of mentum; palpomere 3 wider but not distinctly longer than palpomere 2.

Thorax: Pronotum with dark brown mesal patch, not reaching anterior and posterior pronotal margins, extending laterally to mesal margin of eyes or slightly wider; wide yellowish-brown margins present; punctation very fine, widely spaced, weakly impressed; lateral margins weakly curved, setae absent; posterolateral corners broadly rounded. Prosternum flat. Elytra with extensive dark brown coloration, lateral margins and posterior region light brown; setae absent; shoulder regions not accentuated; punctures fine but more distinct than on head; interspaces about 2 × as wide as punctures, arrangement irregular; rows of coarse lateral punctures absent. Mesoventrite distinctly elevated medially, with pointed protuberance.

Legs light brown like ventrites or slightly lighter; spine-like setae on procoxa absent; metafemur (Fig. 64) with pubescence restricted to mesal portion and anterior half with horizontal hairline; metatarsus about as long as metatibia.

Aedeagus (Fig. 79): Phallobase as long as parameres, longer than wide; manubrium forming a rather wide lobe distinctly separated from main portion of phallobase; median reinforcement or pigmented line absent; borderline between pigmented and unpigmented part of ventral face of phallobase not visible. Lateral margin of parameres almost straight or very slightly curved; apex narrowed, blunt, asymmetrical, slightly pointing mesad; mesal margin of parameres very slightly sigmoid; distance between lateral margins of parameres as wide as diameter of phallobase; basal portion slightly wider than apical part; ventral portion very indistinct; dorsal portion of base slightly curved, reaching into phallobase. Main portion of median lobe slender in apical half, longer than wide, shorter than parameres, margins bottle-shaped, distinctly concave at midlength and almost parallel-sided in apical third; corona in apical position; basal apophyses reaching less

than halflength of main piece of phallobase. Base of median lobe not distinctly connected with parameres by mesal tooth.

ECOLOGY: Collected on a moist rock at the edge of a mountain stream.

DISTRIBUTION: Philippines, Leyte and Mindanao Islands.

ETYMOLOGY: The name of the epithet refers to the destructions caused by the typhoon Haiyan in 2013 on the island of Leyte and is used as adjective.

Anacaena emergens sp.n.

TYPE LOCALITY: Philippines, Palawan Island, Puerto Princesa (District), Santa Cruz (Barangay), Calatobong tributary, 9°56'46"N 118°44'38"E.

TYPE MATERIAL: **Holotype** ♂ (NMW): "PHIL.: Palawan, P. Princesa, Sta. Cruz / Calatobong trib., near Nat. highw. km 29 / swamp rivulet, heavy metal soil, sec. veget. / pool, sand, FPOM [fine particulate organic matter], 28 m a.s.l., 9°56'46"N 118°44'38"E 14.11.94, leg. Freitag (123)M". **Paratypes**: **Mindoro**: 1 ♂ (CFM): Oriental Mindoro [Province], Roxas [City], San Vicente [Barangay], Hinundungan River, Quirao Buhai tributary Tagugoy Creek, 12°36'30"N 121°22'38"E, ca. 200 m a.s.l., littoral pool, sand & gravel, 12.VIII.2012, leg. C.V. Pangantihon "(HBTb)M"; 1 ♂ [prep.] (PNM): same sampling locality, date and collector, bottom gravel, "(HBTc)M"; 1 ex. (CFM): same sampling locality, emergence trap, 12.VIII−21.IX.2012, leg. H. Freitag & C.V. Pangantihon "(HBT)E"; 1 ♂ [prep.] (PNM): Oriental Mindoro, Roxas, San Vicente, Baroc River tributary Hinundugan River; sunny rivulet, 12°36'23"N 121°23'29"E, 118 m a.s.l., littoral sand, pool; secondary vegetation, 12.VII.2012, leg. C.V. Pangantihon "(HR1b)M"; 1 ♂ [prep.] (CFM): Oriental Mindoro, Roxas, San Vicente, Baroc River tributary Taugad Daka River; ca. 12°38'05"N 121°19'33"E, ca. 530 m a.s.l.; leaf packs, 4.IV.2013, leg. C.V. Pangantihon "(TDRd)M"; 1 ♂, 2 ♀♀ (NMW): Mindoro, SE Puerto Galera, 14.XI.1992, 100 m a.s.l., leg. M.A. Jäch "3". **Luzon**: 3 exs. (NMW, CFM [in alc.]): [Bicol Region], Camarines Norte [Province], Vinzon[s], Calaguas Islands, Tinaga Island, Mangkawayan Barangay, 14°28'49"N 122°56'33"E, 20 m a.s.l., small temporary pool, 18.VIII.1992, leg. C.P. Mendoza. **Palawan**: 6 ♂♂, 8 ♀♀ (CFM, NMW): same sampling data as holotype; 3 ♂♂, 2 ♀♀ (PCSD, PNM): Palawan, Taytay [mainland municipality], lake Manguao tibutary Alipuran stream, ca. 40 m a.s.l., 10°45"N 119°32'E, semi-primary forest, 29.IV.2007, leg. H. Freitag "(15)M"; 2 ♂♂ (UPLB): Palawan, Taytay [mainland municipality], Poblacion [Barangay], Culanga Stream, private farm Reyes, ca. 10 m a.s.l., 10°47'48"N 119°30'46"E, emergence trap, 17.V.−12.VI.2007, leg. H. Freitag "(78a)E"; 1 ♀ (NMW): Palawan, Aborlan [mainland municipality], Cabigaan [Barangay], Talakaigan River, mountain river upstream dam, 9°26'50"N 118°26'49"E, ca. 50 m a.s.l., riffle, rocks, bolder, forest, 25.II.1995, leg. H. Freitag "(154)M"; 2 ♂♂ (CFM): Palawan, Taytay [mainland municipality], Poblacion [Barangay], southern Manguao Stream tibutary, ca. 30 m a.s.l., 10°46'00"N 119°30'43"E, primary forest, emergence trap, 18.−25.V.2007, leg. H. Freitag "(63a)E"; 3 exs. (NMW): Busuanga Island, Coron [municipality], 0.7 km W Decabobo, water source helocrene, leaf litter, secondary forest; ca. 30 m a.s.l., 12°07'54"N 120°12'07"E, 31.VIII.1994, leg. H. Freitag "(162o)M".

DIFFERENTIAL DIAGNOSIS: One of the species with oblong-oval habitus (Fig. 15). With asymmetrical, yellow maxillary palpomeres without infuscations (Fig. 41), dark brown to black coloration on the dorsal side, a narrow yellow rim on the lateral clypeal margin, and a weak dorsal punctation which is almost obsolete on the pronotum. Can be separated from the similar *A. princesa* by the more oblong habitus, features of the maxillary palpomere 4 (slender, asymmetrical), the mentum (wider, with distinctly convex lateral margins, Fig. 53), and the labial palpi (slender). Due to the intraspecific variability a reliable differentiation should include the examination of the aedeagus (Fig. 80) which shows very distinct differences between these two species.

DESCRIPTION: Total length 1.8−2.3 mm; maximum width 1.1−1.3; E.I. 1.09−1.30. Habitus (Figs. 15, 16): oblong oval, weakly convex; elytra about 2.9−3.8 × as long as pronotum in dorsal view.

Head (Fig. 41): Labrum light to dark brown, clypeus and frons dark brown to black; narrow yellow rim on lateral clypeal margin indistinct or absent, or with wider preocular brighter areas indistinctly separated from a central dark brown area in some individuals. Irregular punctures

very weakly impressed, interspaces 2−3 × as wide as diameter of punctures; setae absent; series of densely arranged punctures along inner margin of eyes very indistinct. Clypeus large, straight anteriorly, with indistinct, blunt antero-lateral angles. Eyes not constricted anteriorly; dorsal and ventral portion of almost equal size. Frontoclypeal suture absent. Antennae with nine antennomeres; antennomere 3 not distinctly elongated. Maxillary palpomere 2 inflated; palpomere 4 widest at midlength or slightly more distally, with almost straight inner margin and convex outer margin; palpomeres 1−4 yellow, without infuscation. Mentum (Fig. 53) with fine setae on strongly convex lateral margins; length/width ratio 1.89; anterior margin with distinct median incision; ventral punctures very fine, evenly dispersed; labial palpi slender, distinctly longer than lateral edge of mentum; palpomere 3 longer than palpomere 2.

Thorax: Pronotum (Fig. 41) black with yellowish brown margins of very variable extension; less strongly pigmented individuals occur with very wide yellow margins; punctation almost obsolete; few very fine punctures mainly present laterally; lateral margins weakly curved, setae absent; posterolateral corners broadly rounded. Prosternum flat. Elytra dark brown to black, less dark along lateral margins and posterior region in most individuals; very fine setae present on apex; shoulder regions not accentuated; punctures fine but coarser than on head and strongly impressed; interspaces 2−3 × as wide as punctures, arrangement irregular; subseriate short rows of some coarser punctures present laterally. Mesoventrite distinctly elevated medially, with pointed protuberance.

Legs light brown like ventrites or slightly brighter, in distinct contrast to dark dorsal coloration; some spine-like setae on procoxa present; metafemur (Fig. 65) with pubescence restricted to mesal portion and anterior half with horizontal hairline; metatarsus about as long as metatibia.

Aedeagus (Fig. 80): Phallobase as long as parameres and as long as wide; manubrium forming a rather narrow lobe, distinctly separated from main portion of phallobase; median reinforcement or pigmented line absent; borderline between pigmented and unpigmented part of ventral face of phallobase not visible. Lateral margin of parameres very slightly sigmoid; apex wide, broadly rounded, not inflated, slightly pointing mesad; mesal margins of parameres distinctly sigmoid, with strongly pronounced large bulge at midlength; distance between lateral margins of parameres as wide as diameter of phallobase; basal portion not wider than apical part; ventral portion very indistinct, not fused; dorsal portion distinctly curved, distinctly reaching into phallobase. Main portion of median lobe stout, slightly longer than wide, shorter than parameres, bottle-shaped; converging towards blunt apex with distinctly concave margins; corona in apical position; basal apophyses reaching more than halflength of main piece of phallobase. Base of median lobe not distinctly connected with parameres by mesal tooth.

ECOLOGY: Collected in streams, small mountain streams, in stream-associated temporary pools, and in a helocrene, where it was found to dwell in various substrates such as leaf litter and gravel. Many specimens were caught in emergence traps, indicating that the species actively leaves the aquatic habitat. It was found from lowlands up to 530 m altitude.

DISTRIBUTION: Philippines, Islands of Busuanga, Mindoro, Palawan, and Tinaga.

ETYMOLOGY: Emergens (Latin) = emerging. The species is named in reference to the fact that it was commonly collected in emergence traps.

Anacaena hemisphaerica sp.n.

TYPE LOCALITY: Philippines, Mindanao Island, Misamis Occidental Province, Lake Duminagat.

TYPE MATERIAL: **Holotype** ♂ (BMH): "P.I., Mindanao / Misamis Occ.: / L. Duminagat, 1500 m / 4.VII.1958 \ H.E. Milliron / Collector". **Paratype**: 1 ♀ (BMH): same sampling data.

DIFFERENTIAL DIAGNOSIS: The only species of *Anacaena* from the Philippines with eight antennomeres. Belongs to the species with short-oval habitus (Fig. 17) especially very similar to *Anacaena quezona*, differs from this species mainly in the reduced number of antennomeres, the maxillary palpomere 4 (stout) and by the highly convex habitus, from all species of the Philippines by features of the aedeagus (undulating shape of parameres, unique shape of median lobe (Fig. 81).

DESCRIPTION: Total length 2.1 mm; maximum width 1.5 mm; E.I. 1.01. Habitus (Figs. 17–18): highly convex, broadly oval with greatest width at midlength; elytra about 1.1 × as long as pronotum in dorsal view.

Head (Fig. 42): Labrum, clypeus and frons light brown; clypeus slightly brighter laterally, preocular patches absent. Irregular punctures very fine, weakly impressed, widely separated; setae absent; series of densely arranged punctures along inner margin of eyes absent. Clypeus short, straight anteriorly, with indistinct blunt angles between lateral and anterior portion. Eyes not constricted anteriorly; dorsal and ventral portion of almost equal size. Frontoclypeal suture present laterally, very indistinct. Antennae with eight antennomeres; antennomere 3 not elongated. Maxillary palpomeres (Fig. 37) stout, palpomere 2 strongly inflated; palpomere 4 widest at midlength, almost symmetrical with biconvex margins; coloration of palpomeres 1−4 yellow, without infuscation. Mentum with fine setae on lateral margins; anterior margin with mesal incision; ventral punctures obsolete; labial palpi slender, not longer than lateral edge of mentum; palpomere 3 slightly longer than palpomere 2.

Thorax: Pronotum (Fig. 42) amber-colored, without infuscations; punctation obsolete; lateral margins slightly curved, setae absent; posterolateral corners rather narrowly rounded. Prosternum indistinctly reinforced by a short median bulge on anterior half. Elytra amber-colored; setae absent; shoulder regions not accentuated; punctures fine, distinctly coarser than on head; arrangement irregular; interspaces on elytral disc about as wide as punctures; indistinct, short, subseriate rows of coarser punctures with denser distribution present on lateral areas. Mesoventrite distinctly elevated medially, with pointed protuberance.

Legs amber-colored; procoxa without spine-like setae; metafemur (Fig. 66) pubescent on mesal portion and anterior half with horizontal hairline; metatarsus shorter than metatibia.

Aedeagus (Fig. 81): Phallobase slightly shorter than parameres and about as long as wide; borderline between pigmented and unpigmented part of ventral face of phallobase not visible. Lateral and mesal margin of parameres distinctly sigmoid, meandering, with slightly inflated apex, extensions absent; basal portion as wide as apical part; dorsal portion distinctly curved, deeply reaching into phallobase. Median lobe almost reaching apex of parameres, strongly bottle-shaped with clumsy basal half abruptly narrowing to parallel-sided apical half; corona in apical position; basal apophyses reaching halflength of main piece of phallobase. Base of median lobe indistinctly connected with parameres.

ECOLOGY: Unknown.

DISTRIBUTION: Philippines, Mindanao Island.

ETYMOLOGY: The name of the epithet refers to the hemispherical body shape.

Anacaena levistriata sp.n.

TYPE LOCALITY: Philippines, Luzon Island, Cordillera Administrative Region, Mountain Province, 5 km S Bontoc (City), Balitian River.

TYPE MATERIAL: **Holotype** ♂ (NMW): "PHILIP.: Luzon, 27.2.1989 / Mountain Prov., Balitian Riv. / ca. 5 km S Bontoc / Bagnen, leg. Schödl (24)". **Paratypes**: 6 ♂♂, 8 ♀♀ (NMW): same sampling data; 1 ♂ (ISNB): "Montalba[n] / Philippin. [mounted on a yellow label: "Coll. R.I.Sc.N.B. / Philippines"] \ *Anacaena* sp. [handwritten]". Montalban is the old name for Rodriguez, situated in the Rizal Province (Calabarzon Region of Luzon Island); 7 exs. (CFM [in alc.], PNM [1 ♂ prep.]): Luzon, Rizal [Province], Rodriguez [Municipality], Puray [Barangay], Sitio Mabolo, downstream of Puray Falls, ca. 150 m a.s.l., 14°46'35"N 121°12'52"E, leg. C.P. Mendoza, 25.II.1994 "(401)M"; 1 ♂ (UPLB): Luzon, Rizal, Rodriguez River tributary, Puray, Sitio Makapikapi, ca. 130 m a.s.l., 14°45"N 121°12'E, bottom gravel, secondary vegetation, leg. C.P. Mendoza, 25.II.1994 "(400c)M".

DIFFERENTIAL DIAGNOSIS: Differs together with *A. sulcata* from all other species from the Philippines in the combination of a black dorsal coloration (Fig. 19), absence of brighter preocular areas (Fig. 43), a very strong punctation of head, pronotum and elytra, and presence of shallow lateral grooves on elytra (Fig. 31); can be separated from *A. sulcata* by the mentum (length/width ratio slightly larger, Fig. 54), presence of serial punctures on elytra (Fig. 31) and features of the aedeagus (parameres without lateral bulge, Fig. 82).

DESCRIPTION: Total length 2.1−2.7 mm; maximum width 1.3−1.6; E.I. 1.06−1.20. Habitus (Fig. 19–20) oblong oval, moderately convex; elytra about 2.7−3.6 × as long as pronotum in dorsal view. Individuals from Mountain Province are larger (total length 2.4−2.7 mm; maximum width 1.4−1.6) than the specimen from Rizal Province (total length 2.1 mm; maximum width 1.3 mm).

Head (Fig. 43): Labrum, clypeus and frons black; preocular patches absent. Irregular punctures coarse, interspaces as wide as diameter of punctures; setae absent; series of densely arranged punctures along inner margin of eyes absent. Clypeus large, straight anteriorly, with blunt antero-lateral angles. Eyes not constricted anteriorly; dorsal and ventral portion of almost equal size. Frontoclypeal suture absent or very indistinct. Antennae with nine antennomeres, with minute intermediate segments; antennomere 3 not distinctly elongated. Maxillary palpomere 2 distinctly inflated; palpomere 4 widest at midlength, with almost straight inner margin and distinctly convex outer margin; palpomeres 1−3 yellow; palpomere 4 infuscated entirely or on more than distal half. Mentum (Fig. 54) with fine setae on almost straight lateral margins; length/width ratio = 1.45; anterior margin with distinct median incision; some fine, setiferous punctures present ventrally, ungrouped; labial palpi slightly longer than lateral edge of mentum; palpomere 3 slightly longer than palpomere 2.

Thorax: Pronotum (Fig. 43) black, with narrow light brown or yellow lateral margins at most as wide as diameter of eye; punctation slightly finer than on head, interspaces 1−2 × width of punctures; lateral margins distinctly curved, without setae; posterolateral corners rather narrowly rounded. Prosternum distinctly reinforced by a short median bulge on anterior half. Elytra black, with indistinctly demarcated dark brown lateral margins and posterior region in some individuals; setae absent; shoulder regions not or very indistinctly accentuated; punctures coarse; interspaces as wide as punctures on most areas; narrower than punctures in some regions, especially laterally; serial rows between irregular punctures present, especially on mesal portion of elytra (Fig. 31); shallow depressions present along lateral margins (Fig. 20); subseriate rows of very coarse punctures confluent on some areas. Mesoventrite distinctly elevated medially, with sharply pointed protuberance.

Legs dark brown; spine-like setae of procoxa absent; metafemur (Fig. 67) with strongly reduced pubescence restricted to mesal portion and anterior margin; metatarsus shorter than metatibia.

Aedeagus (Fig. 82): Phallobase longer than parameres, longer than wide; manubrium wide, indistinctly separated from main portion of phallobase; median reinforcement or pigmented line absent; borderline between pigmented and unpigmented part of ventral face of phallobase very indistinct. Lateral margin of parameres narrowing towards the very narrowly rounded blunt apex in an evenly convex rounded line; apical region slightly inclined mesally; distance between lateral margins of parameres as wide as diameter of phallobase; basal portion distinctly wider than apical part; ventral face very indistinct, reduced; dorsal part of base almost straight, not reaching into phallobase. Median lobe slender, shorter than parameres, converging with slightly concave margins towards blunt apex; corona in apical position; basal apophyses reaching less than one third of main piece of phallobase. Base of median lobe indistinctly connected with parameres by a mesal tooth.

ECOLOGY: Collected in rivers and calm creek sections in mountainous areas. The collection sites in Rizal that are known to the second author are moderately disturbed mountain creeks in rural areas with secondary vegetation. The specimens are said to be collected in bottom gravel (Fig. 92).

DISTRIBUTION: Philippines, Luzon Island.

ETYMOLOGY: Levis (Latin) = slight, weak; the name of the epithet refers to the weak serial rows of elytral punctures.

Anacaena philippina sp.n.

TYPE LOCALITY: Philippines, Luzon Island, Cordillera Administrative Region, Mountain Province, Gonogon Chico River.

TYPE MATERIAL: **Holotype** ♂ (NMW): "PHILIP.: Luzon 21.2.1989 / Mountain Prov., Gonogon Chico River, ca. 900 m / leg. S. Schödl (18)". **Paratypes**: **Luzon**: 10 exs. (NMW, CFM): same sampling data; 1 ex. (NMW): Luzon, Benguet Province, W Baguio, Asin Road, ca. km 7, 17.II.1989, leg. S. Schödl "11"; 1 ex. (NMW): Luzon, Benguet Province, W Baguio, Asin Hot Spring, 17.II.1989, leg. S. Schödl "12"; 2 exs. (NMW): Luzon, Mountain Province, Balitian River, ca. 5 km S Bontoc Bagnen, 27.II.1989, leg. S. Schödl "24"; 3 exs. (NMW): Luzon, Mountain Province, Sagada, Echo Valley, 23.−24.II.1989, leg. S. Schödl "21"; 1 ♀ (NMW): Luzon [Laguna Province, Calabarzon District], SE San Pablo, Kinabuhayan, Banahaw Mountain, 16.XI.1992, leg. H. Schillhammer "5"; 1 ♂ (BMH): Mountain Province, Abastan, Buguias, 60 km S of Bontoc, 1,800−2,000 m a.s.l., 31.V.−1.VI.1964, leg. H.M. Torrevillas; 3 exs. (NMW, CFM): N Luzon, Cordillera [Administrative Region], Mountain Prov., Sagada, "Underground River", ca. 1450 m a.s.l., ca. 17°05'N 120°54'E, downstream of cave, 14.III.1995, leg. H. Freitag "5". **Mindoro**: 8 exs. (CFM): Oriental Mindoro, Victoria, Bgy. Malayas, Malayas River, W Naujan tributary, ca. 13°09'05"N 121°18'30"E, ca. 10 m a.s.l., secondary vegetation, side spring, eutrophic, algae, shallow, gravel, slow run, 22.II.2010, leg. H. Freitag & C.V. Pangantihon "(308e)"; 1 ex. (CFM): Oriental Mindoro, Socorro, Bgy. Subaan, Subaan River, S tributary Naujan, ca. 13°07'42"N 121°21'45"E, ca. 20 m a.s.l., river mouth, littoral, gravel, pool, 22.II.2010, leg. H. Freitag & C.V.Pangantihon "(309b)"; 16 exs. (NMW): Mindoro, 10 km W Puerto Galera, 24.−25.XI.1992, leg. H. Schillhammer "12"; 7 exs. (NMW): Mindoro, 10 km W Puerto Galera, small stream, ca. 4−5 m wide, behind Mindoro Beach, 17.XI.1992, leg. M.A. Jäch "5"; 1 ex. (NMW): Mindoro, 28 km S Calapan, Balete, 100−700 m a.s.l., 27.−29.XI.1992, leg. M.A. Jäch "19"; 1 ♂ (UPLB): Oriental Mindoro, Roxas, San Vicente [Barangay], Taugad River, 12°37'18"N 121°22'58"E, ca 140 m a.s.l., hygropetric rocks, secondary vegetation, 23.IX.2012, leg. H. Freitag & C.V. Pangantihon "(TR2j)M"; 7 exs. [5 exs. in alc.] (CFM): same sampling locality, side pool, 23.IX.2012, leg. H. Freitag & C.V. Pangantihon "(TR2e)M"; 1 ex. [in alc.] (CFM): Oriental Mindoro, Roxas, San Vicente, Hinundungan tributary Quirao na Balete Creek, ca. 12°35'38"N 121°23'34"E, ca. 230 m a.s.l., sand and gravel, pool, 11.VIII.2012, leg. H. Freitag & C.V. Pangantihon "(HQCb)M"; 1 ♂ (PNM): Oriental Mindoro, Roxas, San Vicente, Baroc River tributary Hinundungan River, ca. 12°36'28"N 121°23'29"E, ca. 118 m a.s.l., riverside pool with mud and leaf litters, 22.I.2013, leg. C.V. Pangantihon "(HR1e)M"; 2 ♀♀ [in alc.] (CFM): Oriental Mindoro, Roxas, San Vicente, Hinundungan River tributary, 12°35'43"N 121°23'34"E, ca. 230 m a.s.l., helocrene, leaf packs, 2.VIII.2012, leg. H. Freitag & C.V. Pangantihon "(HQHd)M"; 1 ♀ (UPLB): Oriental Mindoro, Roxas, San Vicente, Taugad Daka River tributary Sapang Bayog, littoral gravel, pool, 12°37'41"N 121°20'46"E, ca. 400 m a.s.l., 24.I.2013, leg. H. Freitag & C.V. Pangantihon, "(TSCb)M"; 6 exs. (PNM [1 ♂, prep.] CFM [in alc.]: Oriental Mindoro, Roxas, San Vicente, Taugad River, ca.12°37'06"N 121°23'49"E, 100 m a.s.l., side

pools with plant debris; 29.II.2012, leg. H. Freitag "(TR1e)M"; 3 exs. [in alc.] (CFM): Oriental Mindoro, Roxas, San Vicente, Hinundugan tributary Quirao Buhay Creek, 12°36'10"N 121°23'00"E, 130 m a.s.l., sand & gravel, pool, 8.VII.2012, leg. H. Freitag & C.V. Pangantihon "(HBCb)M". **Leyte**: 1 ♀ (NMW): Baybay [City], Patag [Barangay], Visayas State University campus, Lagu Lagu River, 10°45'N 124°48'E, small river, pool, volcanic rocks, gravel, degraded forest, 27.V.1995, leg. H. Freitag "(229a)M". **Mindanao**: 10 exs. (BMH, NMW): Mindanao, Caraga Region, Agusan del Sur Prov., 10 km SE San Francisco, 13.XI.1959, leg. L.W. Quate.

DIFFERENTIAL DIAGNOSIS: Differs from other species from the Philippines in the presence of dark brown speckles on and around the irregular elytral punctures (Fig. 21); indistinctly speckled elytra also occur in some specimens of *A. amplocomata*, but *A. philippina* can be separated from this species by eyes which are not protruding, an infuscated maxillary palpomere 4, and a more extensive dark brown median pronotal patch. *Anacaena philippina* differs from all other species of the Philippines in the basal lobe which is distinctly shorter than the parameres (Figs. 83–84).

DESCRIPTION: Total length 1.8–2.5 mm; maximum width 1.0–1.5 mm; E.I. 1.08−1.25. Habitus (Figs. 21–22): oblong oval, weakly convex, greatest width at midlength; elytra about 2.9−3.8 × as long as pronotum in dorsal view.

Head (Fig. 44): Labrum dark brown to black, clypeus and frons black; yellow, preocular patches usually smaller than diameter of eyes, reduced to a narrow strip or indistinctly visible on lateral margin in some individuals. Irregular punctures moderately fine, distinctly impressed; interspaces on average about as large as punctures; setae absent; series of densely arranged punctures along inner margin of eyes very indistinct or absent. Clypeus large, straight anteriorly, with distinct blunt angles between lateral and anterior portion. Eyes not constricted anteriorly; dorsal and ventral portion of almost equal size. Frontoclypeal suture absent. Antennae with nine antennomeres; antennomere 3 not distinctly elongated. Maxillary palpomere 2 moderately inflated; palpomere 4 widest slightly beyond midlength, slender, with almost straight inner margin and convex outer margin; distinct infuscation present on distal third to distal half. Mentum (Fig. 55) with fine setae on lateral margins; anterior margin with distinct mesal incision; ventral punctures widely spaced, grouped on anterior portion; labial palpi slender, longer than lateral edge of mentum; palpomere 3 slightly longer than palpomere 2.

Thorax: Pronotum (Fig. 44) black with yellowish margins of variable extension; in rare cases dark brown with broad, light brown lateral margins; punctation distinctly finer than on head, weakly impressed; lateral margins slightly curved, without setae; posterolateral corners rather narrowly rounded. Prosternum slightly reinforced by an indistinct short median bulge on anterior third. Elytra light brown, with dark brown speckles on and around irregular punctures, confluent in some areas, or indistinct particularly in darker individuals; setae absent; shoulder regions not accentuated but marked by darker coloration in some individuals; punctures coarser than on head, strongly impressed; arrangement irregular; interspaces on elytral disc about as wide as punctures; indistinct, short, subseriate rows of coarser punctures present on lateral areas in some individuals. Mesoventrite distinctly elevated medially, with sharply pointed protuberance.

Legs dark brown to black; procoxa without spine-like setae; metafemur (Fig. 68) pubescent on mesal portion and on anterior half with horizontal hairline; metatarsus about as long as metatibia or slightly shorter.

Aedeagus (Figs. 83–84): Phallobase distinctly shorter than parameres, about as long as wide; manubrium almost parallel-sided, with blunt apex; median reinforcement or pigmented line absent; borderline between pigmented and unpigmented part of ventral face of phallobase reaching more than midlength of basal lobe. Lateral margin of parameres evenly rounded or sigmoid, with great variability between individuals; mesal margin slightly sinuate; distance between lateral margins of parameres as wide as diameter of phallobase or slightly wider; apical

part narrow, asymmetrical, slightly pointing mesad, or strongly narrowed and straight; basal portion distinctly wider than apical region; ventral portion of bases very indistinct, not reaching into phallobase; dorsal portion distinctly curved, deeply reaching into phallobase. Median lobe distinctly shorter than parameres, with slightly concave margins in apical half; corona in apical position; basal apophyses reaching halflength of main piece of phallobase. Base of median lobe not distinctly connected with parameres.

ECOLOGY: Collected in calm sections and side pools of rivers and streams, in a hygropetric habitat, and at the vicinity of a hot spring. The species occurs from lowlands up to 1,450 m altitude.

DISTRIBUTION: Philippines: Luzon, Leyte, Mindoro, and Mindanao Islands.

ETYMOLOGY: The name of the epithet points to the extensive distribution of the species in the Philippines; it is used as an adjective.

Anacaena princesa sp.n.

TYPE LOCALITY: Philippines, Palawan Island, Puerto Princesa (City), Concepcion (Barangay), Taranaban River, 10°02'30"N 119°00'45"E.

TYPE MATERIAL: **Holotype** ♂ (NMW): "PHIL.: Palawan, P[uerto] Princesa; Concepcion / Taranaban R[iver], ca. 6 km W highw. mount. riv. / riffle & pool, bolder, wood litter / c. 150 m a.s.l., 10°02'30"N 119°00'45"E / 20. 1. 1995, leg. Freitag (16b)M". **Paratypes**: 26 exs. (NMW, CFM [in alc.], PNM, UPLB): same sampling data; 2 ♂, 5 ♀♀ (CFM, NMW): Palawan, Puerto Princesa, Concepcion [Barangay], Taranaban R[iver], ca. 6 km W highway, ca. 150 m a.s.l., 10°02'30"N 119°00'45"E, mountain river pool, bolder, gravel, plant debris, 20.I.1995, leg. H. Freitag "(16e)M"; 1 ♂ (NMW): Palawan, Puerto Princesa, Concepcion [Barangay], Taranaban River, mountain river, ca. 10 km upstream, ca. 900 m a.s.l., 10°07'N 119°00'E, pool & fall, rocks, boulders, roots, 20.I.1995, leg. H. Freitag "(16h)M"; 1 ♂ (PCSD): Palawan, Puerto Princesa, Napsan Barangay, road km 42.5, Salakot Falls, Iwahig River tributary, 9°41'49"N 118°31'18"E, degraded primary forest, rocks, boulders, plant debris, 30.XI.2007, leg. H. Freitag "(132)M"; 1 ♂ (PCSD): Puerto Princesa, Napsan [Barangay], 3 km SE Laptay, upper Bubugtungan mountain river, downstream waterfall, disturbed primary forest, side pool, plant debris, 9°41'N 118°27'E, 08.IX.2008, leg. H. Freitag "(23e)M"; 1 ex. (CFM): Palawan, Puerto Princesa; Simpocan [Barangay], upstream Tagkuriring Falls, 120 m a.s.l., 9°47'26"N 118°33'25"E; pine forest, riffle, rocks, boulder, gravel, 08.IX.1994, leg. H. Freitag "(150a)M".

DIFFERENTIAL DIAGNOSIS: Distinguished from the similar *A. emergens* (see Differential Diagnosis of this species) by the short oval habitus (Fig. 23), features of the maxillary palpomere 4 (biconvex, Fig. 45), the mentum (length/width ratio smaller, lateral margins slightly convex, Fig. 56), the labial palpi (stout), and features of the aedeagus (Fig. 85).

DESCRIPTION: Total length 2.1−2.4 mm; maximum width 1.4−1.5; E.I. 1.06−1.12. Habitus (Figs. 23–24) oblong oval, moderately convex; elytra about 3.0−3.2 × as long as pronotum in dorsal view.

Head (Fig. 45): Labrum, clypeus and frons black; very narrow yellow rim on lateral margin of clypeus indistinct in some individuals. Irregular punctures very weakly impressed, interspaces 2−3 × as wide as diameter of punctures; setae absent; series of densely arranged punctures along inner margin of eyes absent or very indistinct. Clypeus moderately large, straight anteriorly, with indistinct, blunt antero-lateral angles. Eyes not constricted anteriorly; dorsal and ventral portion of almost equal size. Frontoclypeal suture absent. Antennae with nine antennomeres; antennomere 3 not distinctly elongated. Maxillary palpomere 2 distinctly inflated; palpomere 4 widest at midlength, with slightly convex inner margin and distinctly convex outer margin; palpomeres 1−4 yellow, without infuscation. Mentum (Fig. 56) with fine setae on slightly convex lateral margins; length/width ratio 1.56; anterior margin with indistinct median incision;

ventral punctures obsolete; labial palpi stout, not longer than lateral edge of mentum; palpomere 3 not longer than palpomere 2.

Thorax: Pronotum (Fig. 45) black with narrow yellowish-brown lateral margins at most as wide as diameter of eye; punctation almost obsolete; few very fine punctures mainly present laterally; lateral margins weakly curved, without setae; posterolateral corners rather narrowly rounded. Prosternum not reinforced. Elytra black, with brown area along lateral margins and on posterior region in most individuals; setae absent; shoulder regions not accentuated; punctures very fine, weakly impressed; interspaces 2−3 × as wide as punctures, arrangement irregular; subseriate rows of some coarse punctures present laterally. Mesoventrite distinctly elevated medially, with sharply pointed protuberance.

Legs dark brown, in distinct contrast to black ventrites; spine-like setae of procoxa absent; metafemoral pubescence (Fig. 69) restricted to mesal portion and less than anterior half with convex hairline; metatarsus shorter than metatibia.

Aedeagus (Fig. 85): Phallobase longer than parameres, longer than wide; manubrium wide, separated from main portion of phallobase; median reinforcement or pigmented line absent; borderline between pigmented and unpigmented part of ventral face of phallobase reaching almost to manubrium. Lateral margin of parameres distinctly sigmoid; apex wide, broadly rounded, slightly asymmetrical, apical part straight; distance between lateral margins of parameres as wide as diameter of phallobase or slightly wider; basal portion slightly wider than apical part; ventral portion very indistinct, not fused; dorsal portion slightly curved, not distinctly reaching into phallobase. Main portion of median lobe stout, almost as long as wide, much shorter than parameres, converging towards blunt apex with slightly concave margins; corona in apical position; basal apophyses reaching less than one third of length of main piece of phallobase. Base of median lobe indistinctly connected with parameres by a mesal tooth.

ECOLOGY: Collected from littoral gravel and under boulders in mountain rivers in primary and secondary forests from lowlands (Fig. 90) up to 900 m altitude.

DISTRIBUTION: Philippines, Palawan Island.

ETYMOLOGY: The name of the epithet refers to Puerto Princesa. It is used as a proper noun in apposition.

Anacaena quezona sp.n.

TYPE LOCALITY: Philippines, Luzon Island, Calabarzon Region, Quezon Province, Quezon National Park.

TYPE MATERIAL: **Holotype** ♂ (NMW): "leg. Jäch (11) / PHILIPPINEN – Luzon / 30 km E Lucena City / Quezon NP 23.11.1992". **Paratypes**: 3 ♂♂, 5 ♀♀ (NMW, CFM): same sampling data.

DIFFERENTIAL DIAGNOSIS: Belongs to the species with short-oval habitus (Fig. 25). Can be separated from the very similar *A. apo* by the maxillary palpomeres (slender with asymmetrical palpomere 4, Fig. 46). *Anacaena quezona* differs from all other species of the Oriental Region in unique features of the aedeagus (Fig. 86).

DESCRIPTION: Total length 1.9–2.2 mm; maximum width 1.2–1.7 m; E.I. 0.99−1.14. Habitus (Figs. 25–26): broadly oval, strongly convex, with greatest width at midlength; elytra about 2.5−3.1 × as long as pronotum in dorsal view.

Head (Fig. 46): Labrum, clypeus and frons light brown; preocular patches absent; posterior portion of frons infuscated in some individuals. Irregular punctures very fine, weakly impressed, widely separated; setae absent; series of densely arranged punctures along inner margin of eyes

very indistinct. Clypeus moderately large, straight anteriorly, with indistinct blunt angles between lateral and anterior portion. Eyes not constricted anteriorly; dorsal and ventral portion of almost equal size. Frontoclypeal suture present laterally, indistinct. Antennae with nine antennomeres; antennomere 3 not distinctly elongated. Maxillary palpomere 2 slightly inflated; palpomere 4 widest at midlength, slender, with almost straight inner margin and convex outer margin; coloration of palpomeres yellow, without infuscation. Mentum with fine setae on lateral margins; anterior margin with distinct mesal incision; ventral punctures obsolete; labial palpi rather stout, not longer than lateral edge of mentum; palpomere 3 slightly longer than palpomere 2.

Thorax: Pronotum (Fig. 46) amber-colored, without infuscations; punctation obsolete; lateral margins slightly curved, without setae; posterolateral corners rather narrowly rounded. Prosternum indistinctly reinforced by a short median bulge on anterior half. Elytra amber-colored, infuscated on disc in most individuals; setae absent; shoulder regions not accentuated; punctures fine, distinctly coarser than on head; arrangement irregular; interspaces on elytral disc about 2 × as wide as punctures; indistinct, short, subseriate rows of coarser punctures with denser distribution on lateral areas present. Mesoventrite distinctly elevated medially, with pointed protuberance.

Legs amber-colored with indistinct infuscations; procoxa without spine-like setae; metafemur (Fig. 70) pubescent on mesal portion and anterior half with horizontal hairline; metatarsus about as long as metatibia or slightly shorter.

Aedeagus (Fig. 86): Phallobase about as long as parameres and about as long as wide; manubrium reduced to a minute short lobe; median reinforcement or pigmented line absent; borderline between pigmented and unpigmented part of ventral face of phallobase very indistinct, reaching midlength of basal lobe. Lateral and mesal margins of parameres distinctly sigmoid, with distinctly inflated apex bearing a mesally directed triangular extension; distance between lateral margins of parameres as wide as diameter of phallobase; basal portion wider than apical part; narrowest portion of parameres distal to midlength; ventral portion of bases very indistinct; dorsal portion distinctly curved, deeply reaching into phallobase. Median lobe stout, short, reaching halflength of parameres, with distinctly concave margins in apical half; corona in apical position; basal apophyses reaching halflength of main piece of phallobase. Base of median lobe not visibly connected with parameres.

ECOLOGY: Collected in a stream in primary forest (personal information by M.A. Jäch).

DISTRIBUTION: Philippines, Luzon Island.

ETYMOLOGY: The name of the epithet refers to the province of Quezon and is used as adjective.

Anacaena sulcata sp.n.

TYPE LOCALITY: Philippines, Luzon Island, Cordillera Administrative Region, Mountain Province, Bangaan Barangay, Bomod-ok waterfall.

TYPE MATERIAL: **Holotype** ♂ (NMW): "PHILIP.: Luzon, 22.2.1989 / Mountain Prov., NE Sagada / Banga'an, Bomod-ok waterf. / leg. Schödl (19)". **Paratypes**: 34 exs. (CFM, NMW, PNM, UPLB): same sampling data; 1 ♂ (FMC): [N] Luzon, [Benguet Province], "P.I.", 75 mi. from Baguio − Bontac road, 7400 ft. a.s.l., trickle over rocks, 24.IV.1946, "CNHM−Philippine Zool. Exped. 1946−47", leg. H. Hoogstraal.

DIFFERENTIAL DIAGNOSIS: Differs from all other species of the Philippines in the unique parameres with a lateral bulge (Fig. 87). Shares a combination of several features with *A. levistriata* (see Differential Diagnosis of *A. levistriata*): black coloration of dorsal side (Fig. 27), absence of brighter preocular areas (Fig. 47), very strong punctation of head, pronotum and

elytra (Figs. 27, 32), and shallow lateral elytral grooves (Fig. 28); it can be separated from *A. levistriata* by the mentum (length/width ratio smaller, Fig. 57), absence of serial punctures (Fig. 32) and features of the aedeagus (Fig. 87).

DESCRIPTION: Total length 2.1–2.5 mm; maximum width 1.3–1.5 mm; E.I. 1.08−1.18. Habitus (Figs. 27–28): oblong oval, almost parallel-sided at midlength, moderately convex; elytra about 2.8−3.3 × as long as pronotum in dorsal view.

Head (Fig. 47): Labrum, clypeus and frons black; preocular patches absent. Irregular punctures coarse, separated by 1−2 × the diameter of punctures; setae absent; series of densely arranged punctures along inner margin of eyes very indistinct. Clypeus large, straight anteriorly, with blunt antero-lateral angles. Eyes not constricted anteriorly; dorsal and ventral portion of almost equal size. Frontoclypeal suture absent or very indistinctly marked by deeper punctures. Antennae with nine antennomeres, with minute intermediate segments; antennomere 3 not distinctly elongated. Maxillary palpomere 2 distinctly inflated; palpomere 4 widest at midlength, with almost straight inner margin and distinctly convex outer margin; palpomeres 1−3 yellow, palpomere 4 entirely infuscated. Mentum (Fig. 57) with fine setae on almost straight lateral margins; length/width ratio = 1.32; anterior margin with distinct median incision; some fine, setiferous punctures present ventrally on anterior third; labial palpi rather stout, not distinctly longer than lateral edge of mentum; palpomere 3 slightly longer than palpomere 2.

Thorax: Pronotum (Fig. 47) largely black, with narrow light brown or yellow lateral margins not wider than diameter of eye; punctation slightly finer than on head, interspaces 1−2 × width of punctures; lateral margins distinctly curved, without setae; posterolateral corners rather narrowly rounded. Prosternum distinctly reinforced by short median bulge on anterior half. Elytra black; indistinctly demarcated dark brown lateral margins and posterior areas of variable extension present in some individuals; setae absent; shoulder regions not or very indistinctly accentuated; punctures coarse; interspaces as wide as punctures; arrangement irregular (Fig. 32); shallow groove present along lateral margin (Fig. 28); subseriate rows of coarser punctures present and in some cases confluent. Mesoventrite distinctly elevated medially, with sharply pointed protuberance.

Legs light to dark brown; spine-like setae of procoxa absent; metafemur (Fig. 71) with highly reduced pubescence restricted to mesal portion and a narrow short strip along anterior margin; metatarsus shorter than metatibia.

Aedeagus (Fig. 87): Phallobase longer than parameres, longer than wide; manubrium wide, indistinctly separated from main portion of phallobase; median reinforcement or pigmented line absent; borderline between pigmented and unpigmented part of ventral face of phallobase very indistinct. Lateral margins of parameres abruptly narrowing towards acuminated apex, forming a bulge at midlength; apex straight, distance between lateral margins of parameres as wide as diameter of phallobase; basal portion distinctly wider than apical part; ventral portion very indistinct, reduced; dorsal portion of base almost straight, horizontal, not reaching into phallobase. Median lobe slender, shorter than parameres, converging with almost straight margins towards blunt apex; corona in apical position; basal apophyses reaching less than one third of main piece of phallobase. Base of median lobe indistinctly connected with parameres by a mesal tooth.

ECOLOGY: Collected near a waterfall and in a hygropetric habitat.

DISTRIBUTION: Philippines, Luzon Island.

ETYMOLOGY: Sulcatus (Latin) = grooved. The name of the epithet refers to the shallow groove on the lateral portion of the elytra.

Anacaena zamboangana sp.n.

TYPE LOCALITY: Philippines, Mindanao Island, Zamboanga del Sur Province, Lemesahan.

TYPE MATERIAL: **Holotype** ♂ (BMH): "P.I., Mindanao / Zamboanga del Sur / Lemesahan, 600 m / 7.IX.1958 \ light trap / H.E. Milliron". **Paratype**: 1 ♀ (BMH): same sampling data.

DIFFERENTIAL DIAGNOSIS: Shares with *Anacaena amplocomata* the extended metafemoral pubescence with round hairline (Fig. 72), differs from this species in the habitus (Figs. 29–30), by the absence of protruding eyes, and from all species of *Anacaena* from the Philippines by features of the aedeagus (parameres with wide apex, Fig. 88).

DESCRIPTION: Total length 2.4 mm; maximum width 1.4; E.I. 1.16. Habitus (Figs. 29–30): oblong oval, strongly convex; elytra about 3.1 × as long as pronotum in dorsal view.

Head (Fig. 48): Labrum yellowish brown, clypeus yellow laterally, dark brown mesally, distinct preocular patches absent, frons dark brown. Irregular punctures very fine, very widely spaced; setae absent; series of densely arranged punctures along inner margin of eyes absent. Clypeus short, straight anteriorly, with indistinct antero-lateral angles. Eyes not constricted anteriorly, not protruding; dorsal and ventral portion of almost equal size. Frontoclypeal suture visible as a fine line. Antenna with nine antennomeres; antennomere 3 slightly elongated, antennomere 4 minute. Maxillary palpomere 2 distinctly inflated; palpomere 4 widest at midlength, inner margin very slightly convex, outer margin distinctly convex; palpomeres 1−4 yellow, without infuscations. Mentum with fine setae on lateral margins; anterior margin with median incision; setiferous ventral punctures indistinct, fine; labial palpi slender, not longer than lateral edge of mentum; palpomere 3 about as long as palpomere 2.

Thorax: Pronotum (Fig. 48) with wide yellow lateral portions, not distinctly demarcated from dark brown median patch reaching to level of inner margin of eyes; punctation obsolete; lateral margins weakly curved, without setae; posterolateral corners broadly rounded. Prosternum not reinforced. Elytra blackish brown, with very narrow light brown lateral margins and posterior area; setae absent; shoulder regions not accentuated; irregular punctures fine, rather weakly impressed; interspaces about as wide as punctures; short series of punctures present along lateral margins, impressions or coarser punctures absent. Mesoventrite distinctly elevated medially, with sharply pointed protuberance.

Legs largely light brown like ventrites; spine-like setae of procoxa absent; metafemur (Fig. 72) pubescent on proximal 3/4 of ventral face, with obliquely rounded hairline; metatarsus slightly shorter than metatibia.

Aedeagus (Fig. 88). Phallobase slightly longer than parameres, longer than wide, not abruptly converging proximad, manubrium shaped as a long lobe, indistinctly separated from main portion of phallobase; median reinforcement or pigmented line absent; ventral face of phallobase indistinctly pigmented basally. Lateral margins of parameres weakly rounded; apex wide, distance between lateral margins of parameres as wide as diameter of phallobase; basal portion about as wide as apical part; ventral portions very distinct, band-like, fused, reaching distinctly into phallobase; dorsal portion of base slightly curved, slightly reaching into phallobase. Median lobe broad, shorter than parameres, converging in almost straight lines to the acuminated apex, corona in apical position; basal apophyses as long as main piece, reaching less than halflength of phallobase. Base of median lobe distinctly connected with parameres by a mesal tooth.

ECOLOGY: Unknown; collected at light trap.

DISTRIBUTION: Philippines, Mindanao Island.

ETYMOLOGY: The epithet refers to the Province Zamboanga and is used as an adjective.

Key to the known Philippine species of *Anacaena*

1 Metafemur largely pubescent with rounded hairline (Figs. 59, 72)..... 2

− Metafemoral pubescence reduced along mesal edge and on anterior portion (Figs. 58, 60−71)..... 3

2 Habitus weakly convex (Figs. 3–4); eyes slightly protruding (Fig. 39); aedeagus: Fig. 74…… ..... ***amplocomata***

− Habitus strongly convex (Figs. 29–30); eyes not protruding (Fig. 48); aedeagus: Fig. 88…… ..... ***zamboangana***

3 Clypeus black, always without bright preocular areas; punctures on head, pronotum and elytra coarse; maxillary palpomere 4 entirely dark or with extended infuscation on more than distal half (Figs. 43, 47); elytra with shallow lateral groove (Figs. 31–32) 4

− Clypeus brown or black, bright preocular areas present in species with black clypeus; punctures on head, pronotum and elytra fine; maxillary palpomere 4 without infuscation or infuscation limited to apical portion (distinctly less than distal half); elytra without lateral groove 5

4 Elytra with indistinct serial punctures between irregular punctation (Fig. 31); aedeagus: Fig. 82 ..... ***levistriata***

− Elytra without serial punctures (Fig. 32); aedeagus: Fig. 87 ..... ***sulcata***

5 Body length more than 2.5 mm; maxillary palpomere 4 infuscated in at least distal half (Fig. 34); aedeagus: Fig. 77..... ***cordillera***

− Body length less than 2.6 mm; maxillary palpomere 4 infuscated in distal third to distal half or infuscation absent 6

6 Infuscation of maxillary palpomere 4 present on distal third to distal half (Fig. 44); aedeagus: Figs. 83–84 ..... ***philippina***

− Maxillary palpomere 4 yellow without infuscation..... 7

7 Clypeus and frons light brown; lighter preocular areas absent; pronotum unicolored, distinct infuscations absent..... 8

− Clypeus and frons dark brown or black; lighter preocular areas present or absent; central part of pronotum with dark brown or black coloration..... 11

8 Antenna with eight antennomeres; lateral margin of parameres undulating, apical portion elongate (Fig. 81)..... ***hemisphaerica***

− Antenna with nine antennomeres, parameres differently shaped 9

9 Maxillary palpomere 4 (Fig. 46) slender with almost straight inner margin and convex outer margin; elytra (Fig. 25) amber-colored, infuscated on disc in most cases; aedeagus: Fig. 86… ..... ***quezona***

− Maxillary palpomere 4 (Figs. 33, 38) stout with almost parallel-sided or slightly biconvex margins; elytra light or dark colored; aedeagus: Figs. 73, 75..... 10

10 Elytra (Fig. 5) light brown with indistinct infuscations; aedeagus: Fig. 75..... ***apo***

− Elytra (Fig. 1) largely dark brown; aedeagus: Fig. 73 ..... ***albay***

11 Maxillary palpomeres (Fig. 41) slender, palpomere 4 asymmetrical, habitus (Figs. 15–16) oblong oval, aedeagus: Fig. 80 ..... ***emergens***

− Maxillary palpomeres slender or stout, palpomere 4 asymmetrical, or symmetrical with biconvex margins, habitus short oval (Figs. 7, 11, 13, 23)..... 12

12 Preocular patches absent, a narrow yellow rim on lateral margin of clypeus mostly present; pronotum black with narrow yellow lateral margins (Fig. 45), aedeagus: Fig. 85 ..... ***princesa***

− Preocular patches present, pronotum dark brown or black with wide yellow lateral margins 13

13 Maxillary palpomere 4 asymmetrical (Fig. 40); elytra with some coarser, serially arranged lateral punctures (Fig. 8); aedeagus: Fig. 76 ..... ***balabag***

– Maxillary palpomere 4 symmetrical; elytra without coarser, serially arranged lateral punctures ... 14

14 Maxillary palpomere 4 stout (Fig. 35); aedeagus: Fig. 78 ..... ***davao***

– Maxillary palpomere 4 slender (Fig. 36); aedeagus: Fig. 79 ..... ***destructa***

Discussion

In this revision the species' status is mainly based on features of the male genitalia, which differ from the aedeagi of all other Oriental members of the genus. Nevertheless, the Philippine species described herein are morphologically similar either to *Anacaena* species from East Asia (mainland China, Taiwan), from the Sundaic region, or to some species occurring on Indonesian Islands east of the Wallacea. This suggests that Philippine *Anacaena* do not form a monophyletic group and that the genus invaded the Philippine Archipelago several times. The Palawan endemic, *A. princesa*, for instance, resembles continental SE Asian and Sundaic congeners such as *A. minuscula* ORCHYMONT, 1942, while *A. zamboangana* from Mindanao appears to be more closely related to East Asian species, especially to *A. jengi* KOMAREK, 2011 and to the *A. yunnanensis*-group (KOMAREK 2012), based on aedeagal and morphological characters.

All species described here are obviously endemic to the Philippines, 12 of these appear to be restricted to single islands. Huxley's line is not seen to be a clear demarcation line of *Anacaena* distribution patterns: *A. emergens* is present on islands at both sides of this line, while only one species, namely *A. princesa*, seems in fact restricted to Palawan. Such patterns are not unusual for insects with flight ability and have been reported before (e.g. MEY 2001). In regard to the coleopteran fauna and insects in general, the entire SE Asian Archipelago should be regarded as a transition zone. Abrupt faunal changes across biogeographic demarcation lines which have been established for vertebrates and vascular plants are often lacking in insects. Nevertheless, most insect taxa possess a high rate of island endemism within this transition zone.

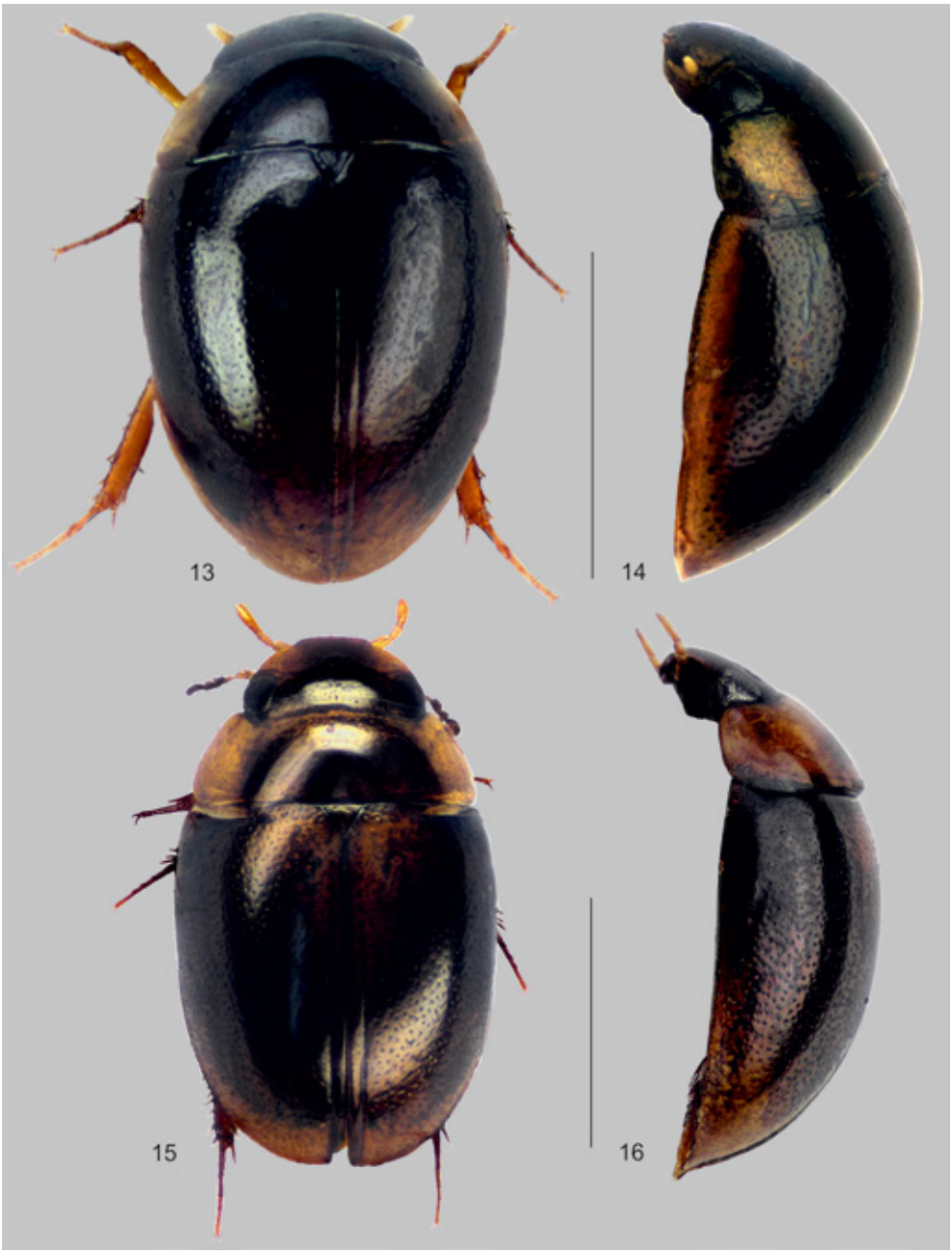
The highest diversity of the *Anacaena* fauna is evident on high mountain ranges, such as Mt. Apo and the Central Cordillera (Fig. 89), compared with the lower number of species in other areas which, however, have been sampled more comprehensively such as Palawan (AQUA Palawana Program) and Mindoro (Ateneo de Manila University Baroc River Catchment Survey). Considering the rather limited number of specimens available and the limitation of collection sites to a few provinces and regions, the diversity of Philippine *Anacaena* revealed herein is surprising: 15 species where recorded among the material collected at ca. 35 sites at seven different islands. Previous studies of the *Anacaena* fauna of neighboring countries and other Oriental Subregions (KOMAREK 2006, 2010, 2011) have shown a comparatively lower diversity: Taiwan: more than 20 sites, 270 specimens, two species recorded; Indian Subcontinent: more than 50 sites, 1,200 specimens, nine species; Indonesia except Papua: more than 30 sites, 196 specimens, six species. An exception, however, is the Island of New Guinea with 27 recorded species (KOMAREK 2009). As the water beetle fauna of many Philippine islands is still unexplored or very insufficiently known, the discovery of numerous additional new species can be expected.

Twelve of the 15 Philippine species are here considered aquatic. They have frequently been collected from bottom gravel and littoral gravel of small to medium-sized rivers and creeks (Figs. 91–92). Leaf litter accumulating in calm zones is another typical microhabitat (Fig. 92). However, the repeated collection in emergence traps (Fig. 93, see also FREITAG 2004), light traps and by beating provides evidence, that they occasionally occur outside of water bodies. The habitat of three species is still unknown.

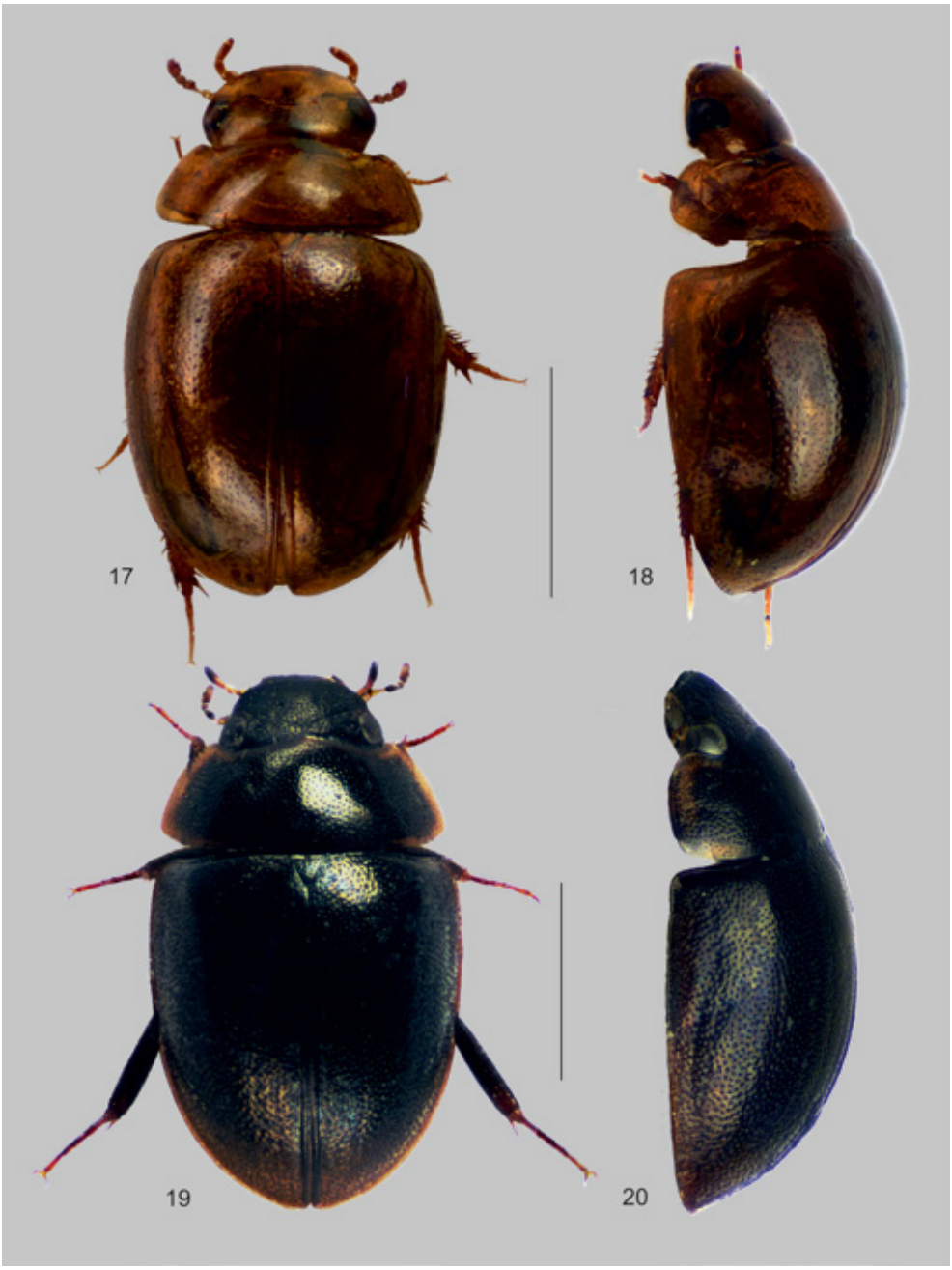
Figs. 1–4: Habitus (dorsal and lateral view) of 1–2) *Anacaena albay*, 3–4) *A. amplocomata.* Scale bar = 1 mm.

Figs. 5–8: Habitus (dorsal and lateral view) of 5–6) *Anacaena apo*, 7–8) *A. balabag*. Scale bar = 1 mm.

Figs. 9–12: Habitus (dorsal and lateral view) of 9–10) *Anacaena cordillera*, 11–12) *A. davao.* Scale bar = 1 mm.



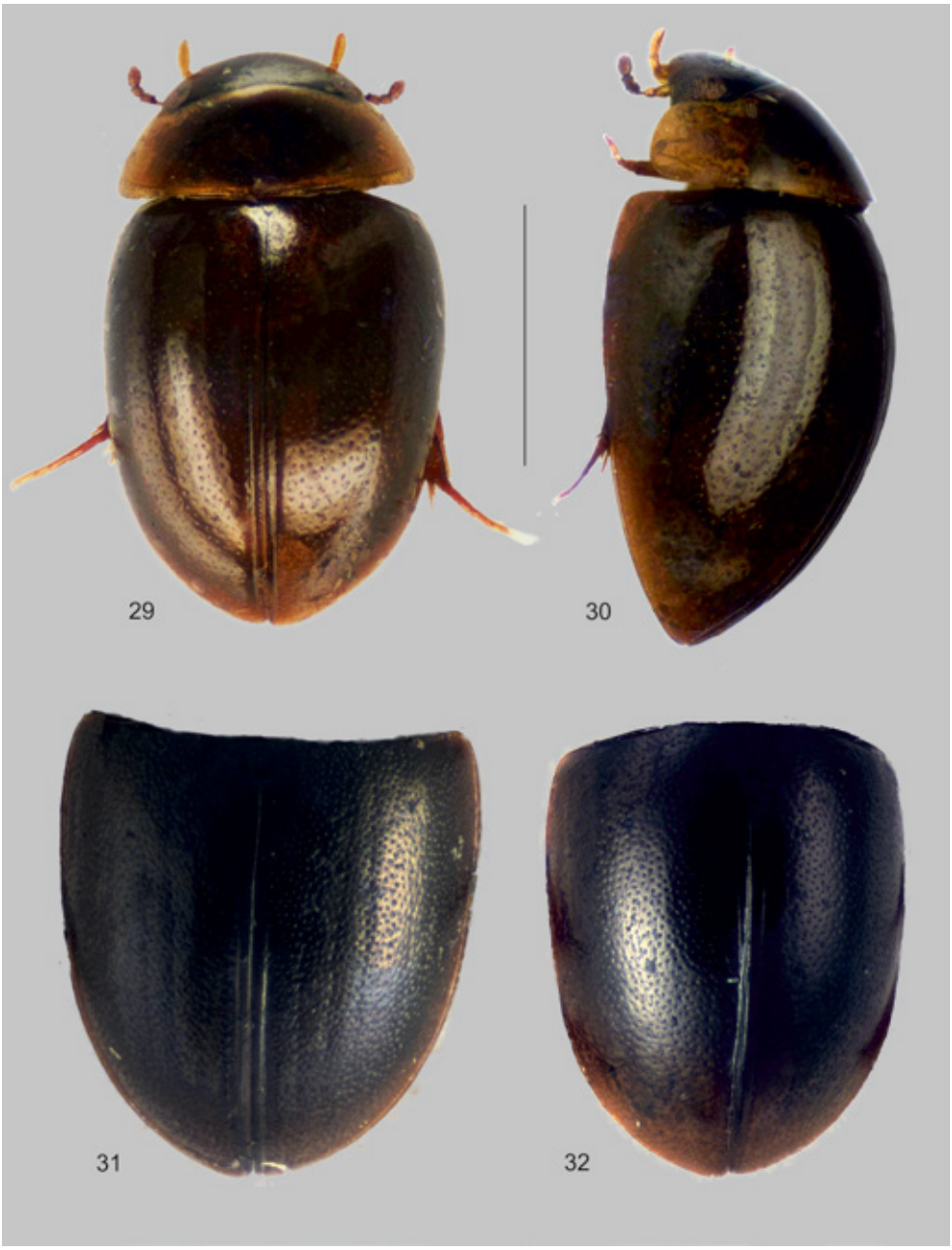
Figs. 13–16: Habitus (dorsal and lateral view) of 13–14) *Anacaena destructa*, 15–16) *A. emergens*. Scale bar = 1 mm.



Figs. 17–20: Habitus (dorsal and lateral view) of 17–18) *Anacaena hemisphaerica*, 19–20) *A. levistriata.* Scale bar = 1 mm.

Figs. 21–24: Habitus (dorsal and lateral view) of 21–22) *Anacaena philippina*, 23–24) *A. princesa.* Scale bar = 1 mm.

Figs. 25–28: Habitus (dorsal and lateral view) of 25–26) *Anacaena quezona*, 27–28) *A. sulcata*. Scale bar = 1 mm.

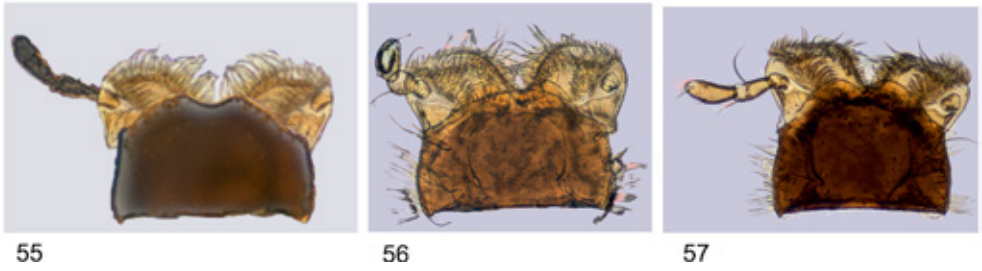


Figs. 29–30: Habitus (dorsal and lateral view) of *Anacaena zamboangana*.
Figs. 31–32: Elytra of 31) *Anacaena levistriata*, 32) *A. sulcata*.

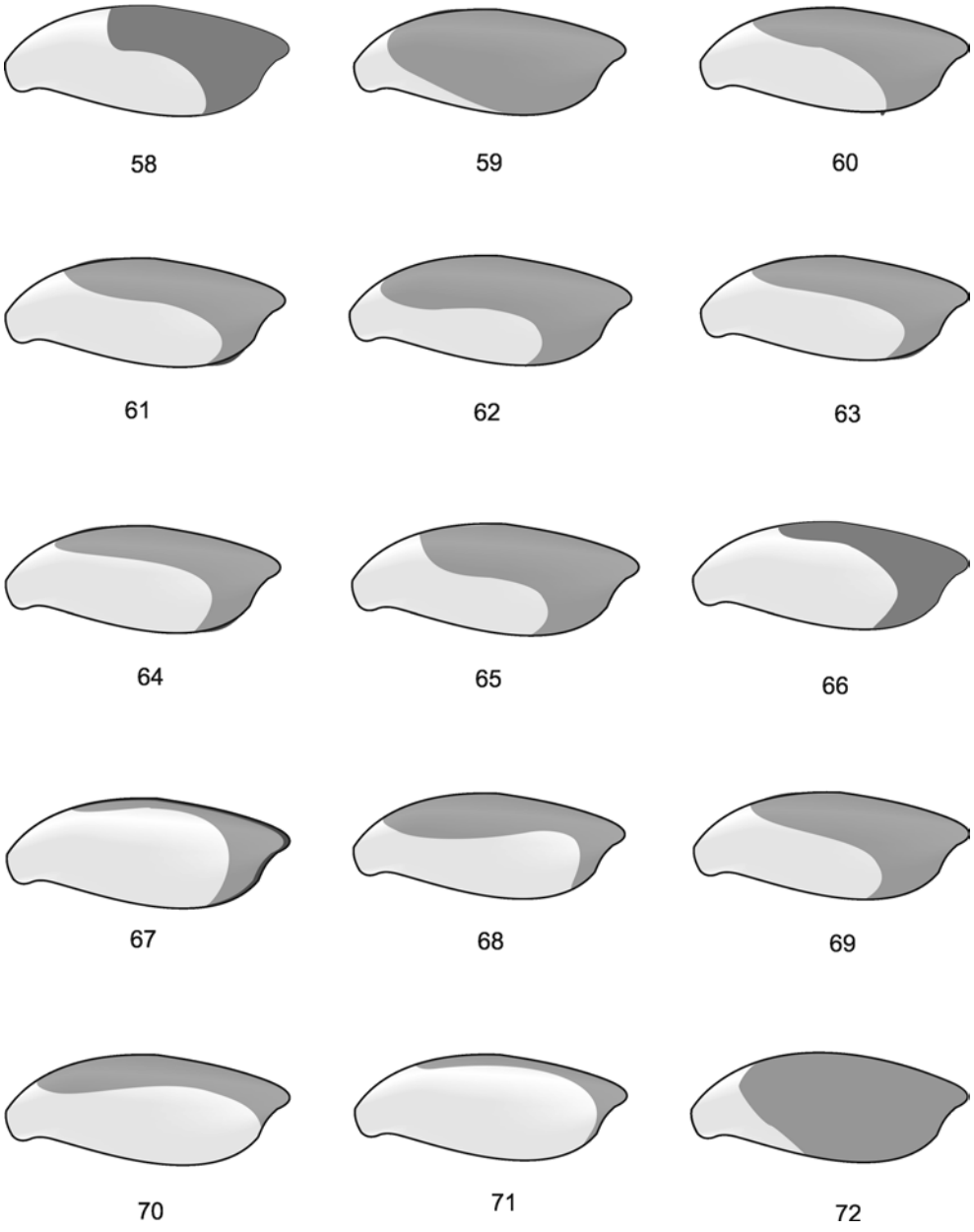
Figs. 33−37: Maxillary palpus of 33) *Anacaena apo*, 34) *A. cordillera*, 35) *A. davao*, 36) *A. destructa*, 37) *A. hemisphaerica* (dark color caused by air inclusions).

Figs. 38−43: Caput and pronotum of 38) *Anacaena albay*, 39) *A. amplocomata*, 40) *A. balabag*, 41) *A. emergens*, 42) *A. hemisphaerica*, 43) *A. levistriata*.

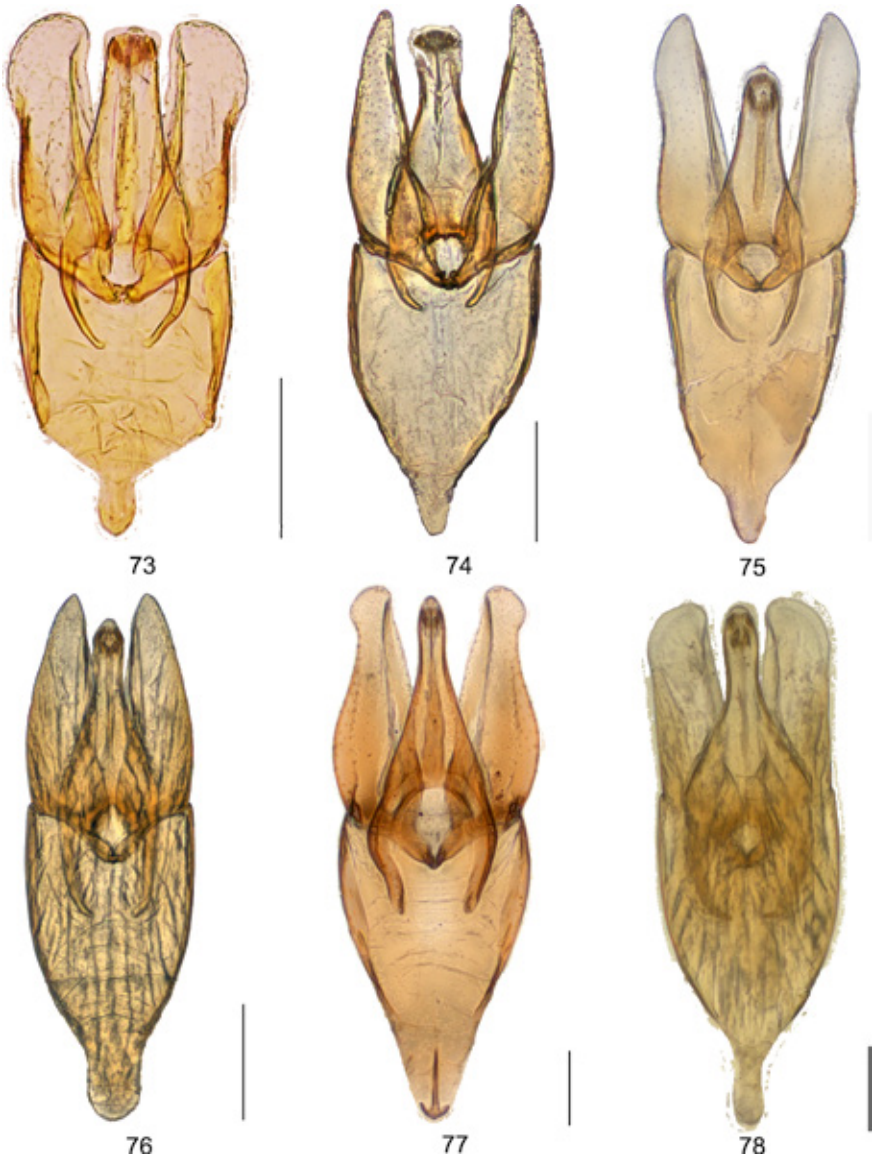
Figs. 44−48: Caput and pronotum of 44) *Anacaena philippina*, 45) *A. princesa*, 46) *A. quezona*, 47) *A. sulcata*, 48) *A. zamboangana.*



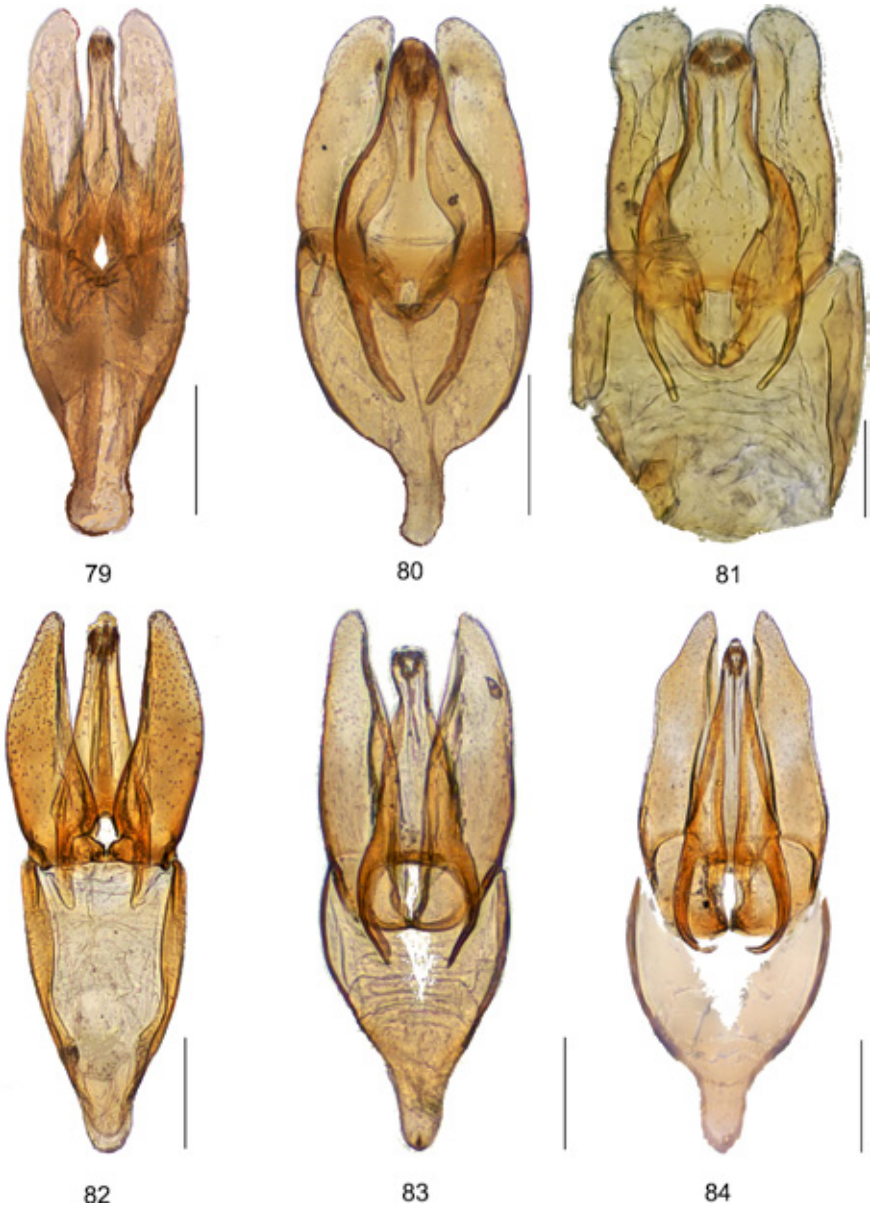
Figs. 49−57: Labium of 49) *Anacaena apo*, 50) *A. cordillera*, 51) *A. davao*, 52) *A. destructa*, 53) *A. emergens*, 54) *A. levistriata*, 55) *A. philippina*, 56) *A. princesa*, 57) *A. sulcata*.



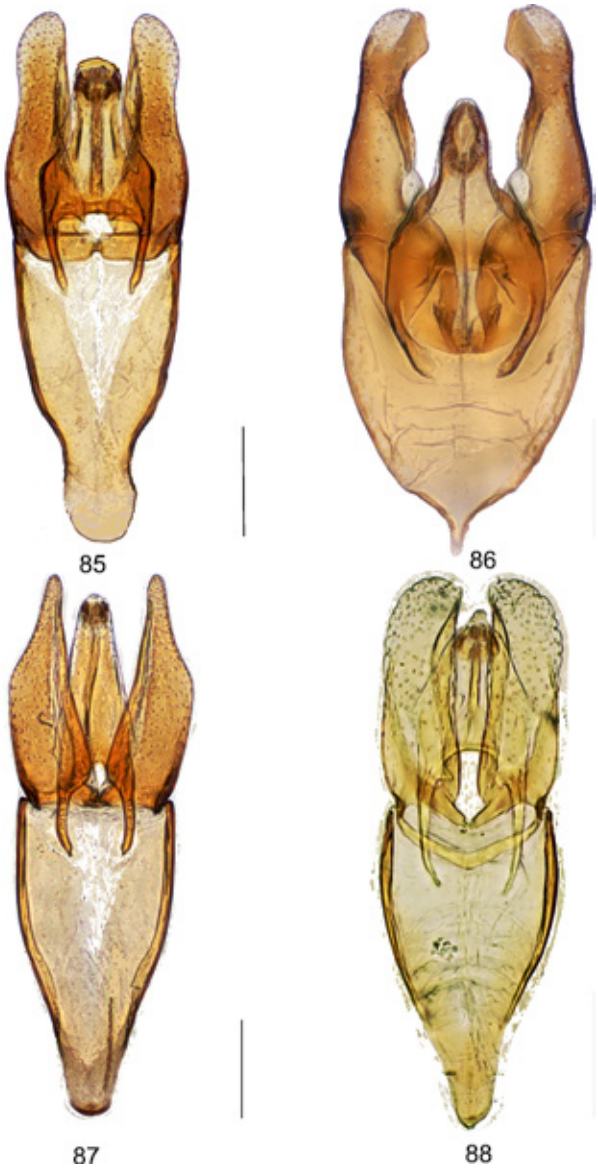
Figs. 58−72: Metafemur of 58) *Anacaena albay*, 59) *A. amplocomata*, 60) *A. apo*, 61) *A. balabag*, 62) *A. cordillera*, 63) *A. davao*, 64) *A. destructa*, 65) *A. emergens*, 66) *A. hemisphaerica*, 67) *A. levistriata*, 68) *A. philippina*, 69) *A. princesa*, 70) *A. quezona*, 71) *A. sulcata*, 72) *A. zamboangana.*



Figs. 73–78: Aedeagus of 73) *Anacaena albay*, 74) *A. amplocomata*, 75) *A. apo*, 76) *A. balabag*, 77) *A. cordillera*, 78) *A. davao*. Scale bar = 0.1 mm.



Figs. 79–84: Aedeagus of 79) *Anacaena destructa*, 80) *A. emergens*, 81) *A. hemisphaerica* (basal lobe partially damaged), 82) *A. levistriata*, 83–84) *A. philippina*. Scale bar = 0.1 mm.



Figs. 85–88: Aedeagus of 85) *Anacaena princesa*, 86) *A. quezona*, 87) *A. sulcata*, 88) *A. zamboangana.* Scale bar = 0.1 mm.

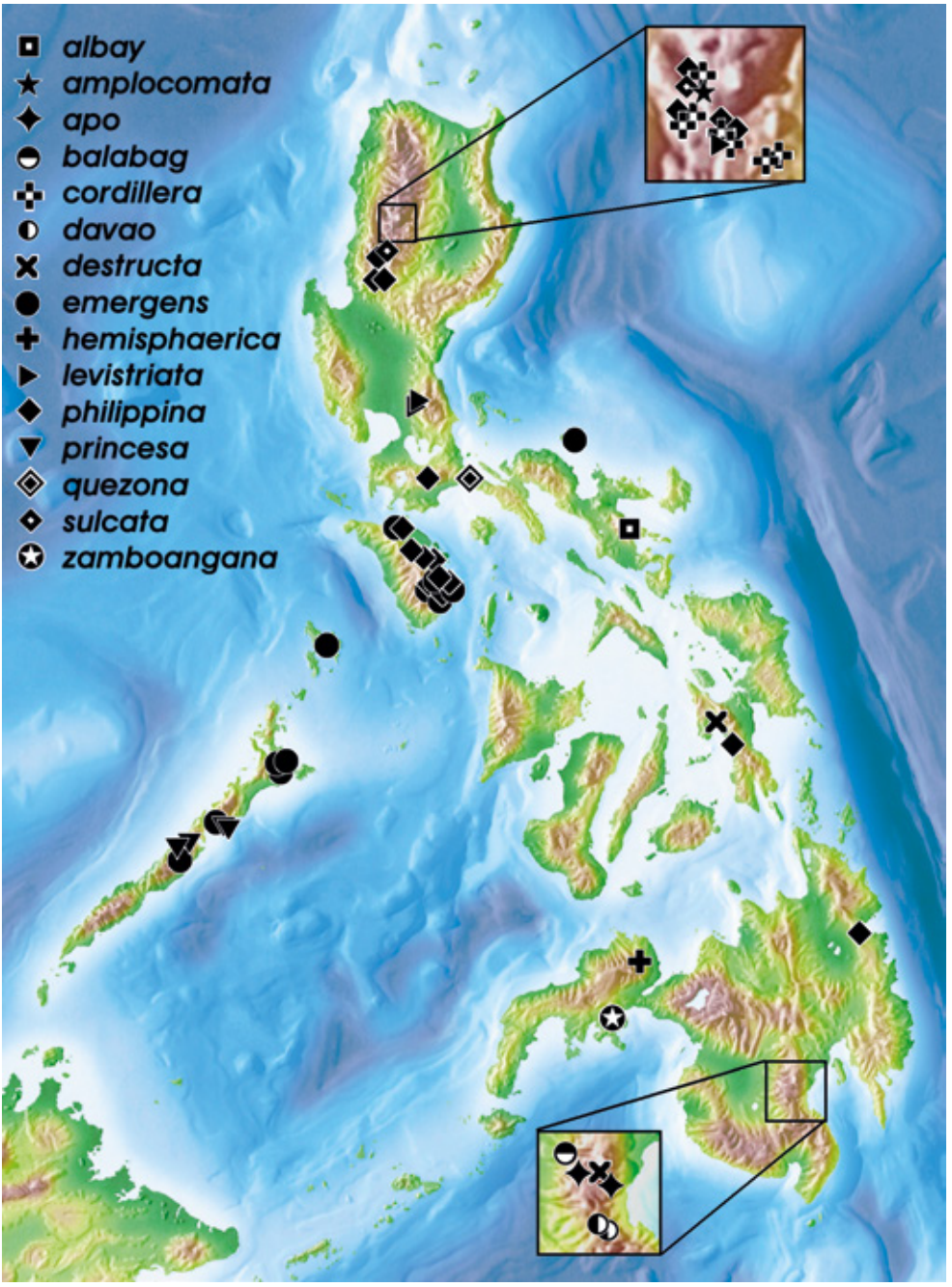


Fig. 89: Map of the Philippines with collection sites of *Anacaena* species.

Figs. 90−93: Habitats of *Anacaena* species in the Philippines: 90) type locality of *A. princesa* in Puerto Princesa, Palawan; 91) collection site of *A. emergens* and *A. philippina* at a Hinundugan River tributary, Roxas, Oriental Mindoro: littoral bottom gravel is a typical microhabitat where several species occur; 92) collection site of *A. levistriata* at a Rodriguez River tributary, Rizal, Luzon; 93) emergence trap at a Hinundugan River tributary, where *A. emergens* was collected.

Acknowledgements

We are grateful to Manfred A. Jäch for his support and the opportunity to use the facilities of the Coleoptera collection of the NMW. Thanks are also due to Rolf G. Beutel (Jena, Germany) for critically reading the manuscript, to M.A. Jäch for valuable comments on the bionomics of the species, and to the curators of the collections listed above for loan of material. The collections of the AQUA Palawana Program were made possible through gratuitous permits kindly issued by the Palawan Council for Sustainable Development (PCSD) and the Bureau of Fisheries and Aquatic Resources (BFAR), Manila. Prerequisite permissions were kindly given by the Barangay councils of Napsan, Taytay Poblacion as well as the City and Municipal Councils of Puerto Princesa City and Taytay, the indigenous Buhid community in San Vicente, Roxas, Oriental Mindoro, and by the Puerto Princesa National Park Management Board. Field sampling of the Baroc River Catchment Survey was kindly supported and permitted by the PENRO Oriental Mindoro, Calapan, SENRO Roxas, Municipal Government of Roxas, and the NCIP Oriental Mindoro. Financial support was provided by an Ateneo de Manila University Loyola Schools Scholarly Work Grant (SOSE 8 2012).

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