

New trap-jaw ant species of *Anochetus* MAYR, 1861 (Hymenoptera: Formicidae) from the Philippine Islands, a key and notes on other species

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Abstract

At present eleven species of *Anochetus* MAYR, 1861 are known from the Philippines, including four species described as new here: *Anochetus weneri* sp.n. (from the island of Mindanao), *A. leyticus* sp.n. and *A. pangantihoni* sp.n. (both from the island of Leyte) belong to Brown's *A. risii* FOREL, 1900 species group. *Anochetus schoedli* sp.n. (from northern Luzon) belongs to Brown's *A. longifossatus* MAYR, 1897 species group. *Anochetus ruginotus* STITZ, 1925 sp.rev. is a valid species and not a synonym of *A. graeffei* MAYR, 1870. An identification key to the workers of Philippine *Anochetus* species is added.

Key words: Ponerinae, *Anochetus*, new species, description, taxonomy, key, Philippines, trap-jaw ants.

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Introduction

Here I present descriptions of four new Philippine species of the ponerine ant genus *Anochetus* MAYR, 1861. The study follows previous works on Philippine "trap-jaw ants" of the genera *Odontomachus* LATREILLE, 1804 (SORGER & ZETTEL 2011) and *Myrmoteras* FOREL, 1893 (ZETTEL & SORGER 2011). Since the revision by BROWN (1978) no further species of *Anochetus* was described from the entire Oriental Region (BOLTON 2011). Descriptions of two species from the transition zone between the Palaearctic and Oriental Regions (TERAYAMA 1989, WANG 1993) were considered in this study.

Regarding the Philippine fauna, BROWN (1978) reported on six species of *Anochetus*: (1) *Anochetus brevis* BROWN, 1978, only known from the type series collected on Mt. Apo, Mindanao; (2) *A. graeffei* MAYR, 1870, a polymorphic and widely distributed species occurring from India to Polynesia with the junior synonym *A. ruginotus* STITZ, 1925 described from Luzon (but see below); (3) *A. incultus* BROWN, 1978, only known from the type series from Mt. Makiling, Luzon; (4) *A. isolatus* MANN, 1919, a chiefly Melanesian species with records from Luzon and Negros; (5) *A. modicus* BROWN, 1978 with type locality Moaratoa Island offshore Borneo and possibly conspecific specimens from Java and Negros; (6) *A. princeps* EMERY, 1884, distributed from Myanmar to Sulawesi, with a record from Luzon. Describing four species new to science and revocating *A. ruginotus* from synonymy, this paper raises the number of Philippine species to eleven (see Box 1). However, I do not have enough data for conducting a comprehensive study in the "Ants of the Philippine Islands"-series (e.g., SORGER & ZETTEL 2011). Considering that most species are only known

from one or a few well-known localities, additional undescribed species must be expected. Especially Winkler extraction could provide numerous samples of *Anochetus* and other small and cryptic ants of the leaf litter, which are not readily sampled by other techniques (BESTELMAYER & al. 2000, IVANOV & al. 2010). Yet, I include a preliminary key to facilitate the identification of the recorded species.

Material and methods

All specimens were dry mounted on card squares or triangles. Examination of specimens was carried out with a Nikon SMZ 1500 and a Leica Wild M10 stereomicroscope and measurements were taken at magnifications of 50× and 80×. Line drawings (Figs. 1 - 7) were done by help of a camera lucida. Stacked digital images (Figs. 8 - 29) were taken with a Leica DFC490 camera attached to a Leica MZ16 binocular microscope and processed with the help of Leica Application Suite. They were then stacked with ZereneStacker 64-bit and processed with Adobe Photoshop 7.0.

Acronyms of repositories: Specimens will be deposited in the following collections:

CZW Coll. H. & S.V. Zettel, Vienna, Austria

FMNH Field Museum of Natural History, Chicago, Illinois, USA

MNKB Museum für Naturkunde, Berlin, Germany

NHMW Natural History Museum, Vienna, Austria

UPLB University of the Philippines, Los Baños, Philippines

USC University of San Carlos (Entomological Collection), Cebu City, Philippines

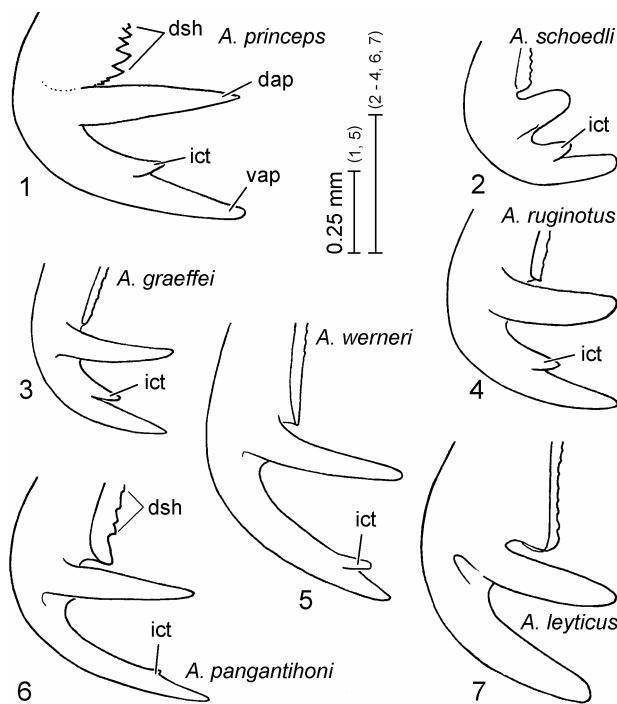
Measurements and indices:

- CI Cephalic index. $HW / HL \times 100$.
 HL Head length. Maximum length of head in full-face view, excluding mandibles, measured from anterior-most point of gena to posterior-most point of head vertex, parallel to midline.
 HW Head width. Maximum width of head (at ocular prominences) in full-face view (eyes not reaching outline of head).
 MdI Mandible index. $MdL / HL \times 100$.
 MdL Mandible length. Maximum length of mandible in frontal view of head measured from base of shaft to apex (excluding condyles).
 MsL Mesosoma length. Maximum length of mesosoma, measured in lateral view, diagonal from cervical shield to posterolateral propodeal edge.
 PnW Pronotum width. Maximum width of pronotum in dorsal view.
 PtH Petiole height. Maximum height of petiole, measured in lateral view as a straight line from bottom edge of petiole, perpendicular to petiolar apex (see SORGER & ZETTEL 2011: fig. 2).
 PtL Petiole length. Measured in lateral view along anterodorsal outline of petiole from small antero-apical tooth to apex (see SORGER & ZETTEL 2011: fig. 2).
 PtW Petiole width. Maximum width of petiole in dorsal view.
 SI Scape index. $SL / HW \times 100$.
 SL Scape length. Maximum length of antennal scape in dorsal view excluding basal constriction.
 TL Total length. Length of entire ant measured in dorsal view with head stretched out, from anterior margin of mandible to apex of abdomen.

Measurements are taken from holotypes (in *A. graeffei*: lectotype) and from paratype workers of new species with smallest and largest HW. All measurements are in millimetres. Terms for head structures and mandibular dentition follow BROWN (1976, 1978) (see also Figs. 1 and 8).

Key to species (workers)

- 1 Intercalary tooth on mandibular apex well developed and situated between base and mid-length of ventral apical tooth (Figs. 1 - 4). 2
- Intercalary tooth on mandibular apex absent or small and situated at apical third of ventral apical tooth (Figs. 5 - 7). 6
- 2 TL > 8 mm. Shaft of mandible bread-knife-shaped, with a single sharp, dentate medial edge (Fig. 1). *A. princeps*
- TL < 7 mm. Shafts of mandibles forceps-shaped, each with a narrow medial plane between two more or less distinct, often finely serrate edges (Figs. 2 - 4). 3
- 3 Pronotal disc smooth and shiny (e.g., Fig. 18). Eye glabrous (Fig. 16). 4
- Pronotal disc strongly sculptured (Figs. 26, 27). Eye beset with minute setae (Figs. 24, 25). 5
- 4 Head smooth. Eyes of normal size. TL > 6 mm. *A. isolatus*
- Head sculpture reaching nuchal carina. Eyes minute (Fig. 16). TL 3.7 - 3.8 mm. ... *A. schoedli* sp.n.



Figs. 1 - 7: Apex of mandible, seen approximately from direction of body axis when mandibles closed: (1) *Anochetus princeps*; (2) *A. schoedli* sp.n.; (3) *A. graeffei* (specimen from Luzon, Mt. Banahaw); (4) *A. ruginotus* (specimen from Mindanao, Songkoy Spring); (5) *A. werneri* sp.n.; (6) *A. pangantihoni* sp.n.; (7) *A. leyticus* sp.n.; dat = dorsal apical tooth; dsh = dentition of shaft (distal part); ict = intercalary tooth; vat = ventral apical tooth.

- 5 Emargination of vertex shallow (Fig. 24). Mesosoma stout (Fig. 26), $PW / HW > 0.57$ (0.58 in lectotype, 0.61 - 0.65 in Philippine specimens). First gaster tergite coarsely punctured, in Philippine specimens with some additional striation (Fig. 28). *A. graeffei*
- Emargination of vertex deep (Fig. 25). Mesosoma slender (Fig. 27), $PW / HW 0.50 - 0.53$ (0.53 in holotype). First gaster tergite finely punctured (Fig. 29). *A. ruginotus* sp.rev.
- 6 Pronotal disc sculptured (e.g., Figs. 10, 22). 7
- Pronotal disc smooth and shiny (e.g., Fig. 14). 9
- 7 TL 9.4 mm. Node of petiole very broad in lateral aspect (Fig. 21). Intercalary tooth on mandible distinct (Fig. 5). *A. werneri* sp.n.
- TL < 6 mm. Node of petiole slender in lateral aspect (Fig. 9). Intercalary tooth on mandible minute or absent (e.g., Fig. 7). 8
- 8 TL 4.4 - 5.2 mm. Striation on head confined to frons between frontal carinae. Pronotum with longitudinal, but irregular striation. *A. incultus*
- TL 5.5 - 5.7 mm. Striation on head extended onto vertex (Fig. 8). Pronotum with dense, regular, longitudinal striation (Fig. 10). .. *A. leyticus* sp.n.
- 9 Eyes minute, length 0.13 - 0.14 mm. Mandibles short, length < 0.70 mm. Longitudinal striae on frons obsolete. *A. brevis*

Box 1: List of species recorded from Philippine islands (* = endemic species).

* <i>A. brevis</i> BROWN, 1978	Mindanao
<i>A. graeffei</i> MAYR, 1870	Luzon, Masbate, Negros, Palawan
* <i>A. incultus</i> BROWN, 1978	Luzon
<i>A. isolatus</i> MANN, 1919	Luzon, Negros
* <i>A. leyticus</i> sp.n.	Leyte
<i>A. modicus</i> BROWN, 1978	Negros
* <i>A. pangantihoni</i> sp.n.	Leyte
<i>A. princeps</i> EMERY, 1884	Luzon
* <i>A. ruginotus</i> STITZ, 1925	Luzon, Mindanao
* <i>A. schoedli</i> sp.n.	Luzon
* <i>A. werneri</i> sp.n.	Mindanao

- Eyes of moderate size, length > 0.15 mm. Mandible length > 0.70 mm. Longitudinal striae on frons distinct, at least laterally. 10
- 10 Mesonotum smooth. Propodeum with more than 30 transverse costulae. Frons entirely striate. ...
..... *A. modicus*
- Mesonotum transversely striate. Propodeum with 20 - 25 transverse costulae (Fig. 17). Striation of frons restricted to sides (Fig. 15).
..... *A. pangantihoni* sp.n.

Descriptions of new species

Anochetus leyticus sp.n. (Figs. 7 - 11)

Etymology: This species is named after the island of origin, Leyte.

Type material: Holotype (worker, USC) and six paratypes (workers, CZW, NHMW) from Leyte Island, Leyte Province, Baybay, slopes of Mt. Pangasugan, behind Leyte State University, banks of Calbiga-a River, 50 - 100 m a.s.l., 20.-21.III.2005, leg. H. Zettel & C.V. Pangantihon (# 422) (labels see Fig. 11).

Diagnosis of worker: TL 5.5 - 5.7 mm. Head (Fig. 8) with deeply emarginated vertex; longitudinal striation covering a large area on frons and vertex. Eye moderately large, glabrous. Mandible long, MdI = 73 - 75; shaft medianly with two edges, dorsal one smooth, ventral one minutely serrate; intercalary tooth absent (Fig. 7). Pronotum with distinct longitudinal striation (Fig. 10). Propodeum with transverse costulae. Petiole with narrow node in lateral aspect, its apex narrowly rounded when seen laterally (Fig. 9) and in anterior aspect (Fig. 10); peduncle moderately developed (Fig. 8). Gaster tergite 1 with sparse punctures (Fig. 9). Whole dorsum with sparse setiferation.

Description of worker: Measurements of holotype: TL 5.64; HL 1.35; HW 1.20; CI 89; MdL 1.01; MdI 75; SL 1.22; SI 102; MsL 1.91; PnW 0.66; PtH 0.42; PtL 0.50; PtW 0.22. Measurements of paratype with smallest HW: TL 5.50; HL 1.34; HW 1.19; CI 89; MdL 1.09; MdI 74; SL 1.22; SI 103; MsL 1.85; PnW 0.64; PtH 0.44; PtL 0.47; PtW 0.21. Measurements of paratype with largest HW: TL 5.70; HL 1.38; HW 1.24; CI 90; MdL 1.03; MdI 75; SL 1.27; SI 102; MsL 1.92; PnW 0.66; PtH 0.44; PtL 0.51; PtW 0.22.

Colour: Medium brown; centre of head dorsum, mesosoma, and tergites 2 - 3 slightly infuscated; mandibles, antennae, tarsi, and apex of abdomen pale brown.

Structures: Head (Fig. 8) with moderately developed ocular and temporal prominences and deeply emarginated vertex; frontal striation extended posteriorly onto vertex, almost reaching nuchal carina. Eye medium-sized, glabrous. Mandible moderately long, stout, medial plane terminating in a large tooth, ventral edge of plane weakly serrate; intercalary tooth absent (Fig. 7). Antenna (Fig. 8) long and slender; scape strongly curved, distal part narrowed; flagellum slender, antennomere 3 slightly shorter than antennomeres 2 and 4, following antennomeres steadily increasing in length.

Mesosoma (Figs. 9, 10) slender. Disc of pronotum with coarse, longitudinally orientated costae. Mesonotum smooth, metanotum with longitudinal costae. Propodeum with 24 - 29 transverse costae, counted along midline. Sides of thorax mostly striate, but mesopleura smooth except for some, variably developed, short striae anteriorly and posteroventrally.

Petiole with short peduncle and narrow node; its apex in lateral aspect (Fig. 9) narrowly rounded, in anterior aspect (Fig. 10) almost pointed. Gaster smooth and shiny except for sparse setae-bearing punctures.

Comparative notes: *Anochetus leyticus* sp.n. belongs to the *A. risii* FOREL, 1900 species group as defined by BROWN (1978). In BROWN's (1978) key it goes to couplet 10, with *A. tua* BROWN, 1978 from West Malaysia and *A. incultus* from Luzon Island. It differs from *A. incultus* by size and sculpture (see key). *Anochetus tua* is much larger (TL 7.6 - 8.2 mm vs. 5.5 - 5.7 mm) and has relatively large eyes (see BROWN 1978: fig. 1) and a thick petiolar node (see BROWN 1978: fig. 29).

Anochetus pangantihoni sp.n. (Figs. 6, 12 - 15)

Etymology: This species is dedicated to Clister V. Pangantihon (USC) who collected part of the type series.

Type material: Holotype (worker, USC) and 13 paratypes (workers, CZW, NHMW) from Leyte Island, Leyte Province, Baybay, slopes of Mt. Pangasugan, behind Leyte State University, banks of Calbiga-a River, 50 - 100 m a.s.l., 20.-21.III.2005, leg. H. Zettel & C.V. Pangantihon (# 422) (labels see Fig. 15).

Diagnosis of worker: TL 4.7 - 4.9 mm. Head with deeply emarginated vertex; longitudinal striation restricted to stripes medial of frontal carinae (Fig. 12). Eye moderately large, with very few minute setae. Mandible moderately long, MdI = 65 - 68; shaft medially with two edges, dorsal one smooth, ventral one minutely serrate; intercalary tooth minute (Fig. 6). Pronotum smooth except for widely spaced, fine, setiferous punctures (Fig. 14). Propodeum with 20 - 25 transverse costulae. Petiole with narrow node in lateral aspect, its apex narrowly rounded when seen laterally (Fig. 13) and in anterior aspect (Fig. 14); peduncle moderately developed (Fig. 13). Gaster tergite 1 with sparse punctures (Fig. 13). Whole dorsum with sparse setiferation.

Description of worker: Measurements of holotype: TL 4.75; HL 1.18; HW 1.08; CI 91; MdL 0.78; MdI 66; SL 1.01; SI 94; MsL 1.59; PnW 0.64; PtH 0.43; PtL 0.45; PtW 0.21. Measurements of paratype with smallest HW: TL 4.75; HL 1.15; HW 1.04; CI 90; MdL 0.79; MdI 68; SL 0.97; SI 93; MsL 1.63; PnW 0.60; PtH 0.40; PtL 0.43;



Figs. 8 - 11: *Anochetus leyticus* sp.n., paratype worker (CZW; TL 5.63 mm, HW 1.22 mm). (8) Head, frontal aspect; ey = compound eye, fc = frontal carina; nc = nuchal carina, op = ocular prominence; tp = temporal prominence; (9) habitus, lateral aspect; (10) mesosoma and petiole, dorsal aspect; (11) labels. © Herbert Zettel.

PtW 0.20. Measurements of paratype with largest HW: TL 4.84; HL 1.19; HW 1.10; CI 92; MdL 0.79; MdI 66; SL 1.01; SI 92; MsL 1.64; PnW 0.64; PtH 0.43; PtL 0.46; PtW 0.21.

Colour: Very dark brown, almost black; anterior parts of head and in some specimens also the petiole medium brown. Mandibles and antennae pale brown. Legs brown, gradually paler towards tarsi.

Structures: Head (Fig. 12) with moderately developed ocular and temporal prominences and deeply emarginated vertex; frontal striation reduced to stripes medial of frontal carinae. Eye medium-sized, with some very short setae laterally which are not distinct in all specimens. Mandible moderately long, stout, medial plane terminating in a sharp tooth, ventral edge of plane weakly serrate; intercalary tooth minute (Fig. 6). Antenna (Fig. 12) long and slender; scape strongly curved, distal part narrowed; flagellum rather stout, antennomere 3 slightly shorter than antennomeres 2 and 4, following antennomeres steadily increasing in length.

Mesosoma (Figs. 13, 14) slender. Disc of pronotum smooth except for widely spaced setiferous punctures. Mesonotum with transverse striation, metanotum with longitudinal costae. Propodeum with 20 - 25 transverse costulae, counted along midline. Sides of thorax mostly smooth, except metapleura with some coarse costae along meso-metapleural suture and with some striation posteroventrally.

Petiole with moderately long anterior peduncle and with narrow node; in lateral aspect (Fig. 13) node with narrowly

rounded apex and slightly concave anterior face, in anterior aspect (Fig. 14) apex almost pointed. Gaster smooth and shiny except for sparse setae-bearing punctures.

Comparative notes: *Anochetus pangantihoni* sp.n. belongs to the *A. risii* species group as defined by BROWN (1978), where it takes an intermediate position between *A. modicus* and *A. brevis* both reported from the Philippines. It differs from *A. brevis* by absolutely and relatively longer mandibles, by absolutely larger eyes, and by a relatively long anterior peduncle of the petiole. It differs from *A. modicus* by sculpture of the mesonotal disc and of the propodeal dorsum, and shape of the petiole. In *A. modicus* the mesonotum is smooth, but in *A. pangantihoni* sp.n. it is transversely striate. BROWN (1978) counts 30 transverse costulae for the propodeal dorsum of *A. modicus*, while *A. pangantihoni* sp.n. has 20 - 25 costulae on the entire dorsum (including its declivitous area). Compared with the holotype of *A. modicus*, the petiole of *A. pangantihoni* sp.n. is more petiolate and its node is narrower (in lateral aspect) with a slightly concave anterior slope (vs. convex in *A. modicus*). There is also a distinct gap in size between *A. pangantihoni* sp.n. (4.7 - 4.9 mm) and the holotype of *A. modicus* (5.9 mm) from "Moaratoa Island" offshore Borneo. The conspecificity of a single, very small worker (4.8 mm) of "*A. modicus*" from the Philippines (Cuernos de Negros) is discussed by BROWN (1978); it needs further investigation. Regarding head sculpture, the longitudinal striae are restricted to the lateral thirds of the frontal area in *A. pa-*



Figs. 12 - 15: *Anochetus pangantihoni* sp.n., paratype worker (CZW; TL 4.89 mm, HW 1.07 mm). (12) Head, frontal aspect; (13) habitus, lateral aspect; (14) mesosoma and petiole, dorsal aspect; (15) labels. © Herbert Zettel.

pangantihoni sp.n., obsolete in *A. brevis*, and filling the entire frontal area and slightly surpassing the frontal carinae posteriorly in *A. modicus*.

According to the description by TERAYAMA (1989), *Anochetus taiwaniensis* TERAYAMA, 1989 from the island of Taiwan differs from *A. pangantihoni* sp.n. by much larger size (TL 6.7 - 7.3 mm), relatively long mandibles (Mdl 0.70 - 0.73), small denticles on the dorsal ridge of the mandibular shaft, and a distinct intercalary tooth.

Anochetus schoedli sp.n. (Figs. 2, 16 - 19)

Etymology: This species is dedicated to the late Dr. Stefan Schödl in reminiscence of our joint expedition to northern Luzon.

Type material: Holotype (worker, UPLB) and one paratype (worker, CZW) from the north of Luzon Island, Benguet Province, near Baguio City, 2 km below Camp John Hay, ca. 1400 - 1500 m a.s.l., 18.II.1999, leg. H. Zettel (# 181) (labels see Fig. 19).

Diagnosis of worker: Very small, light coloured species, TL 3.7 - 3.8 mm. Head (Fig. 16) stout, with hardly emarginated vertex; dorsal sculpture reaching nuchal carina. Eye minute, glabrous. Mandible (Fig. 2) stout and short, Mdl 50; shaft medially with two weak edges, both serrate; intercalary tooth strongly developed. Antenna short, SI 81 - 82. Pronotum smooth, with sparse, fine punctures. Propo-

deum anteriorly strongly constricted (Fig. 18), posteriorly without teeth or lobes. Petiole with narrow, acuminate node in lateral aspect (Fig. 17), its dorsal margin broadly convex in anterior aspect; peduncle almost absent. Gaster tergite 1 with moderately large punctures. Whole dorsum with rather densely set, short setae.

Description of worker: Measurements of holotype: TL 3.80; HL 1.00; HW 0.87; CI 87; MdL 0.50; Mdl 50; SL 0.71; SI 81; MsL 1.20; PnW 0.48; PtH 0.31; PtL 0.32; PtW 0.23. Measurements of paratype: TL 3.77; HL 0.96; HW 0.84; CI 88; MdL 0.47; Mdl 50; SL 0.69; SI 82; MsL 1.19; PnW 0.47; PtH 0.30; PtL 0.31; PtW 0.22.

Colour: Pale yellowish brown; propodeum and gaster tergites 2 - 3 slightly darker than other body parts. Head anterior of eyes, mandibles, antennae, and legs pale yellow.

Structures: Head (Fig. 16) squared, with weakly developed ocular and temporal prominences and hardly emarginated vertex; dorsal sculpture composed of a fine striation on frons and medial part of vertex (reaching posteriad to nuchal carina) and a relatively strong and dense puncturation on lateral parts, which is on medial part indistinct due to overlaying striation. Eye very small, glabrous. Mandible short, stout, medial plane narrow, apically reduced, ventral edge of plane distinctly serrate; intercalary tooth large (Fig. 2). Antenna (Fig. 16) short; scape distinctly widened at middle; flagellum short and stout, antennomere 2 slightly



Figs. 16 - 19: *Anochetus schoedli* sp.n., paratype worker (CZW; TL 3.77 mm, HW 0.84 mm). (16) Head, frontal aspect; (17) habitus, lateral aspect; (18) mesosoma and petiole, dorsal aspect; (19) labels. © Herbert Zettel.

longer than combined length of antennomeres 3+4, following antennomeres steadily increasing in length and width; antennomere 12 (including terminal spine) as long as combined length of antennomeres 9 - 11.

Mesosoma (Figs. 17, 18) stout. Disc of pronotum smooth except for setiferous punctures. Mesonotum smooth, metanotum punctured. Propodeum with pair of longitudinal, anteriorly converging carinae which do not form teeth or lobes; posterior space between carinae (on dorsal surface) finely, transversely striate; posterior face of propodeum smooth. Sides of mesosoma mostly smooth, except for finely coriaceous stripes of lateral part of propodeum.

Petiole with extremely short peduncle; node in lateral aspect (Fig. 17) narrow, triangular, with pointed apex, in anterior aspect (Fig. 18) broad, with broadly rounded dorsal margin. Gaster smooth and shiny except for setae-bearing punctures which are more distinct on anterior half of tergite 1.

Comparative notes: *Anochetus schoedli* sp.n. belongs to the *A. longifossatus* MAYR, 1897 species group as defined by BROWN (1978), an assemblage of small, light-pigmented Oriental species with reduced eyes, axially compressed petiolar node and smooth pronotal disc. However, when identifying *A. schoedli* sp.n. with BROWN's (1978) key to species, it keys out with *A. evansi* CRAWLEY, 1922, a phylogenetically distant species from Iran. As seen in this species, *A. schoedli* sp.n. lacks a pair of propodeal teeth or lobes that is present in all other representatives of

the *A. longifossatus* group. BROWN (1978) noted in his chapter 18 (chiefly dealing with *A. populatus* BROWN, 1978) that he has seen "badly damaged specimens ... from southern Negros" that have the "propodeal angles low and obtuse" and "may well represent yet another local small-eyed species." However, it is presently uncertain, whether Brown's specimens from Negros are conspecific with *A. schoedli* sp.n. from northern Luzon.

***Anochetus weneri* sp.n.** (Figs. 5, 20 - 23)

Etymology: This species is named for the memory of Dr. Floyd G. Werner, dedicated participant of the Philippine Zoological Expedition 1946 - 1947, who collected the type.

Type material: **Holotype** (worker, FMNH) from the south of Mindanao Island, Davao Province, east slope of Mt. McKinley, ca. 1000 m a.s.l. (3,300 ft.), 29.VIII.1946, leg. F.G. Werner (# 31) (labels see Fig. 23).

Diagnosis of worker: Large and slender species, TL 9.4 mm. Head (Fig. 20) slender, with deeply emarginated vertex; striation restricted to frons, medially and (here very weak) laterally of frontal carinae. Eye large, glabrous. Mandible very long, Mdl = 82; shaft medianly with two weak edges, ventral one serrate, dorsal one smooth; intercalary tooth small, but distinct, located at distal third of ventral apical tooth (Fig. 5). Antenna very long, SI 114. Pronotum and metanotum with longitudinal costulae; propodeum with transverse costulae (Fig. 22). Petiole with very broad node in lateral aspect (Fig. 21), its dorsal margin rounded in an-



Figs. 20 - 23: *Anochetus wernerii* sp.n., holotype worker (FMNH; TL 9.40 mm, HW 1.83 mm, PnW 1.09 mm). (20) Head, frontal aspect; (21) habitus, lateral aspect; (22) mesosoma and petiole, dorsal aspect; (23) labels. © Herbert Zettel.

terior aspect (Fig. 22); peduncle short. Gaster tergite 1 with sparse, fine punctures. Whole dorsum with sparsely distributed, erect setae; setae on legs comparatively long.

Description of worker: Measurements of holotype: TL 9.40; HL 2.05; HW 1.83; CI 89; MdL 1.68; MdI 81; SL 2.09; SI 114; MsL 3.23; PnW 1.09; PtH 0.68; PtL 0.78; PtW 0.36.

Colour (Figs. 20 - 22): Specimen having been stored in alcohol till 2010; light colour possibly being partly or entirely result of fading. Mesosoma dark brown, distinctly darker than other body parts. Head and mandibles reddish brown, centre of dorsum slightly darker. Petiole and gaster light reddish brown. Antennae and legs pale orange.

Structures: Head (Fig. 20) with strong ocular prominences and deeply emarginated vertex; striation restricted to frons, chiefly between frontal carinae, but reduced along midline. Eye large, almost reaching head sides laterally. Mandible very long, shaft slender, medial plane terminating in a small tooth, ventral edge of plane weakly serrate; intercalary tooth distinct, located at distal third of ventral apical tooth (Fig. 5), and slightly larger than in related species. Antenna (Fig. 20) long and slender; scape strongly

curved, distal part strongly narrowed; flagellum very slender, antennomeres 2 - 4 of subequal length, following antennomeres steadily but weakly increasing in length.

Mesosoma (Figs. 21, 22) slender. Disc of pronotum with coarse costae, chiefly longitudinally orientated, but anteriorly circular, posteriorly slightly diverging. Mesonotum smooth, metanotum with longitudinal costae. Propodeum with 15 transverse costae, counted along midline. Sides of thorax almost entirely smooth and shiny, except for some weakly developed rugae near meso- and metacoxa.

Petiole with almost triangular node in lateral aspect (Fig. 21), narrowly rounded apex, and short peduncle; sides of node with some weak rugae; in anterior aspect (Fig. 22) node distinctly compressed and its apex narrowly rounded. Gaster smooth and shiny except for sparse setae-bearing punctures.

Comparative notes: *Anochetus wernerii* sp.n. belongs to the *A. risii* species group as defined by BROWN (1978) where it is outstanding by large size (TL 9.4 mm), a very broad node of the petiole (lateral aspect, Fig. 21) and a comparatively large intercalary tooth (Fig. 5).

Notes on other Philippine species

Anochetus graeffei MAYR, 1870 (Figs. 3, 24, 26, 28)

Material examined (Philippine specimens): 2 workers (NHMW) from the central part of Luzon Island, Laguna Province, Mt. Banahaw, above Kinabuhayan village, 600 - 700 m a.s.l., trail to Crystallino, 24.XI.1995, leg. J. Kodada & B. Rigová. 1 worker (CZW) from Masbate Island, 3.5 km southeast of Masbate proper, Tugbo village, Tugbo River area, 2.III.1998, leg. H. Zettel (# 152). 1 gyne (NHMW) from the central part of Palawan Island, above San Rafael, 300 m a.s.l., in degraded forest on slope, 4.XII.1995, leg. J. Kodada.

Measurements of lectotype: TL 4.35; HL 1.07; HW 0.96; CI 90; MdL 0.60; Mdl 56; SL 0.82; SI 85; MsL 1.32; PnW 0.56; PtH 0.39; PtL 0.41; PtW 0.26.

Notes: The taxonomy and synonymy of *A. graeffei* was treated by WILSON (1959) and BROWN (1978). Following these authors, *A. graeffei* is very widely distributed from India to Australia and a most polymorphic species. According to BROWN (1978) this decision is not final: "[The bounds of graeffei variation, and whether or not the species divides into sibling species, are ripe subjects for future gamma-taxonomic studies.](#)" Variation concerns size, colour, and sculpture (most notably on head, pronotum and gaster tergite 1). In the Gustav Mayr Collection at NHMW there are the lectotype (designated by BROWN 1978) and paralectotypes of *A. graeffei* and syntypes of three taxa in synonymy (*A. punctiventris* MAYR, 1878, *A. rudis* EMERY, 1899, and *A. punctiventris taylori* FOREL, 1900) which display the strong variation of *A. graeffei* s.l. In addition, the holotype of *A. ruginotus* from Luzon was examined; *A. ruginotus* is a valid species and must be excluded from synonymy. See also notes under *A. ruginotus*.

Philippine workers and gyne examined are peculiar by some fine striation in addition to the coarse puncturation of gaster tergite 1 (Fig. 28), a character that is also present in a sample from Sarawak, Borneo (NHMW). A distinct indentation of the apex of the petiolar node is present in the workers from Laguna and in the gyne from Palawan, but absent in the Masbate worker.

A hitherto undescribed, but important peculiarity of both *A. graeffei* s.l. and *A. ruginotus* are short setae on the compound eyes (Figs. 24, 25); it is undescribed whether or not this character is also present in other species of Brown's *A. graeffei* group. Less obvious, shorter setae have been also observed in a few species of the *A. risii* group.

Anochetus incultus BROWN, 1978

Material examined: 1 worker (FMNH) from the central part of Luzon Island, Laguna Province, 4 km southeast of Los Baños, Mt. Makiling, 7.V.1977, leg. L. Watrous. 1 gyne (CZW) from the central part of Luzon Island, Quezon Province, Atimonan, forest near Old Zigzag Road, 27.-28. I.2002, leg. H. Zettel (# 300).

Notes: *Anochetus incultus* is a species of the *A. risii* group (BROWN 1978). It was described from five workers and a gyne from Mt. Makiling in Laguna Province; no further record was published. One examined worker from the type locality is much smaller than the types (TL 4.4 mm vs. 4.8 - 5.2 mm) and has a reduced sculpture on frons and pronotum, but is probably conspecific. The gyne from Quezon Province agrees well with the description of the paratype

gyne (BROWN 1978) except for smaller size (TL 5.0 mm vs. 5.6 mm).

Anochetus princeps EMERY, 1884 (Fig. 1)

Material examined: One worker (CZW) from the central part of Luzon Island, Laguna Province, Mt. Makiling, 150 - 500 m a.s.l., 12.IX.1993, leg. H. Zettel (# 21).

Notes: *Anochetus princeps* is unique among all Philippine *Anochetus* species by the structure of the mandible as described in the key and illustrated in Figure 1. It belongs to the *A. rugosus* group (BROWN 1978).

Anochetus princeps was described from Java, as well as its synonyms *A. jacobsoni* FOREL, 1911 and *A. serratus* STITZ, 1925. Other synonyms, *A. princeps* var. *laeta* FOREL, 1910 and *A. jacobsoni* var. *taipingensis* FOREL, 1913 are from Sumatra and West Malaysia, respectively. These synonymies were established by BROWN (1964). BROWN (1978) presented the first record of *A. princeps* from the Philippines: Mount Makiling, Laguna Province, Luzon Island. I have examined one worker from the same mountain. As already noted by BROWN (1964), some allopatric populations of *A. princeps* may turn out to be biological species. Compared to specimens from West Malaysia (CZW, NHMW), the Luzon worker has a more strongly elevated anterior rim of the mesonotum, but otherwise it agrees very well, despite its isolated record. In contrast, specimens from Myanmar and Thailand (CZW, NHMW) may belong to an undescribed species, because they differ considerably in pronotum sculpture and head shape.

Anochetus ruginotus STITZ, 1925 sp.rev. (Figs. 4, 25, 27, 29)

Material examined: Holotype (worker, MNKB) from Luzon, leg. Jagor. Five workers (NHMW) from the northeast of Mindanao Island, Surigao del Norte Province, 40 road-kilometres south of Surigao City, Songkoy Spring environment, 8.II.2000, leg. S. Schödl (# 11).

Diagnosis of worker: TL 4.3 - 4.6 mm; Head (Fig. 25) stout, posteriorly weakly constricted, vertex deeply emarginate; longitudinal striation almost reaching nuchal carina. Eye small, with some minute setae. Mandible stout and short, MdI = 55; shaft medianly with two edges, dorsal one smooth, ventral one minutely serrate; intercalary tooth strongly developed (Fig. 4). Pronotum with distinct longitudinal striation; propodeum with irregular rugosity (Fig. 27). Petiole with narrow node in lateral aspect, its apex narrowly rounded when seen laterally, weakly convex (almost straight) in anterior aspect; peduncle almost absent. Gaster tergite 1 sparsely punctured (Fig. 29). Whole dorsum with densely set, short setae, head with additional subcumbent pilosity.

Measurements of holotype: TL 4.58; HL 1.20; HW 1.05; CI 88; MdL 0.69; Mdl 58; SL 0.96; SI 91; MsL 1.38; PnW 0.56; PtH 0.44; PtL 0.45; PtW 0.24.

Notes: *Anochetus ruginotus* was described from "Luzon" (STITZ 1925); the exact type locality remains unknown. A new record is from northeastern Mindanao and indicates a wide distribution in the archipelago. The species was set in synonymy with *A. graeffei* by BROWN (1978). However, morphological evidence is strong that *A. ruginotus* is a valid species, and the two species can be easily distinguished by the characters presented in the key (couplet 5). *Anochetus graeffei* has a wide distribution and is also pre-



Figs. 24 - 29: Comparison of (24, 26, 28) *Anochetus graeffei* (Luzon, Mt. Banahaw; NHMW; TL 3.61 mm, HW 0.79 mm) and (25, 27, 29) *A. ruginotus* (Surigao, Songkoy Spring; NHMW; TL 4.43 mm, HW 1.03 mm). (24, 25) Head, frontal aspect; (26, 27) mesosoma and petiole, dorsal aspect. (28, 29) gaster, dorsal aspect. © Herbert Zettel.

sent in the Philippines (see above). At a first glance *A. ruginotus* and *A. graeffei* have a very different habitus. While in *A. graeffei* the head is squared and the mesosoma is broad, *A. ruginotus* has a deep emargination of the vertex and the mesosoma is slender as in most other *Anochetus* species (comp. Figs. 24 - 27). Body size, ratio of PW / HW and sculpture of gaster tergite 1 (see the key above and Figs. 28 - 29) differ conspicuously when comparing Philippine specimens of the two taxa. However body size ranges are overlapping when including all populations of *A. graeffei* s.l. The entire mandible, but most notably its apical teeth are usually more gracile in *A. graeffei* than in *A. ruginotus* (comp. Figs. 3 and 4), except for the syntypes of *A. rudis*, which have stout mandibles, almost as *A. ruginotus*. An additional difference between *A. ruginotus* and *A. graeffei* is found in head sculpture (comp. Fig. 24 and 25). Al-

though strong variation is observed in the extension of the striation in *A. graeffei*, in all forms a strong puncturation is intermitting the striae, so that in densely sculptured specimens the intervals appear interrupted. In contrast setiferous punctures in *A. ruginotus* are very fine and hardly "disturbing" a regular striation. A difference in the apex of the petiolar node, which is rounded in *A. ruginotus* and incised in some Philippine *A. graeffei* specimens, is not consistent in *A. graeffei* s.l.

Discussion

Species diversity: The ant diversity of the western Malasian Region is still poorly understood, especially for forest dwelling species. Several recent studies have demonstrated a high degree of endemism on the region's several thousands of islands, not only in the Philippines (e.g., ZETTEL

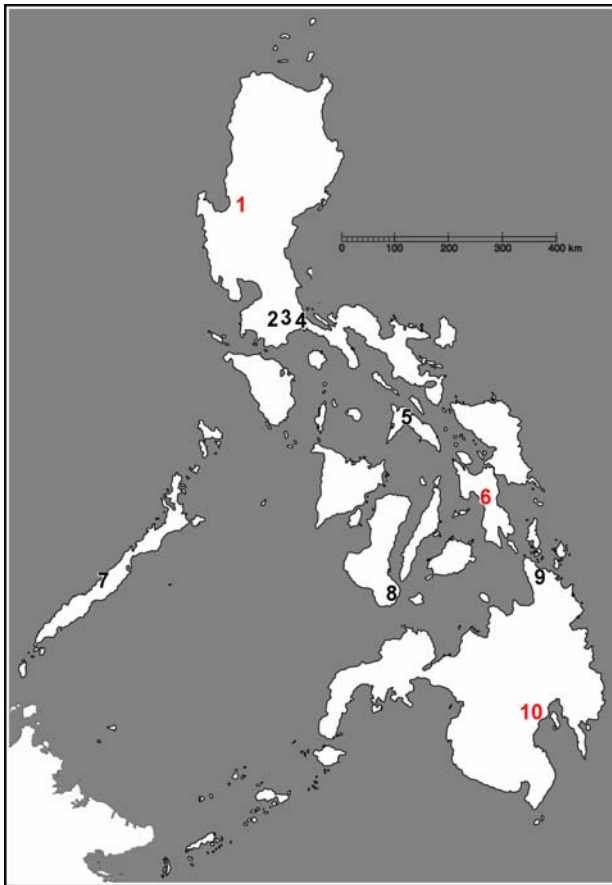


Fig. 30: Map of the Philippine Islands with all published records of *Anochetus* (except uncertain type locality of *A. ruginotus*); red numbers indicate type localities of new species: 1 – Baguio, Camp John Hay: type locality of *A. schoedli* sp.n. 2 – Los Baños and Mt. Makiling: type locality of *A. incultus* (see BROWN 1978) and records of *A. princeps*. 3 – Mt. Banahaw: records of *A. graeffei* and *A. isolatus* (see BROWN 1978). 4 – Quezon, Atimonan: record of *A. incultus*. 5 – Masbate Island: record of *A. graeffei*. 6 – Leyte State University, slopes of Mt. Pangasugan: type locality of *A. leyticus* sp.n. and *A. pangantihoni* sp.n. 7 – Palawan, San Raffael: record of *A. graeffei*. 8 – Dumaguete, Cuernos de Negros: records of *A. graeffei*, *A. isolatus*, *A. modicus*, and an unnamed *A. longifossatus*-group species (see BROWN 1978). 9 – Surigao, Songkoy Spring: record of *A. ruginotus*. 10 – Mt. Apo-Mt. McKinley range: type locality of *A. brevis* (see BROWN 1978) and *A. weneri* sp.n.

2006, ZETTEL & ZIMMERMANN 2007, ZETTEL & SORGER 2010a, b, SORGER & ZETTEL 2011, ZETTEL & SORGER 2011), but also in neighbouring Malaysia and Indonesia (e.g., EGUCHI 2001, BOLTON 2007, KOHOUT 2008, 2009, MEZGER & PFEIFFER 2010).

At least eleven species of *Anochetus* have been recorded from the Philippines. One additional unnamed species of the *A. longifossatus* species group may belong to *A. schoedli* sp.n. Of the eleven species, *A. graeffei* and *A. ruginotus* belong to the *A. graeffei* group, *A. isolatus* to the *A. cato* FOREL, 1901 group, *A. schoedli* sp.n. to the *A. longifossatus* group, and *A. princeps* to the *A. rugosus* EMERY, 1890 group. The other six species belong to the *A. risii* group, which shows a great diversity in southeastern Asia and eastwards to Taiwan, the Philippines and New Guinea (BROWN

1978, TERAYAMA 1989). Endemism is chiefly found in the *A. risii* group: Five species are only recorded from single locations in the Philippines, the identification of the sixth species (*A. modicus* from Negros) needs confirmation. The mountainous species *A. schoedli* sp.n. is probably also a locally endemic species, as are all other members of the *A. longifossatus* species group (see BROWN 1978). Their small body size, light pigmentation, and minute eyes indicate a life in the lower leaf litter and possibly low dispersal abilities. Three species, *A. graeffei*, *A. princeps* and *A. isolatus* have wide distribution. However, more detailed taxonomic studies may change the concept of species with high morphological variability like *A. graeffei* and *A. isolatus*. *Anochetus ruginotus* is presently only recorded from the Philippines, but as the taxon was hitherto in synonymy with *A. graeffei*, it may have a wider distribution than presently known.

Considering the fragmentary collection data from a very few, well-studied sites (Fig. 30), it can be expected that the Philippine *Anochetus* fauna is much richer than presently known. Preliminary results indicate a high rate of endemic species, some being possibly restricted to individual islands or mountain ranges. The situation resembles that of *Odontomachus* and *Pristomyrmex* (see ZETTEL 2006, SORGER & ZETTEL 2011).

Habitats: Most Philippine records of *Anochetus* are from forested slopes of mountains at low elevations. Exceptional is one lowland record of *A. graeffei* from Masbate, which fits well to observations on some other widely distributed, euryoecious ants species (e.g., *Odontomachus simillimus* SMITH, 1958; see SORGER & ZETTEL 2011). WILSON (1959: p. 507) speculates that "very probably it [*A. graeffei*] has been distributed through part of this range by the inadvertent agency of man." Highest *Anochetus* records in the Philippines are the type localities of *A. weneri* sp.n. (ca. 1000 m a.s.l.), *A. schoedli* sp.n. (ca. 1400 - 1500 m a.s.l.) and *A. brevis* (1520 - 1830 m a.s.l.). BROWN (1978) reports a collection of *A. princeps* at an elevation of ca. 1500 m (5000 ft) on Borneo. These are among the highest records in the genus.

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