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## Taxonomic revision of *Anacaena* THOMSON, 1859 VII. Indonesia except Papua (Coleoptera: Hydrophilidae)

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### Abstract

The species of *Anacaena* THOMSON, 1859 (Coleoptera: Hydrophilidae) from Indonesia (except Papua) are revised. The two known species are redescribed. The male of *A. modesta* ORCHYMONT, 1932 is described for the first time. Four new species, *A. jaechi*, *A. javana*, *A. orchymonti*, and *A. sulawesica* are described. All six species are endemic to Indonesia and five of them to a single island. A key to the species is presented.

**Key words:** Coleoptera, Hydrophilidae, *Anacaena*, taxonomy, revision, key to species, new species, Oriental Region, Indonesia, Java, Sulawesi, Sumatra.

### Introduction

Indonesia consists of 17.508 islands scattered on both sides of the equator with a total area of 1.919.440 square kilometers. Its hydrophilid fauna is still rather poorly investigated.

The genus *Anacaena* THOMSON has been recorded only from three Indonesian islands: Java, Sumatra, and New Guinea. The twelve species occurring in the Indonesian part of New Guinea were already revised by KOMAREK (2009). Only two species, *Anacaena modesta* ORCHYMONT, 1932 (Java) and *A. mista* ORCHYMONT, 1932 (Sumatra, Java) have been described from the more western Indonesian islands so far. These two species are redescribed herein.

The examination of historical museum specimens and material collected during more recent expeditions to Java (1987, 1999) and Sulawesi (1985, 1992, 2009), yielded four new species, which are described below.

### Material and methods

66 type specimens from the Institut National des Sciences Naturelles, Bruxelles described by ORCHYMONT (1932) and 130 undetermined specimens of *Anacaena* from Java, Sumatra and Sulawesi deposited in five collections were examined. Mouth parts, 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. Measurements were taken using a micrometric eyepiece. Drawings were made by the use of 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

CSH	Collection Andre Skale, Hof (Germany)
EI	elytral index = ratio of greatest elytral length to greatest elytral width
ISNB	Institut National des Sciences Naturelles, Bruxelles (Belgium)
KSEM	Snow Entomological Collection, University of Kansas, Lawrence, KS (USA)
MSNG	Museo Civico di Storia Naturale G. Doria, Genova (Italy)
NHM	National History Museum, London (UK)
NMW	Naturhistorisches Museum Wien (Austria)

### Checklist of the species of *Anacaena* from Indonesia (except Papua)

- |  |                                   |
|--|-----------------------------------|
| 1. <i>Anacaena jaechi</i> sp.n.            | South Sulawesi                    |
| 2. <i>Anacaena javana</i> sp.n.            | West Java                         |
| 3. <i>Anacaena mista</i> ORCHYMONT, 1932   | West and South Sumatra, West Java |
| 4. <i>Anacaena modesta</i> ORCHYMONT, 1932 | Central Java                      |
| 5. <i>Anacaena orchymonti</i> sp.n.        | West, Central and East Java       |
| 6. <i>Anacaena sulawesica</i> sp.n.        | South and North Sulawesi          |

### *Anacaena jaechi* sp.n.

TYPE LOCALITY: Indonesia, South Sulawesi, surroundings of Malino, 700 m a.s.l.

TYPE MATERIAL: **Holotype** ♂ (NMW): "S-Sulawesi 1992 / Umg. [surroundings of] Malino / 700m (32) / leg. Jäch 2.V.". **Paratypes**: 7 ♂♂, 9 ♀♀ (KSEM, NMW): same sampling data.

**DIFFERENTIAL DIAGNOSIS**: This species is very similar to *A. orchymonti*, but can be distinguished by the largely dark brown to almost black pronotum with narrow yellowish lateral margins, by the maxillary palpomere 4 completely infuscated, and by the parameres with a distinct bulge in the distal third of the medial margin.

**DESCRIPTION**: Total length 2.2–2.7 mm; maximum width 1.3–1.5 mm; EI: 1.12–1.23. Habitus: oblong oval, with greatest width in midlength; elytra about 2.8–3.3 × as long as pronotum in dorsal view.

Head (Figs. 7, 13): Labrum black. Clypeus and frons dark brown to black, without preocular patches. Irregular punctures fine, strongly impressed, interspaces about 2 × as large as punctures, without setae; series of indistinct, minute, densely arranged punctures present along inner margin of eyes. Microsculpture absent. Clypeus long, straight to slightly emarginate anteriorly, with indistinct angles between lateral and anterior portion. Eyes not constricted anteriorly; dorsal and mesal portion of almost equal size. Frontoclypeal suture obsolete. Antennae composed of nine antennomeres; pedicellus distinctly longer than wide; antennomere 3 slightly elongate. Maxillary palpomere 2 slightly inflated; palpomere 4 completely infuscated, widest in midlength, with distinctly curved outer margin and slightly curved inner margin. Mentum ca. 1.6 × as wide as long, rather flat, slightly impressed anteriorly; lateral margins convex, with distinct anterior angles, with dense fringes of long soft setae; anterior margin almost semicircularly projecting, with deep distinct median impression; ventral face set with widely spaced, evenly distributed, fine setiferous punctures; microsculpture absent. Labial palpi rather stout; slightly longer than lateral edge of mentum; palpomere 3 slightly longer than palpomere 2.

Thorax (Fig. 19): Pronotum dark brown to black, with lateral margins indistinctly brighter in some individuals. Punctuation very fine, feebly impressed; interspaces about 5 × as wide as one

puncture, slightly denser and coarser towards lateral margins; microsculpture absent. Prosternum with short anteromedian tectiform bulge, projecting towards gula mesally. Lateral borders of pronotum and elytra without setae. Elytra black, without accentuated shoulder regions, with weakly demarcated anterior declivity; punctures fine, strongly impressed, irregular, with a short series of coarser punctures along lateral margin; interspaces 1–2 × as wide as one puncture; microsculpture absent; sutural stria in slightly more than posterior half of elytra. Mesoventrite distinctly elevated mesally with a sharply pointed protuberance. Legs dark brown. Procoxa and protrochanter pubescent, without spine-like setae. Femoral hairlines distinct, pro- and mesofemora pubescent on proximal 4/5, metafemoral pubescence restricted to anterior margin and proximal area. Metatarsus shorter than metatibia.

Abdominal ventrites dark brown to black, entirely covered with dense hydrofuge pubescence.

Aedeagus (Fig. 1): Main piece of phallobase shorter than parameres, about as long as wide; manubrium smoothly converging, extended into a narrow lobe; ventral face of phallobase with deep incision; lateral and mesal margins of parameres slightly curved; mesal margins with a slight bulge distal to midlength; distance between lateral margins of parameres as wide as distance between lateral margins of phallobase; apex rather narrow, very weakly pigmented, very slightly pointing mesad; basal portion slightly wider than apical part; ventral portion of bases not visible; dorsal portion of bases very slightly curved, not reaching into phallobase. Median lobe as long as parameres or very slightly shorter; corona in apical position of median lobe; basal apophyses distinctly shorter than main piece of median lobe, attaining less than midlength of phallobase. Base of median lobe distinctly connected with parameres by a small tooth.

ETYMOLOGY: The name of the epithet refers to the collector Manfred A. Jäch.

DISCUSSION: The specific rank is mainly based on features of the aedeagus and the distinctive coloration of head, pronotum, and elytra.

ECOLOGY: The type specimens were collected in a small stream in the forest, at 700 m a.s.l.

DISTRIBUTION: Indonesia, South Sulawesi.

### *Anacaena javana* sp.n.

TYPE LOCALITY: Indonesia, West Java, Province of Banten, Tangerang [City], Cibodas.

TYPE MATERIAL: **Holotype** ♂ (MSNG): “Giava [Java] / Teibodas Ott. 1874 / O. Beccari \ Museo Civico / di Genova”. **Paratypes**: 2 ♀ ♀ (MSNG; a third female lacking head and pronotum is not included in the type series): same data.

DIFFERENTIAL DIAGNOSIS: This species differs from all other Indonesian species of *Anacaena* in the short clypeus and the extended metafemoral pubescence.

DESCRIPTION: Total length 2.3–2.6 mm; maximum width 1.5–1.6 mm; EI: 1.11–1.18. Habitus: oblong oval, with greatest width in midlength; elytra about 2.9–3.3 × as long as pronotum in dorsal view.

Head (Figs. 8, 14): Labrum brown. Clypeus and frons dark brown, clypeus with indistinct yellow preocular patches. Irregular punctures very fine, very widely spaced, without setae; series of very indistinct, minute, densely arranged punctures present along inner margin of eyes. Microsculpture absent. Clypeus short in longitudinal diameter, straight anteriorly, without distinct angles between lateral and anterior portion. Eyes not constricted anteriorly; dorsal and mesal portion of almost equal size. Frontoclypeal suture not visible. Antennae composed of nine antennomeres; pedicellus distinctly longer than wide; antennomere 3 elongate. Maxillary palpomere 2 distinctly inflated; palpomere 4 without infuscation, widest in midlength, with

distinctly curved outer margin and slightly curved inner margin. Mentum ca.  $1.7 \times$  as wide as long, rather flat, slightly impressed anteriorly, lateral margins convex, with distinct anterior angles, with fringes of very fine soft setae; anterior margin almost semicircularly projecting, with deep distinct median impression; ventral face set with widely spaced, evenly distributed, fine setiferous punctures; microsculpture absent. Labial palpi stout; slightly shorter than lateral edge of mentum, palpomere 3 slightly longer and wider than palpomere 2.

Thorax (Fig. 20): Pronotum dark brown, with very wide yellow to light brown lateral margins; dark area extending to mesal margins of eyes or slightly more laterad and to anterior pronotal margin. Punctuation very fine, almost obsolete, very widely spaced; microsculpture absent. Prosternum slightly bulged. Elytra dark brown. Lateral borders of pronotum and elytra without setae. Elytra without accentuated shoulder regions, with weakly demarcated anterior declivity; punctures fine, strongly impressed, irregular, tending to form series on lateral portion; coarser along lateral margin; interspaces  $2-3 \times$  as wide as puncture; microsculpture absent; sutural stria in posterior  $2/3$  of elytra. Mesoventrite distinctly elevated mesally with a sharply pointed protuberance. Legs light brown. Procoxa and protrochanter pubescent without spine-like setae. Femora pubescent on proximal  $4/5$ ; hairlines distinct, metafemoral hairline slightly oblique. Metatarsus shorter than metatibia.

Abdominal ventrites dark brown, entirely covered with dense hydrofuge pubescence.

Aedeagus (Fig. 2): Main piece of phallobase shorter than parameres, slightly longer than wide; manubrium smoothly converging, extended into a moderately wide lobe; ventral face of phallobase with deep incision, not distinctly visible; lateral and mesal margins of parameres very slightly curved. Distance between lateral margins of parameres as wide as distance between lateral margins of phallobase; apex rather broad, not inflated, very slightly pointing mesad; basal portion very slightly wider than apical part; ventral portion of bases fused mesally; dorsal portion of bases distinctly curved, without extension into phallobase. Median lobe shorter than parameres; corona in apical position of median lobe; basal apophyses about as long as main piece of median lobe, not reaching midlength of phallobase. Base of median lobe indistinctly connected with parameres.

ETYMOLOGY: The adjectival name refers to the island of Java where the specimens were found.

DISCUSSION: This species differs very distinctly from all other species of *Anacaena* from Indonesia.

ECOLOGY: unknown.

DISTRIBUTION: Indonesia, West Java.

### *Anacaena mista* ORCHYMONT, 1932

*Anacaena mista* ORCHYMONT 1932: 683; partim.

TYPE LOCALITY: Indonesia, Sumatra, Prov. Sumatera Barat, Danau Diatas. The Indonesian term "Danau Diatas" means "Upper Lake". This lake is located in West Sumatra at  $1^{\circ}04'37''\text{S}$   $100^{\circ}45'17''\text{E}$  near Padang, the capital of the province.

TYPE MATERIAL: **Holotype** ♂ (ISNB, aedeagus separately mounted on transparent card): "♂ \ SUMAT, Dana[u], di Atas / Flussgebiet an Steinen [river area on stones] / 16.3.29 / Exp. Thienemann [mounted on a yellow collection label "Coll. R.I.Sc.N.B. / Sumatra"] \ A. d'Orchymont det. / *Anacaena* / *mista* m. \ [red label:] ♂ HOLOTYPUS / *Anacaena mista* / d'Orchymont / E. Gentili 1992". ORCHYMONT (1932) notes: "Mittelsumatra. Danau di Atas, an Steinen im Zuflussgebiet [= on stones in tributary], 1530 m, FF 20 h, 16.III.29, 1 ♂". **Paratypes**: 6 exs. (ISNB): "[W-]Java, Kandang Badak / (Gadeh) Quelle 2400 m / 11.7.29, Exp. Thienemann"; 2 exs. (ISNB): "Tjibodas

[Cibodas] / Kali Tjiwalen 1400 m / 10.VII 1929, Exp. Thienemann"; 2 exs. (ISNB): "Tjibodas / Kali Tjiwalen 1400 m / 14.VII 1929, Exp. Thienemann".

#### ADDITIONAL MATERIAL EXAMINED:

**S-Sumatra:** 2 exs. (ISNB): "Palembang / [South] Sumatra" – these specimens are provided with a "paratype" label but they were not listed as paratypes by ORCHYMONT (1932); **W-Java:** 5 exs. (NMW): Gede-Pangrango N.P., near Headquarters, 1550 m a.s.l., 3.VIII.1994, R. Schuh; 6 exs. (KSEM, NMW): Gede-Pangrango N.P., Cibodas Botanical Garden, 1400 m a.s.l., 23.VIII.1994, R. Schuh; 1 ex. (NMW): Cibodas, Cibeureum, 16.I.1987, M. Jäch "J7"; 3 exs. (NMW): Tangkuban Prahu Gede, 10 km N Bandung, 1500–1700 m a.s.l., 5.VIII.1994, R. Schuh; 3 exs. (NMW): Telaga Patengan, 2 km SE Rancabali, 40 km SSW Bandung, 1400 m a.s.l., 6.VIII.1994, R. Schuh; 1 ex. (NMW): "Ranca Upas", 10 km S Ciwidey, ca. 1300 m a.s.l., 9.VIII.1994, R. Schuh; 1 ex. (NMW): Gunung Tilu Nat. Res., 25 km S Bandung, 1400 m a.s.l., 11.VIII.1994, R. Schuh.

**DIFFERENTIAL DIAGNOSIS:** The species is very similar to *A. orchymonti*. It differs from this species by the following characters: preocular patches larger, pedicellus shorter, maxillary palpomeres stouter, palpomere 2 with stronger inflation, palpomere 4 not infuscated, biconvex, slightly different proportions of mentum, labial palpomere 3 distinctly stouter; pronotum: median patch smaller and subdivided, punctures obsolete; spine-like setae on procoxa present. There are also differences in the aedeagus: slightly wider median lobe with comparatively shorter basal apophyses, less deep incision of ventral face of phallobase, stronger excavation of medial margins of parameres, basis of parameres distinctly wider than apex, median infuscation of manubrium absent.

**DESCRIPTION:** Total length 2.0–2.6 mm; maximum width 1.2–1.6 mm; EI: 1.11–1.25. Habitus: oblong oval, with greatest width in midlength; elytra about  $3.1\text{--}3.5 \times$  as long as pronotum in dorsal view.

Head (Figs. 9, 15): Labrum usually yellow to dark brown, dark brown with yellowish areas in some individuals. Mesal portion of clypeus dark brown, with large yellow preocular patches often confluent medially, or clypeus entirely yellow, or yellow with dark brown posterior area. Frons dark brown. Irregular punctures fine, rather strongly impressed, interspaces  $1\text{--}2 \times$  as large as punctures, slightly denser towards clypeal margins, without setae; series of indistinct, minute, densely arranged punctures present along inner margin of eyes. Microsculpture absent. Clypeus long, straight to slightly emarginate anteriorly, with distinct angles between lateral and anterior portion. Eyes not constricted anteriorly by clypeal extension; dorsal and mesal portion of almost equal size. Frontoclypeal suture very indistinct. Antennae composed of nine antennomeres; pedicellus slightly longer than wide; antennomere 3 elongate. Maxillary palpomere 2 distinctly inflated; palpomere 4 widest in midlength, with curved inner and outer margins, without infuscation. Mentum ca.  $1.8 \times$  as wide as long, rather flat, slightly impressed anteriorly; lateral margins with dense fringes of long soft setae, convex, with distinct anterior angles; anterior margin almost semicircularly projecting with deep, distinct mesal impression; ventral face set with very widely spaced, evenly distributed, fine setiferous punctures; microsculpture absent. Labial palpi stout; about as long as lateral edge of mentum, palpomere 2 almost as long as palpomere 3.

Thorax (Fig. 21): Pronotum with small dark brown median patch, subdivided into a larger central portion and smaller lateral portions in most individuals, narrower to the posterior than to the anterior margin; four dark points surrounding median patch present in most individuals. Punctures obsolete on pronotal disc, very fine at lateral margins; microsculpture absent. Prosternum tectiform. Elytra light brown with brighter areas laterally, posteriorly, and antero-mesally; rows of dark spots visible on lateral and posterior areas with lighter coloration in most individuals. Lateral borders of elytra with minute fine long setae arising from dorsal face. Elytra with distinctly accentuated shoulder regions, with weakly demarcated anterior declivity; punctures fine, strongly impressed, coarser than pronotal punctures, irregular on most parts, with short series of coarse punctures laterally; interspaces  $1\text{--}2 \times$  as wide as one puncture; micro-

sculpture absent. Sutural stria in posterior 2/3–3/4 of elytra. Mesoventrite distinctly elevated mesally with a sharply pointed protuberance. Legs dark brown, distal portions of femur and tibia lighter. Procoxa and protrochanter pubescent with few spine-like setae. Femoral hairlines distinct; pro- and mesofemur pubescent on proximal 4/5, pubescence on metafemur restricted to anterior half and proximal portion with horizontal hairline. Metatarsus shorter than metatibia.

Abdominal ventrites dark brown to black, entirely covered with dense hydrofuge pubescence.

Aedeagus (Fig. 3): Main piece of phallobase about as long as parameres or slightly shorter, slightly longer than wide; manubrium smoothly converging, extended into a moderately wide lobe; incision of ventral face of phallobase reaching to half length of main piece of phallobase, very slightly pigmented and thus indistinctly visible; lateral and mesal margins of parameres slightly curved; distance between lateral margins of parameres as wide as distance between lateral margins of phallobase; apex moderately broad, very slightly pointing mesad; basal portion slightly wider than apical part; ventral portion of bases not visible, dorsal portion of bases slightly curved, slightly reaching into phallobase. Median lobe shorter than parameres; corona in apical position of median lobe; basal apophyses distinctly shorter than main piece of median lobe, attaining less than midlength of phallobase. Base of median lobe indistinctly connected with parameres by a small tooth.

DISCUSSION: ORCHYMONT (1932) describes two morphologically slightly differing groups of specimens which he considers as one species. The first group which he calls “Stammform” in contrast to the second group consists of light colored specimens with subdivided dark central pronotal patch with very fine pronotal punctation. In the present study several less ambiguous morphological differences have been observed between the two groups (see Differential Diagnosis), including characters of the aedeagus. These findings justify the specific status of the second group. The two exemplars of *A. mista* from Sumatra, Palembang, erroneously labelled as “paratypes”, ORCHYMONT (1932) described as “Vergleichsstücke [= specimens for comparison]” with different metafemoral pubescence. In the present study a metafemoral pubescence differing from the type specimens could not be observed.

ECOLOGY: This species was collected on stones and among leaves in small streams. According to ORCHYMONT (1932), *A. mista* was found in wells, streams, and waterfalls in 1400–2400 m a.s.l. Rudolf Schuh and Manfred A. Jäch collected it in streams, among leaves amassed between overflowed rocks (personal communication).

DISTRIBUTION: Indonesia, West Sumatra and West Java.

### *Anacaena modesta* ORCHYMONT, 1932

*Anacaena modesta* ORCHYMONT 1932: 685.

TYPE LOCALITY: Indonesia, Java, Province of Central Java (Java Tengah), Dieng [mountain plateau], Serajoe River Valley, spring near Patakbantang.

TYPE MATERIAL: **Holotype** ♀ (ISNB): “♀ \ JAVA, Dieng, Serajoe / [handwritten]–tal bei Patakbantang– quelle [= spring] / 6.6.29 Exp. Thienemann [mounted on a yellow collection label “Coll. R.I.Sc.N.B. / Java”] \ A. d’Orchymont det. / *Anacaena / modesta* m. \ [red label:] ♀ HOLOTYPE / *Anacaena / modesta* d’Orch. / E. Gentili 1992”. ORCHYMONT (1932) notes: “Mitteljava, Diëng, Quelle im Serajutal, bei Patakbantang, 2050 m, FD5, 6.VI.29”. **Paratypes**: 2 ♀ ♀ (ISNB): same sampling data.

#### ADDITIONAL MATERIAL EXAMINED:

**Central Java**: 1 ♂, 2 ♀ ♀ (NMW): Dieng T.[elaga] [Lake] Warna, 29.I.1987, M. Jäch “J19”; 1 ♀ (NMW): Dieng Umg. [surroundings], 30.I.1987, M. Jäch “J20”; 1 ♂, 3 ♀ ♀ (NMW): Serayu, 26.VI.1993.

DIFFERENTIAL DIAGNOSIS: This species is similar to *A. mista*, *A. orchymonti* and *A. jaechi*. It can be separated from *A. mista* and *A. jaechi* by the infuscated apex of the maxillary



palpomere 4, from *A. orchymonti* and *A. jaechi* by the dorsal coloration, and from all species mentioned by features of the aedeagus.

DESCRIPTION: Total length 2.7–3.1 mm; maximum width 1.5–1.7 mm; EI: 1.16–1.25. Habitus: oblong oval, with greatest width in midlength; elytra  $3.3\text{--}3.7 \times$  as long as pronotum in dorsal view.

Head (Figs. 10, 16): Labrum black. Clypeus and frons dark brown to black, with distinct yellow preocular patches. Irregular punctures fine, intermixed with some coarser punctures, strongly impressed; interspaces  $1\text{--}3 \times$  as large as punctures, denser towards clypeal margins, without setae; series of indistinct, minute, densely arranged punctures present along inner margin of eyes. Microsculpture absent. Clypeus long, straight to slightly emarginate anteriorly, with distinct angles between lateral and anterior portion. Eyes not constricted anteriorly; dorsal and mesal portion of almost equal size. Frontoclypeal suture obsolete. Antennae composed of nine antennomeres; pedicellus slightly longer than wide; antennomere 3 slightly elongate. Maxillary palpomeres slender, palpomere 2 distinctly inflated; palpomere 4 distinctly infuscated apically, widest in midlength, with distinctly curved outer margin and almost straight inner margin. Mentum ca.  $1.5 \times$  as wide as long, rather flat, slightly impressed anteriorly; lateral margins convex, with distinct anterior angles, with dense fringes of long soft setae; anterior margin almost semicircularly projecting, with deep distinct mesal impression; ventral face set with widely spaced, evenly distributed, fine setiferous punctures; microsculpture absent. Labial palpi slender; longer than lateral edge of mentum, palpomere 3 as long as palpomere 2.

Thorax (Fig. 22): Pronotum yellow, with a small, dark brown median patch, subdivided into a larger central spot and two smaller paramedian spots, together approximately as wide as distance between eyes or slightly wider. Punctuation fine, distinctly impressed, similar to punctuation on head, interspaces about  $1\text{--}2 \times$  as wide as one puncture, denser towards lateral margins; microsculpture absent. Prosternum with short anteromedian tectiform bulge. Lateral borders of pronotum and elytra without setae. Elytra light brown, with indistinct darker spots around punctures; sutural stria dark brown; shoulder regions slightly accentuated, with weakly demarcated anterior declivity; punctures stronger than on head, strongly impressed, irregular, with a short series of coarser punctures along lateral margin; interspaces  $1\text{--}2 \times$  as wide as one puncture; microsculpture absent; sutural stria in posterior  $3/4$  of elytra. Mesoventrite distinctly elevated mesally with a sharply pointed protuberance. Legs dark brown. Procoxa and pro-trochanter pubescent without spine-like setae. Femoral hairlines distinct; pro- and mesofemora pubescent on proximal  $4/5$ , metafemoral pubescence restricted to anterior margin and proximal area with horizontal hairline. Metatarsus shorter than metatibia.

Abdominal ventrites dark brown to black, entirely covered with dense hydrofuge pubescence.

Aedeagus (Fig. 4): Main piece of phallobase shorter than parameres, about as long as wide; manubrium smoothly converging, extended into a wide lobe; ventral face of phallobase with deep incision; lateral and mesal margins of parameres very slightly curved, distance between lateral margins of parameres as wide as distance between lateral margins of phallobase; apex narrow, not inflated, very weakly pigmented, straight; basal portion wider than apical part; ventral portion of bases not visible; dorsal portion very slightly curved, not distinctly reaching into phallobase. Median lobe slightly shorter than parameres; corona in apical position of median lobe; basal apophyses shorter than main piece of median lobe, attaining less than midlength of phallobase. Base of median lobe indistinctly connected with parameres by a small tooth.

DISCUSSION: ORCHYMONT (1932) compares *A. modesta* with *A. mista* and describes *A. modesta* as “larger” and with distincter and denser punctuation on head, pronotum and elytra. The three type specimens examined by ORCHYMONT (1932) were females. The additional material available now shows also differences in the aedeagus of the two species.

ECOLOGY: According to ORCHYMONT (1932) this species was found in wells, at 2050 m a.s.l.; M.A. Jäch collected it in shallow pools near a larger lake.

DISTRIBUTION: Indonesia, Central Java.

*Anacaena orchymonti* sp.n.

*Anacaena mista* ORCHYMONT 1932: 683; partim.

TYPE LOCALITY: Indonesia, Province of Central Java (Java Tengah), Sarangan.

TYPE MATERIAL: **Holotype** ♂ (ISNB): “♂ \ Java, Sarangan Kali / Pagargada Wasserfall [handwritten] / 6.XII.1928 / Exp. Thienemann [mounted on a yellow collection label “Coll. R.I.Sc.N.B. / Java”] \ Para- / type [red label]”. **Paratypes: Central Java:** 20 exs. (ISNB, NMW): same data; 2 exs. (ISNB): [Sarangan], oberhalb des Wasserfalles [= above cascade], 1520 m, 7.XII.1928, Exp. Thienemann “S10”; 13 exs. (ISNB): Sarangan, Wasserfall [= cascade] im Kali Djumok, 1465 m a.s.l., 7.XII.1928, Exp. Thienemann “S9”; 1 ex. (ISNB): Kali Djumok, ca. 1790 m a.s.l., 9.XII.1928, Exp. Thienemann “FS5”; 12 exs. (ISNB): Ngatiloga-Wasserfall, 1410 m a.s.l., 6.XII.1928, Exp. Thienemann “FS2”; **West Java:** 2 exs. (ISNB): Tjibodas [Cibodas], Bach unterhalb des Gartens [= stream underneath garden], ca. 1400 m a.s.l., 14.VII.1929, Exp. Thienemann “Fy14c”; 4 exs. (NMW): Cibodas, T. Biru, 1500 m a.s.l., 16.I.1987, M. Jäch “J8”; 1 ex. (NMW): Cibodas, stream, 17.I.1987, M. Jäch “J10”; **East Java:** 23 exs. (KSEM, NMW): 70 km S Surabaya, ca. 20 km NW Malang, north slope of Gunung Kawi, 6 km W Batu, Coban Rondo waterfall, S Pandesari, ca. 07°52'15"S 112°27'47"E, 1200 m a.s.l., stream below waterfall, ca. 2 m wide, very cold, basalt, surroundings partly cleared and reforested with pines, 27.IX.1995, H. Schillhammer “6”; 7 exs. (NMW): 50 km S Surabaya, near Arjuno, Tretes, NE-slope of Gunung Arjuno, ca. 07°43'15"S 112°37'07"E, 1550 m a.s.l., small creek, 10–20 cm wide, in narrow basalt gorge, about 2–3 m wide, with partly vertical walls, small pools of 30–50 cm diameter in regular intervals, no gravel, shaded by shrubs and *Casuarina* trees, 21.IX.1995, H. Schillhammer “3”.

DIFFERENTIAL DIAGNOSIS: This species is very similar to *A. mista*. For differences see Differential Diagnosis of the latter.

DESCRIPTION: Total length 2.2–2.6 mm; maximum width 1.3–1.6 mm; EI: 1.02–1.20. Habitus: oblong oval, with greatest width in midlength; elytra 2.9–3.3 times as long as pronotum in dorsal view.

Head (Figs. 11, 17): Labrum dark brown. Clypeus dark brown with yellow preocular patches as wide as eye or slightly smaller. Frons dark brown. Irregular punctures fine, rather strongly impressed, mixed with few coarser punctures; interspaces 2–3 × as large as punctures, without setae; series of indistinct, minute, densely arranged punctures present along inner margin of eyes. Microsculpture absent. Clypeus large in longitudinal diameter, straight to slightly emarginate anteriorly, with distinct angles between lateral and anterior portion. Eyes not constricted anteriorly by clypeal extension; dorsal and mesal portion of almost equal size. Frontoclypeal suture very indistinct, obsolete in mesal portion. Antennae composed of nine antennomeres; pedicellus almost 2 × as long as wide; antennomere 3 slightly elongate. Maxillary palpomere 2 weakly inflated; palpomere 4 widest in midlength, with almost straight inner margin and curved outer margin and with terminal infuscation, indistinct in some individuals. Mentum ca. 1.6 × as wide as long, rather flat, slightly impressed anteriorly; lateral margins convex, with distinct anterior angles, set with dense fringes of long soft setae; anterior margin almost semicircularly projecting with deep distinct mesal impression; ventral face set with widely spaced, evenly distributed, fine, setiferous punctures; microsculpture absent. Labial palpi slender; about as long as lateral edge of mentum, palpomere 2 almost as long as palpomere 3.

Thorax (Fig. 23): Pronotum with large dark brown median patch of variable extension, as wide as width of head in most individuals, with wide lateral and narrow anterior and posterior yellow margins. Punctuation very fine, as fine as on head or slightly coarser; interspaces about 2–3 × as wide as one puncture, slightly denser towards lateral margins; microsculpture absent; Prosternum tectiform. Elytra dark brown with brighter areas laterally, along sutural stria, posteriorly, and



anteromesally; posterolateral borders with minute fine long setae arising from dorsal face; shoulder regions indistinctly accentuated, with weakly demarcated anterior declivity; punctures fine, strongly impressed, distinctly stronger than pronotal punctation, irregular, with short series of coarse punctures laterally; interspaces about  $2 \times$  as wide as one puncture; microsculpture absent; sutural stria in posterior 2/3 of elytra. Mesoventrite distinctly elevated mesally with a sharply pointed protuberance. Legs dark brown. Procoxa and protrochanter pubescent without spine-like setae. Femoral hairlines distinct; pro- and mesofemora almost completely pubescent; pubescence on metafemur restricted to anterior half and proximal portion with horizontal hairline. Metatarsus distinctly shorter than metatibia.

Abdominal ventrites dark brown to black, entirely covered with dense hydrofuge pubescence.

Aedeagus (Fig. 5): Main piece of phallobase about as long as parameres, slightly longer than wide; manubrium smoothly converging, extended into a moderately broad lobe; incision of ventral face of phallobase deeper than half length of main piece of phallobase, very slightly pigmented and thus indistinctly visible, manubrium with infuscated area mesally; lateral and mesal margins of parameres very slightly curved; distance between lateral margins of parameres as wide as distance between lateral margins of phallobase; apex broad, not inflated, not distinctly pointing mesad; basal portion almost as wide as apical part; ventral portion of bases not visible, dorsal portion slightly curved, distinctly reaching into phallobase. Median lobe slightly shorter than parameres; corona in subapical position of median lobe; basal apophyses shorter than main piece of median lobe, attaining less than midlength of phallobase. Base of median lobe indistinctly connected with parameres.

DISCUSSION: In the description of *A. mista*, ORCHYMONT (1932) includes a group of individuals which differ from the „Stammform“ (see also Discussion of *A. mista*) by the following characters: coloration darker, pronotal dark brown patch not subdivided, but of broad oval shape, pronotal punctation variably fine to very fine. Additional structural differences listed in Differential Diagnosis of *A. mista* clearly justify the specific status of *A. orchymonti*.

ECOLOGY: This species was collected in waterfalls and streams (between 1200 and 1790 m a.s.l., together with *Limnebius* LEACH, Hydraenidae), and at a margin of a forest lake (Fig. 25).

DISTRIBUTION: Indonesia, Java.

### *Anacaena sulawesica* sp.n.

TYPE LOCALITY (Fig. 26): Indonesia, North Sulawesi, surroundings of Modinding, NE of Kotamobagu.

TYPE MATERIAL: **Holotype** ♂ (NMW): “N-Sulawesi 1992 / Umg. [surroundings] Modinding / NE Kotamobagu (12) / leg. Jäch 19.IV.”. **Paratypes**: 9 ♂♂, 9 ♀♀ (KSEM, NMW): same sampling data, M.A. Jäch & S. Schödl; 7 ♂♂, 7 ♀♀ (NMW, CSH): North Sulawesi, 5 km NE Tabulo, Manangga village, 50–200 m a.s.l., 0°32'75"N 122°10'10"E, 26.II.2009, A. Skale “013”; 2 ♂♂, 2 ♀♀ (NHM): “Sulawesi Utara / Gng. Ambang F.R. / nr. Kotamobagu / 4. Feb. 1985 \ [handwritten:] D. Alia / ca 1400m / R. Ent. Soc. Lond. / Project WALLACE / B.M. 1985–10”; 1 ♀ (NHM): “INDONESIA / Sulawesi Utara / Danau Mooat 1200m / nr. Kotamobagu / July 1985 \ Malaise / trap \ R. Ent. Soc. Lond. / Project WALLACE / B.M. 1985–10”; 1 ♀ (NHM): “INDONESIA, leaf litter \ Sulawesi Utara / Gng. Ambang F.R. / nr. Kotamobagu / 18. Jan. 1985 \ lower montane / forest / 1200 m \ Project WALLACE / B.M. 1985–10”; 4 ♂♂, 5 ♀♀ (NMW): South Sulawesi, Umg. [surroundings] Malino, E Ujung Pandang, 29.IV.1992, M.A. Jäch & S. Schödl “27”; 1 ♀ (NMW): S-Sulawesi, Malino Takapala waterfall, 1400 m, 1.V.1992, S. Schödl “29”; 1 ♂ (NMW): S-Sulawesi, Malino-Manipi, 1400 m a.s.l., 1.V.1992, S. Schödl “30”.

DIFFERENTIAL DIAGNOSIS: This species is very similar to *A. orchymonti*; a reliable differentiation is possible using features of the aedeagus; it differs from *A. jaechi* in the presence of preocular patches and in the shape of the aedeagus.

**DESCRIPTION:** Total length 2.2–2.3 mm, maximum width 1.3 mm; EI: 1.17–1.19. Habitus: oblong oval, with greatest width in midlength; elytra about  $3.0\text{--}3.1 \times$  as long as pronotum in dorsal view.

**Head** (Figs. 12, 18): Labrum dark brown. Clypeus and frons dark brown; yellow preocular clypeal patches about as large as eye or smaller. Irregular punctures fine, strongly impressed, intermixed with some courser punctures; interspaces about  $3\text{--}4 \times$  as large as punctures, without setae; series of very indistinct, minute, densely arranged punctures present along inner margin of eyes. Microsculpture absent. Clypeus long, straight to slightly emarginate anteriorly, with distinct angles between lateral and anterior portion. Eyes not constricted anteriorly; dorsal and mesal portion of almost equal size. Frontoclypeal suture very indistinct. Antennae composed of nine antennomeres; pedicellus distinctly longer than wide; antennomere 3 slightly elongate. Maxillary slightly inflated, palpomere 4 widest in midlength, with distinctly curved outer margin and very slightly curved inner margin; apical infuscation usually present but very indistinct or absent in some individuals. Mentum ca.  $1.7 \times$  as wide as long, rather flat, slightly impressed anteriorly; lateral margins convex, with distinct anterior angles, with dense fringes of long soft setae; anterior margin almost semicircularly projecting, with deep distinct mesal impression; ventral face set with widely spaced, fine setiferous punctures, with denser distribution anteriorly; microsculpture absent. Labial palpi slender, slightly longer than lateral edge of mentum, palpomere 3 slightly longer than palpomere 2.

**Thorax** (Fig. 24): Pronotum dark brown, with yellow to light brown lateral margins; dark brown area extending to lateral margins of eyes and to anterior pronotal margin; distinctly smaller in some individuals, not reaching anterior pronotal margin. Punctuation very fine, feebly impressed; interspaces about  $5 \times$  as wide as puncture, slightly denser towards lateral margins; microsculpture absent. Prosternum tectiform. Lateral pronotal and elytral borders without setae. Elytra dark brown, indistinctly lighter brown on lateral margins and apical area; shoulder regions not accentuated, with weakly demarcated anterior declivity; punctures fine, distinctly stronger than on head and pronotum, strongly impressed, irregular, tending to form series, especially on lateral portion; coarser punctures in short rows along lateral margin; interspaces  $1\text{--}2 \times$  as wide as punctures; microsculpture absent. Sutural stria in posterior  $3/4$  of elytra. Mesoventrite distinctly elevated mesally, with a sharply pointed protuberance. Legs dark brown. Procoxa and pro-trochanter pubescent without spine-like setae. Femoral hairlines distinct; pro- and mesofemora pubescent on proximal  $4/5$ ; metafemoral pubescence restricted to anterior margin and proximal area, with horizontal hairline; metatarsus slightly shorter than metatibia.

Abdominal ventrites dark brown to black, entirely covered with dense hydrofuge pubescence.

**Aedeagus** (Fig. 6): Main piece of phallobase shorter than parameres, about as long as wide; manubrium smoothly converging, extended into a narrow lobe; ventral face of phallobase without visible incision; lateral margins of parameres slightly curved; mesal margins with a distinct large bulge in midlength; distance between lateral margins of parameres not as wide as distance between lateral margins of phallobase; apex narrow, weakly pigmented, asymmetrical, not pointing mesad; basal portion wider than apical part; ventral portion of bases not visible; dorsal portion of bases very slightly curved, with distinct extension into phallobase. Median lobe shorter than parameres; corona in subapical position of median lobe; basal apophyses distinctly shorter than main piece of median lobe, attaining midlength of phallobase. Base of median lobe indistinctly connected with parameres by a small tooth.

**ETYMOLOGY:** The adjectival name refers to the island of Sulawesi, where the species was found.

**DISCUSSION:** The specific rank is based mainly on distinctive features of the aedeagus.

**ECOLOGY:** Jäch and Schödl collected this species in small forest streams. Skale collected the specimens in water-filled ruts without vegetation within the relatively open ground of a palm plantation.

**DISTRIBUTION:** Indonesia, Sulawesi.

### Key to the species of *Anacaena* from Indonesia (except Papua)

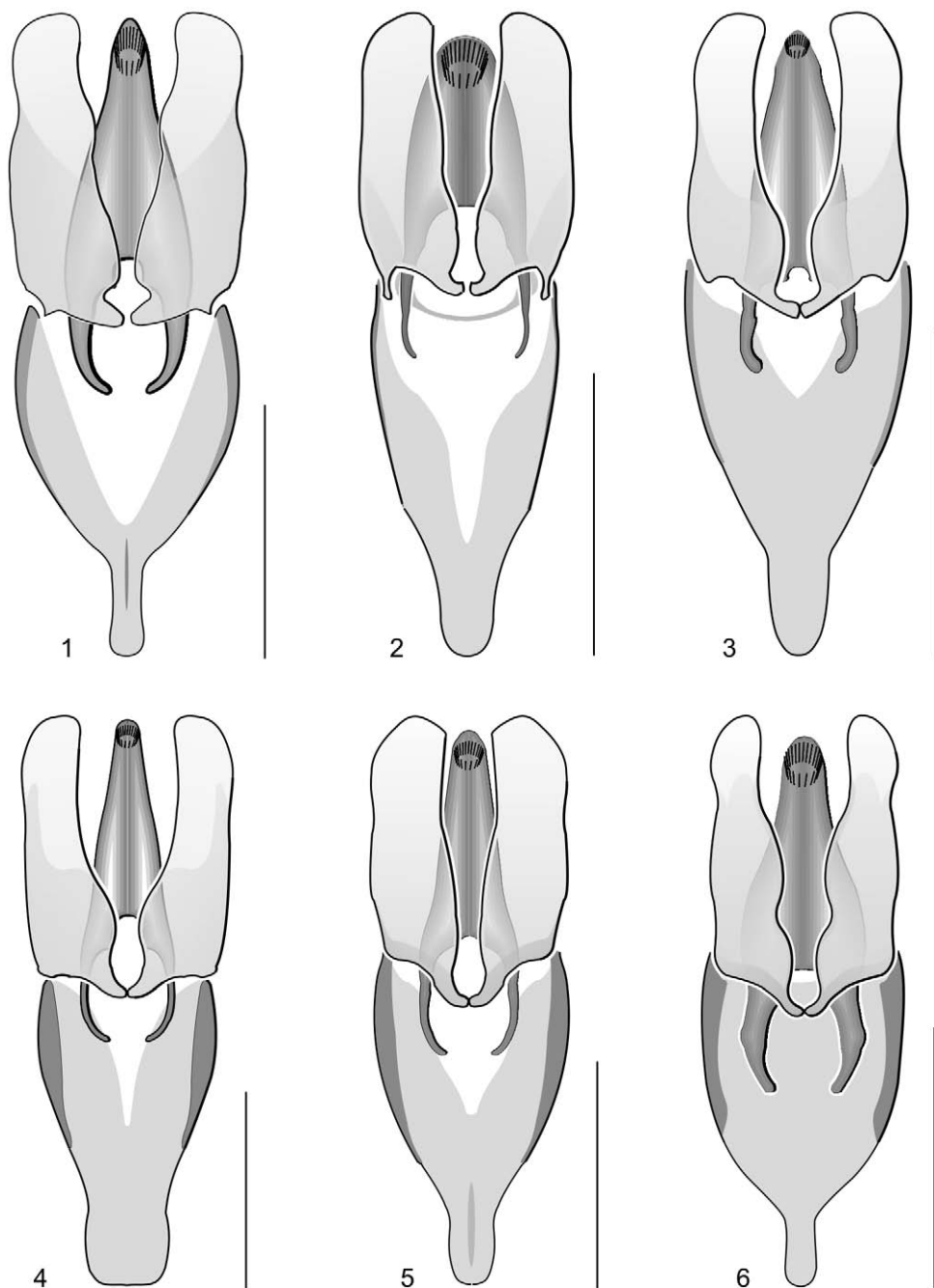
- 1 Clypeus shorter than diameter of eye; metafemora pubescent on approximately 4/5 of ventral face with oblique hairline (Fig. 20) ..... *javana*
- Clypeus als large as diameter of eye or larger; metafemoral pubescence reduced to proximal portion and anterior half with horizontal hairline (Figs. 19, 21–24). ..... 2
- 2 Preocular patches absent; maxillary palpomere 4 largely infuscated; pronotum black with narrow light brown anterolateral corners; aedeagus (Fig. 1): mesal margins of parameres with a slight bulge distal to midlength ..... *jaechi*
- Preocular patches present; maxillary palpomere 4 infuscated apically or infuscation absent; pronotum light brown with dark brown central patch of variable extension; aedeagus (Figs. 3–6): mesal margins of parameres without bulge or with large bulge in midlength ..... 3
- 3 Elytral coloration light brown; Aedeagus see Figs. 3–4 ..... 4
- Elytral coloration dark brown; Aedeagus see Figs. 5–6 ..... 5
- 4 Maxillary palpomere 4 infuscated apically (Fig. 10); body length 2.7–3.1 mm; aedeagus (Fig. 4): manubrium extended into a very wide lobe, median lobe narrow apically, basal apophyses long ..... *modesta*
- Maxillary palpomere 4 not infuscated (Fig. 9); body length 2.0–2.6 mm; aedeagus (Fig. 3): manubrium extended into a moderately wide lobe, median lobe not narrow apically, basal apophyses short ..... *mista*
- 5 Aedeagus (Fig. 6): extension of manubrium narrow, mesal margins of parameres with large bulge in midlength, apex of parameres narrow, median lobe with slightly concave lateral margins, basal apophyses wide ..... *sulawesica*
- Aedeagus (Fig. 5): extension of manubrium wide, mesal margins of parameres without bulge, apex of parameres wide, median lobe with straight lateral margins, basal apophyses narrow ..... *orchymonti*

### Discussion

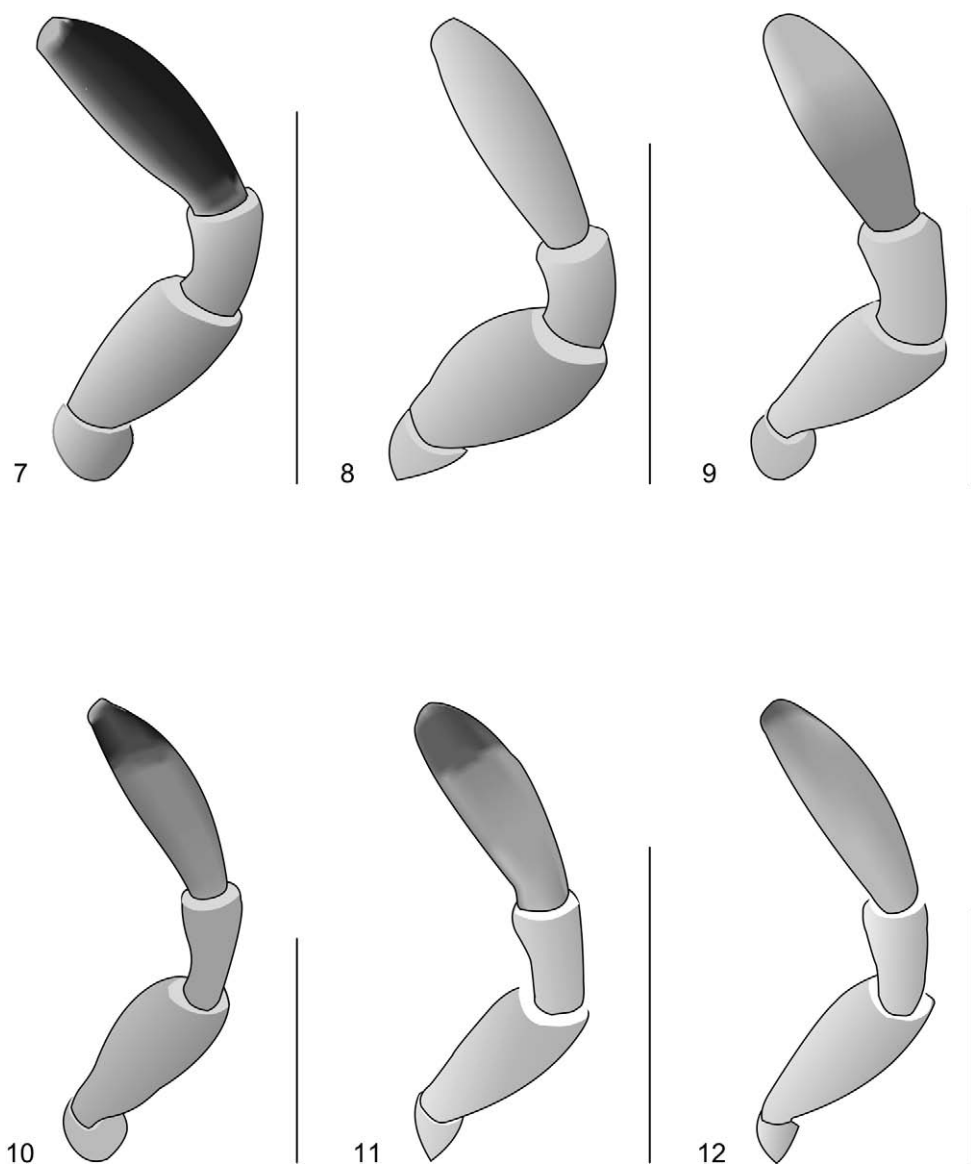
The morphology of five of the six species described here is very similar, and they also show structural affinities to species from Malaysia, Thailand, and China such as for instance a large clypeus and a reduced metafemoral pubescence. Characters often present in the New Guinean species (e.g. constricted eyes, serial punctures on elytra, aedeagus with spine-like extension of manubrium) are consistently absent. *Anacaena javana*, which was found in 1874 and not recorded since that time, differs more distinctly from the other species treated here (e.g. short clypeus and extended metafemoral pubescence).

Five species are aquatic, found in springs, waterfalls and streams. The habitat of *A. javana* is still unknown.

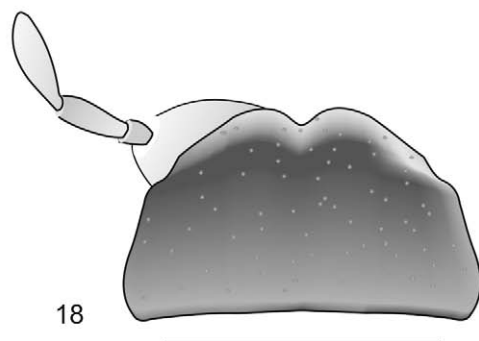
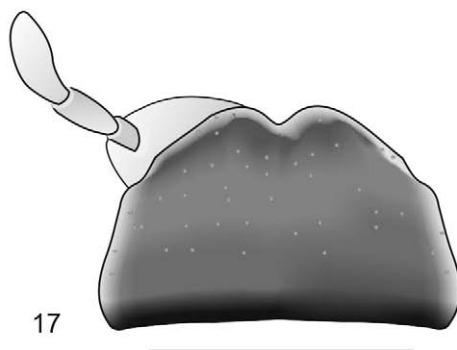
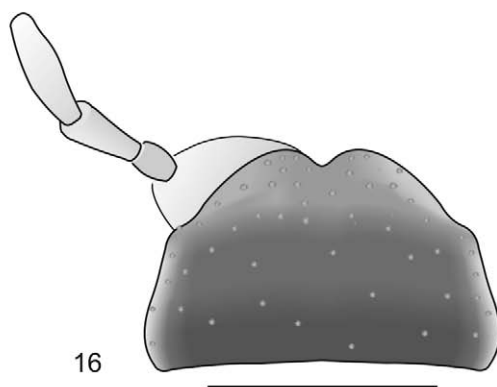
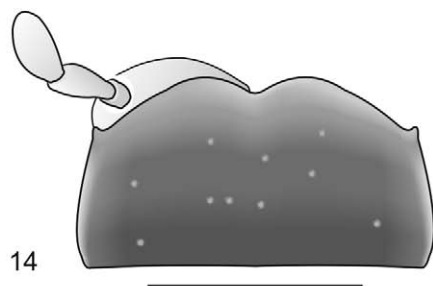
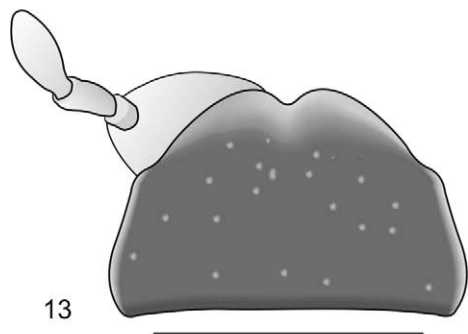
Only one species, *A. mista*, is distributed on two Sunda Islands (Sumatra, Java), whereas the others are obviously endemic to either Java or Sulawesi. According to our present knowledge, the distributional area of three species (*A. jaechi*, *A. javana*, and *A. modesta*) is very small. The remarkable degree of diversification found in New Guinea (KOMAREK 2009) and New Caledonia (KOMAREK 2010) has hitherto not been confirmed for the Sunda Islands.



Figs. 1–6: Aedeagus: 1) *Anacaena jaechi*, 2) *A. javana*, 3) *A. mista*, 4) *A. modesta*, 5) *A. orchymonti*, 6) *A. sulawesica*. Scale bars = 0.2 mm.

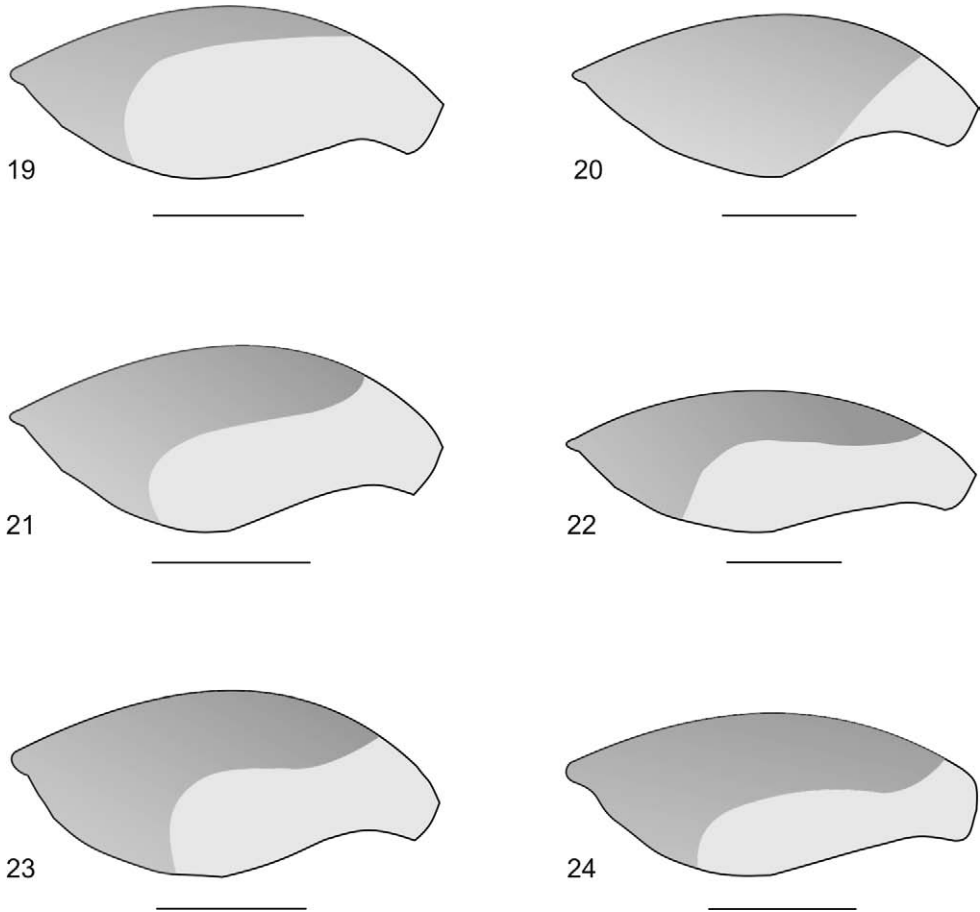


Figs. 7–12: Maxillary palpi: 7) *Anacaena jaechi*, 8) *A. javana*, 9) *A. mista*, 10) *A. modesta*, 11) *A. orchymonti*, 12) *A. sulawesica*. Scale bars = 0.2 mm.



Figs. 13–18: Mentum (setae omitted) and labial palpi: 13) *Anacaena jaechi*, 14) *A. javana*, 15) *A. mista*, 16) *A. modesta*, 17) *A. orchymonti*, 18) *A. sulawesica*. Scale bars = 0.2 mm.





Figs. 19–24: Metafemora, ventral view, hairline: 19) *Anacaena jaechi*, 20) *A. javana*, 21) *A. mista*, 22) *A. modesta*, 23) *A. orchymonti*, 24) *A. sulawesica*. Scale bars = 0.2 mm.

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### Zusammenfassung

Die Arten der Gattung *Anacaena* THOMSON, 1859 von den Sumatra, Java und Sulawesi werden revidiert. Vier neue Arten werden beschrieben. Alle sechs Arten sind endemisch in Indonesien,

davon drei in Java und zwei in Sulawesi. Fünf der sechs behandelten Arten sind aquatisch, das Habitat der sechsten Art (*Anacaena javana*) ist nicht bekannt, Der Aedeagus von *A. modesta* wird erstmals dargestellt. Ein Schlüssel zu den Arten Indonesiens (außer Papua) wird präsentiert.



Figs. 25–26: Habitat of 25) *Anacaena orchymonti*, W Java, Telaga Biru, and 26) *A. sulawesica* (type locality, M.A. Jäch).

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