

New data on the genera *Euchomenella* and *Tagalomantis* (Dictyoptera: Mantidae: Angelinae)

Новые сведения о родах *Euchomenella* и *Tagalomantis* (Dictyoptera: Mantidae: Angelinae)

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New material from Borneo Island, Malacca Peninsula, Pangkor and Luzon islands was examined. A new species, *Euchomenella udovichenkoi* **sp. nov.**, is described. It differs from other species of the genus by shape of the hypophallus and the pseudophallus, in having a curved furcasternum, a number of joints in the cerci and an almost dull colouration. Genitalia of *Tagalomantis manillensis* (Saussure, 1870) are described for the first time. New localities for *Euchomenella matilei* Roy, 2001, *E. macrops* (Saussure, 1870), and *E. molucarum* (Saussure, 1872) are given.

Изучен материал с острова Борнео, полуострова Малакка, островов Пангкор и Лузон. Описан один новый вид *Euchomenella udovichenkoi* **sp. nov.** Он отличается от известных видов рода формой гипофаллуса и псевдофаллуса, искривленным фуркастернумом, количеством члеников в церках и почти матовой окраской. Впервые описаны гениталии *Tagalomantis manillensis* (Saussure, 1870). Приведены новые локалитеты для *Euchomenella matilei* Roy, 2001, *E. macrops* (Saussure, 1870) и *E. molucarum* (Saussure, 1872).

Key words: praying mantids, morphology, male genitalia, cervical sclerites, Indomalayan Region, Mantodea, Mantidae, Angelinae, *Euchomenella*, *Tagalomantis*, new species

Ключевые слова: богомолы, морфология, гениталии самца, шейные склериты, Индомалайская область, Mantodea, Mantidae, Angelinae, *Euchomenella*, *Tagalomantis*, новый вид

INTRODUCTION

Subfamily Angelinae of the family Mantidae was erected by Beier (1964) and includes slender, stick-like praying mantids with armament shifted to the femoral apex, shortened tibiae and a long pronotum with the metazone much longer than the prozone. In Oriental tropics, the group is represented by six genera (Roy, 2001, 2002, 2008; Vyjayandi, 2009), the most common being *Euchomenella* Giglio-Tos, 1916, whose synonym *Tagalomantis* Hebard, 1920 has been restored recently. A detailed review of taxonomy of these genera can be found in Roy (2001), who also pointed to an insufficient knowledge of this taxa. Most

species are known by few specimens, often by males only. The male genitalia were described only recently (Roy, 2001). Biology and ecology of these genera are practically unknown, although there are suppositions that their main habitats are bush and dense crowns of trees (Prete et al., 2012). The study of a limited material from Malaysia, Thailand and Philippines brings new data on the aforementioned genera, including one new species.

MATERIAL AND METHODS

All specimens except one were collected by light trap and killed by fumes of ethyl acetate. Collecting methods for the single

male of *Tagalomantis manillensis* (Saussure, 1870) are unknown. Dry material was soaked, genitalia were extracted and cleaned in 5% water solution of KOH, followed by washing in water. The genitalia and terminalia are stored in 80% ethanol in microvials. Study and sketching of the genitalia as well as other structures were carried out using a light microscope MBS-10 (LSOZ, JSC).

Dried whole specimens, genitalia and terminalia are deposited in the Zoological Institute of Russian Academy of Sciences (ZIN), Zoological Museum of Lomonosov Moscow State University (ZMMU) and in the author's personal collection (ESPC).

Terminology of the male genitalia follows Klass (1997) with terms from Beier (1964) given in brackets. Terminology of the cervical sclerites follows Wieland (2006).

SYSTEMATICS

Order **DICTYOPTERA**

Family **MANTIDAE**

Subfamily **ANGELINAE**

Genus ***Euchomenella*** Giglio-Tos, 1916

Diagnosis. Internal apical lobes of forecoxa adjacent. Second discoidal spine of forefemur longer than the first one. Foretibia with seven external spines (very rarely with eight). Ratio of prozone length to length of metazone 3.7–5.4. Cerci simple. Female significantly larger than male, with strongly shortened fore- and hindwings. Ratio of forewing length to length of pronotum 1.10–1.38 for males and 0.22–0.28 for females.

Included species. Eight species, including one new described below.

Euchomenella udovichenkoi sp. nov. (Figs 2, 6, 7, 9, 11, 12)

Holotype. Male; **Malaysia**, Borneo, Sabah State, Tambunan Distr., Trus Madi Mt., 1150 m, mixed dipterocarp forest, 28 March – 10 April 2011, coll. P. Udovichenko (ZIN).

Paratype. Male (nor. 10379, 10380), same state and mountain, but Keningau Distr., 1160 m, mixed dipterocarp forest, 28 July 2012, coll. A. Klimenko (ESPC).

Description. *Male.* Head transverse, flattened, with ocelli well developed. Eyes large, oval shaped. Antennae longer than half of body length, broken off in holotype, presumably complete in paratype. Width of first segment slightly less than transverse diameter of median ocellus; second segment considerably narrower than first one, oblong, with small constriction at middle; third segment elongated, cylindrical; fourth and subsequent segments cylindrical, shortened or elongated; on left antenna of holotype, segments beginning with 52nd one very flattened and rectangular (probably result of trauma or ontogenetic defect). Each segment with 4–7 long setae, and 10th and subsequent segments also covered with short sensillae. Vertex with two well developed longitudinal scores.

Intercervicalia (Fig. 9, *icv*) triangular, with their ends fused; longitudinal groove (Fig. 9, *lcvg*) narrow, extending along whole lateral cervical sclerites (Fig. 9, *lcs*). Two ventral cervical sclerites developed (Fig. 9, *vcs*); distal sclerite narrower than proximal one. Basisternum almost smooth, with two narrow longitudinal elevations.

Pronotum very long and narrow; its edges with rare small teeth slightly more pronounced in prozone, while in posterior half of metazone, these edges almost smooth; sometimes isolated smaller denticles developed between these teeth. Prozone semicircular in cross section, narrowed to anterior end, where it rounded and bordered by wide fringe. Surface of prozone smooth, near transverse groove with wide longitudinal impression turned into very narrow, faint groove; this groove extending up to anterior end of prozone. Transverse groove greatly depressed, bent laterally and turned into fringe of prozone running to anterior end of pronotum. Supracoxal dilatation of pronotum small but distinct, with a pair of small teardrop-like impressions in posterior half

of dilatation. Metazone five times as long as prozone, gradually expanding to posterior edge of pronotum, with median carina beginning from transverse groove and increasing in height after supracoxal dilatation; cross section of metazone in shape of triangle. In posterior half of metazone, sides of this triangle equal to base of this triangle in length or longer than this base, and lower edges of pronotum in profile with very low but distinct projection (Fig. 12) reflecting curvature of furcasternum. Most posterior part of pronotum widely rounded, with two elevations sitting close to each other near posterior end of median carina, and with two shallow oblique grooves lateral to these elevations.

Forecoxae and forefemora long, narrow, trigonal. Surface of verges of forecoxa generally smooth, with dense punctation. External anterior verge at base covered with rare long hairs, external posterior verge with short hairs. Spines on ribs located far from each other; between them, 1–3 smaller tubercles developed. Base of each spine or tubercle with short seta. Anterior ribs of forefemora with series of spines with setae, as on forecoxae. Posterior surface of forefemur with series of bigger and more noticeable regular spines, beginning from base and ending between 1st and 2nd discoidal spines. First discoidal spine located approximately at 0.57 of forefemur length from femoral base. Second discoidal spine two times as long as first one, third discoidal spine 1.5–2 times as long as second one, fourth discoidal spine slightly shorter than first one. Each forefemur with four external spines, 15 internal spines on left and 14 (16 in paratype) internal spines on right legs, and one apical spine on each side. Foretibia short, slightly longer than 1/3 of forefemur, with setae on anterior surface, with seven external spines, with 15 (14 in paratype) and 14 (16 in paratype) internal spines on left and right legs, correspondingly. Foretarsus covered with setae, its first segment longer than all others together. Middle and hind legs very thin and slender. Middle and

hind femora covered with rare hairs, tibiae and tarsi, with dense hairs. Apex of middle and hind femora with short heel. First segment of middle tarsus 2 times and of hind tarsus 3 times longer than all other segments of same tarsus together. Arolium absent. Fore- and hindwings well developed, narrow, almost reaching abdominal apex.

Abdomen with seven visible sternites. Sternites II–V prolonged, with very small protrusions at middle of posterior edges; sternite VI square; sternites VII–VIII transverse. Genital plate slightly asymmetrical, wide, narrowed to apex and truncated. Its apex covered with relatively long dense hairs below. Right stylus absent (broken off); left stylus very short, with a single seta. Anal plate (Fig. 11) roughly pentagonal, covered densely with short setae near posterior edge. Cerci simple, with 12 joints each. First joint longer than wide; second joint very short; joints from third to seventh clearly transverse; eighth joint square; rest joints longitudinal, but 12th joint conical. Joints starting from second one covered with long setae. Inner sides of cerci with more longer setae than outer ones.

Genitalia (Figs 2, 6, 7) typical of higher praying mantids, although sclerotisation of many areas very weak, and boundaries of some elements not well defined. L4A (hypophallus) short, rectangular; its maximum length approximately 1.5 times as great as its maximum width. Short triangular protuberance developed on L4A in place of connection between L4A and L4B (left epiphallus). L4B weakly arcuate; its left boundary well defined while the right one sclerotised only in proximal third; distal part of L4B fused with L1 (pseudophallus). Two visible folds on dorsal surface of L4B in middle of its length presented. L2 (titillator) proximally fused with dorsal surface of L4A; thick membrane connecting proximal half of left boundary of L2 with left boundary of L4B developed. Distal half of left boundary of L2 curved toward its middle and forming big fold with cavity inside; right boundary of this fold not fused with

dorsal surface of L2. Right boundary of L2 not well defined, gradually transitioned into membranous right boundary of L4B. Distal end of L2 forming twisted hook (Fig. 2, *paa*), end of which covered with several longitudinal rows of depressed points: apical points with very miniature setae in the middle. L1 (pseudophallus) well defined everywhere except at its base. At distal end, its dorsal surface fused through narrow "crest" with sclerotised part of ventral surface of L4B while ventral surface of L1 forming heavily sclerotised apophysis (apophysis of pseudophallus). Apophysis (Fig. 2, *aph*) elongated, slightly narrower at apex, and with apex and most part of right boundary covered with very small tubercles. R1 (right epiphallus) thick, triangular, with strong rounded notch proximally (Fig. 6). Left "branch" of sclerite R1A very elongated, right "branch" of R1A sclerotised only in proximal half and with distal end not well defined. Three areas of rare depressed dots on ventral surface of R1A developed: near distal end (near "apex" of triangle) and along borders of each "branch" (on right "branch", this band of dots curved to R1B). "Apex" of triangle also covered with rare setae. R1B situated ventrally on right "branch" of R1A; boundary between R1B and R1A unclear. R1B similar in shape to R1A, its left "branch" with strongly curved and sclerotised apophysis having smooth surface (apophysis of right epiphallus), and its right "branch" connected with narrow, strongly elongated R3.

Colouration of holotype. Dark. Head copper, front and central area of vertex brown with light band from odd ocellus through front and vertex. Eyes brown. Scape and pedicel yellowish, rest of segments black. Pronotum light brown with small compact dark brown spots on venter and larger dark brown areas on dorsum (latter areas partly fused with each other). Dorsum of abdomen unicolour, dark-brown; abdominal venter light-brown with lighter sternite VIII and middle of sternite II, with dark-brown triangular marks at base of ster-

nites III–VII, and with smaller dark marks on rest of venter. Genital plate dark-brown along edges, lighter in middle, and with whitish spots. Fore legs exteriorly brown, with chaotically placed darker and lighter spots. Forecoxae interiorly dark-brown, with whitish lateral edges. Spines dark, with brown spots at the bases. Foretrochanters beige. Forefemur with internal dark-brown spot at base, light-brown area situated slightly distad and having dark-brown patches, wide dark-brown transverse band situated near middle of femur, copper spot almost reaching beginning of internal spine series, second (more distal) dark transverse band interrupted by next light area, third dark band over femoral brush, and apical part of forefemur light-brown with darker marks. Foretibia interiorly yellowish, with three equidistant from each other narrow dark transverse bands. External spines of foretibia brown. First and second external spines of forefemur, second discoidal, and internal spines situated on the dark parts of this femur black; remaining spines yellow with brown vertices. Middle and hind femora and tibiae off-white, atop and below with black bands sometimes merging with each other. Middle and hind tibiae painted in brown distally. Tarsi brown. Forewings translucent, with light bronze sheen, covered with merging dark spots and whitish areas between them. Apices of forewings slightly darker anteriorly. Costal and subcostal fields of hindwings coloured like forewings; rest part uniformly darkened, transparent. Anterior lobe of hindwing with barely noticeable bronze sheen and slightly darker apical part.

Paratype with lighter overall colouration and especially light on forelegs being exteriorly beige with small dark-brown patches and interiorly with more fragmented dark areas. Pronotum dorsally with brighter and bigger light brown areas, too. Colouration of abdomen and wings same as in holotype.

Female unknown.

Measurements in mm (values for paratype in brackets). Body length 63 (65);

head width 4.9 (5.05); pronotum: total length 26.1 (27.4), maximum width 2.5 (2.5), length of prozone 4.3 (4.2); length of forecoxa 12.4 (12.7); length of forefemur 14.5 (14.8); length of foretibia 5.6 (5.9); length of hindfemur 15.4 (15.5); forewings: total length 35 (35), maximum width 6.1.

Comparisons. The new species differs from other known species of the genus by the following characters: (1) the furcasterium is clearly curved in lateral view [all other species having the furcasterium more or less straight posterior to the supracoxal dilatation, and the height of the pronotum gradually rising to the posterior end]; (2) L4A (hypophallus) in male genitalia is short, rectangular, with a process at the top left corner [all other species with L4A elongated, simple]; (3) the apophysis of L1 (apophysis of pseudophallus) elongated, narrowed to the apex, covered with small but well noticeable tubercles along the right border and on the apex [such tubercles have not been reported in other representatives, including *E. heteroptera* (De Haan, 1942), which is the only species with an elongated apophysis known before; the unusual specimen of *E. macrops* (Saussure, 1870) described below also has an elongated apophysis, but irregularities on its surface are visible only under a very high magnification; specimens of all other species examined by the author possess the apophysis broad and smooth]; (4) the degree of sclerotisation of male genitalia is lower than in all other species, the boundaries of its elements are not well defined; (5) the anal plate is almost triangular near the apex [all other species with anal plate markedly truncated at the apex, although this character is, most likely, a matter of variability]; (6) cerci with 12 joints [all other species with cerci consisting of 14 joints]; (7) colouration of the fore- and hindwings differs from that in other congeners in its pattern and by a smaller sheen. *Euchomenella udovichenkoi* **sp. nov.** is similar to *E. matilei* Roy, 2001 by the colouration pattern and shape of pronotum, and to *E. molucarum* (Saussure, 1872) and

E. heteroptera, by the proportions of body parts. But, in general, the new species is well separated from the others.

Etymology. This beautiful and interesting species named in honour of one of its collectors, coleopterologist Pavel Udovichenko.

Euchomenella macrops (Saussure, 1870)
(Fig. 1)

Material examined. One male (nor. 10370, 10372); **Thailand**, Trat Prov., Ko Kut Distr., Ko Kut I., 6–9 August 2010, coll. A. Klimenko (ESPC).

Remarks. This is the first record outside Vietnam. The male generally corresponds to the original description and clarifications made by Roy (2001). It is similar to the specimens from Vietnam deposited in ZIN collection but differs a little by proportions of the body parts and, more significantly, by shape of L1 (pseudophallus and its apophysis). The right forecoxa has nine external spines; the left one has ten external spines separated by smaller rare tubercles. The forefemur bears 15 and the foretibia 13 internal spines.

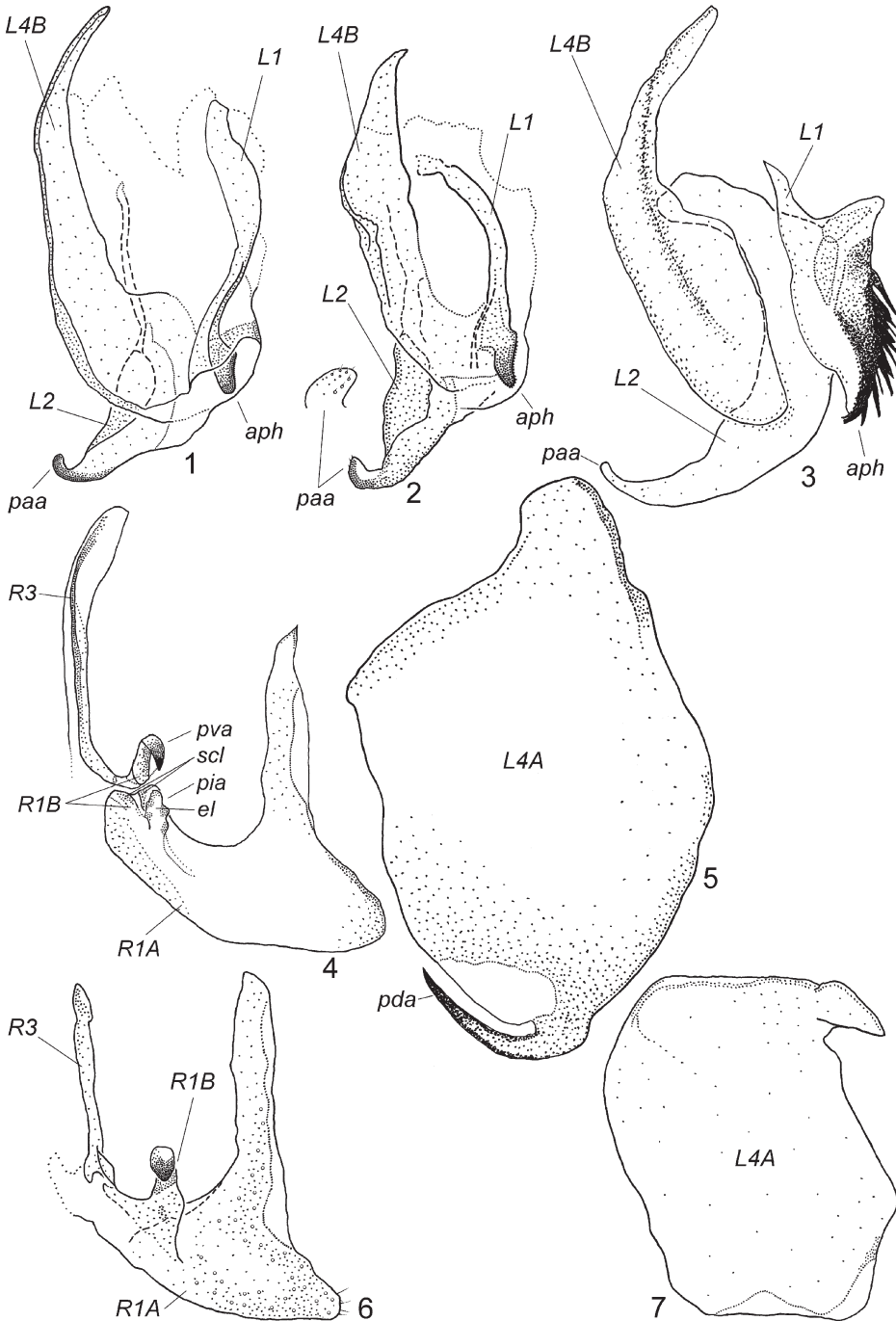
Measurements in mm. Body length 59; head width 6; pronotum: total length 25, maximum width 2.8, length of prozone 4.9; length of forecoxa 12.5; length of forefemur 15.2; length of foretibia 6.6; length of hindfemur 15.4 mm; forewing: total length 30, maximum width 5.9.

Euchomenella molucarum (Saussure, 1872)
(Figs 8, 13)

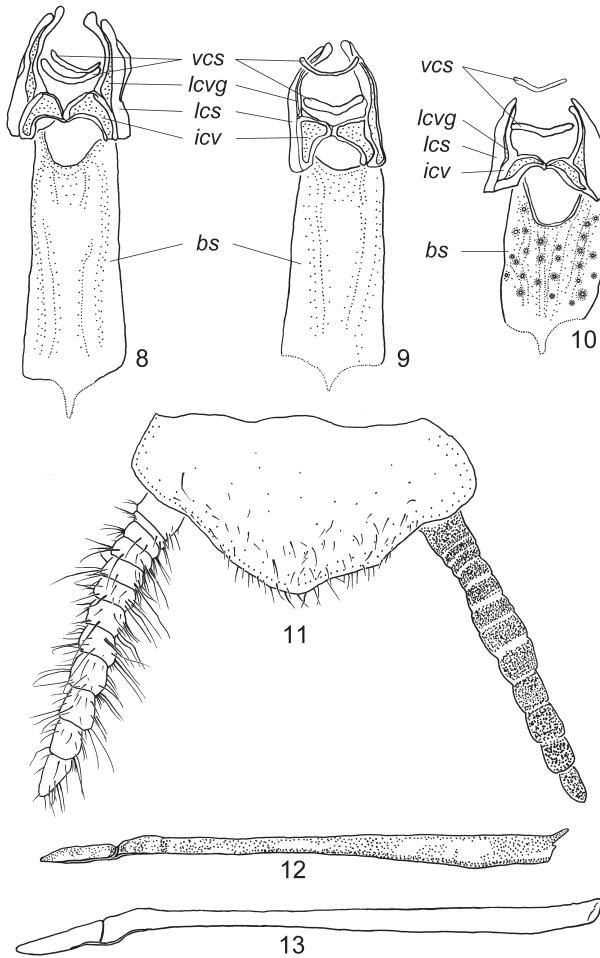
Euchomena moluccarum Saussure et Zehntner, 1895

Material examined. One male (nor. 10373, 10374); **Malaysia**, Perak State, Pangkor I. near Malacca, 20–25 August 2010, coll. A. Klimenko (ESPC).

Remarks. This specimen was caught on Pangkor Island off the coast of Perak in north-west peninsular Malaysia, and there is no reason that this species would not be



Figs 1–7. *Euchomenella* and *Tagalomantis*, male: 1, *E. macrops*; 2, 6, 7, *E. udovichenkoi* sp. nov.; 3–5, *T. manillensis*. Genitalia: left dorsal complex, dorsal view (1–3); right dorsal complex, ventral view (4, 6); hypophallus, ventral view (5, 7). Abbreviations: *pda*, distal process of hypophallus; *paa*, distal hook of titillator; *aph*, apophysis of pseudophallus; *pva*, anterior part of sclerite R1B; *pia*, posterior part of sclerite R1B; *el*, elevated platform of posterior part of sclerite R1B; *scl*, heavily sclerotised areas on posterior part of sclerite R1B. Figs 1–7 made at the same scale.



Figs 8–13. *Euchomenella* and *Tagalomantis*, male: **8, 13**, *E. molucarum*; **9, 11, 12**, *E. udovichenkoi* sp. nov.; **10**, *T. millensis*. Cervical sclerites (8–10); anal plate (11); prothorax, lateral view (12–13). Abbreviations: *bs*, basisternum; *icv*, intercervicalia; *lcs*, lateral cervical sclerites; *vcs*, ventral cervical sclerites, *lcvg*, lateral longitudinal grooves.

present on Malayan Peninsula itself. The mantis is quite larger than Sunda Islands's specimens from collection of Muséum National d'Histoire Naturelle (Roy, 2001), but overall corresponds to their description. Genitalia also show that the male is conspecific with *E. molucarum*. It should be recalled that there is uncertain synonymy of *E. molucarum* and *E. apicalis* Werner, 1922. As I did not have an access to the type material

of both species, the identification of this particular specimen as *E. molucarum* rather than *E. apicalis* is quite arbitrary.

Measurements in mm. Body length 72; head width 6.1; pronotum: total length 31, maximum width 3, length of prozone 5.1; length of forecoxa 13.6; length of forefemur 16.1; length of foretibia 6.7; length of hindfemur 18.2; forewing: total length 35, maximum width 6.6.

Euchomenella matilei

Roy, 2001

Material examined. Two males (nor. 10375, 10378); **Malaysia**, Borneo, Sabah State, Tambunan Distr., slopes of Trus Madi Mt., 1200 m, mixed dipterocarp forest; 23 April – 8 May 2006, coll. A. Sochivko (ESPC).

Remarks. These newly collected specimens of the largest representative of the genus show different variants of colouration, from light to dark. The light colouration is characterised by the body being light-brown, the legs yellow, the presence of black spots with well-defined boundaries on the ventral side near the apex of the forecoxae and at the base of the forefemora, the transverse bands of the forefemora light-brown, diffuse, and the forewings having

relatively large transparent areas. The dark variant has the pronotum dark-brown, the legs dorsally dark-brown with rare yellow-brown patches, ventrally yellowish but with well-marked black spots and bands, and the forewings strongly smoky, with rare and small transparent areas. The basisternum is similar in shape to that in other representatives of the genus, almost smooth, with a medial elevation in the distal third. In one of the males, the basisternum has few,

barely noticeable and very low tubercles.

Measurements in mm. Body length 76–82; head width 6.5–6.7; pronotum: total length 33–36, maximum width 3.6, length of prozone 5.7–5.9 mm; length of forecoxa 14.6–17; length of forefemur 17–18.1; length of foretibia 7.1–7.3; length of hindfemur 18–19.5; forewing: total length 45.5–49, maximum width 8.9–9.5.

Tagalomantis Hebard, 1920

Remarks. Study of the single available specimen allow to confirm the validity of restoration of this genus from the synonyms of *Euchomenella*. *Tagalomantis* differs from other Oriental genera of Angelinae in many respects. In external morphology, it differs from *Euchomenella*, *Indomenella* Roy, 2008, *Rhodomantis* Giglio-Tos, 1917 and *Mythomantis* Giglio-Tos, 1916 by the presence of 11–12 external spines on foretibia; from *Euchomenella*, in addition, by a short basisternum covered with very noticeable tubercles and by ratio of the pronotum length to length of the body that is equal to 0.33–0.38 for males of *Tagalomantis* and 0.41–0.47 for males of *Euchomenella*. It is distinguishable from *Cotigaonopsis* Vyjayandi, 2009 by fully developed wings in male and by inner apical lobes of the forecoxa adjacent, and from other genera of Angelinae by the inner apical lobes of forecoxa adjacent and the second discoidal spine longer than the first one. But the most important differences are in the male genitalia structure. L4A (hypophallus) has a long, curved distal process, sharpened at the end. In other genera of Oriental Angelinae, such a process is more or less short (*Indomenella*, *Mythomantis*, *Rhodomantis*, *Cotigaonopsis*) or absent at all (*Euchomenella*). L1 (pseudophallus) in *Tagalomantis* is short and not separated from L2 (titillator), as it represents an actual continuation of L2 (Fig. 3), while almost in all other mentioned genera (situation with *Cotigaonopsis* is unclear) and even in the African angeline genus *Stenopyga* Karsch, 1892, L1 is a clearly separate structure con-

nected with L2 through membrane. It is not even clear, whether these structures are homologous in *Tagalomantis* and other Angelinae genera. Apical hook of L2 is flat in *Tagalomantis* (Fig. 3) but twisted at the end and having bulging along its left boundary in *Euchomenella* (Figs 1, 2), *Cotigaonopsis* as well as in *Stenopyga* (these characters in other genera are unknown). To summarise, the genus which has been synonym of *Euchomenella*, may represent a quite unrelated evolutionary branch.

Tagalomantis manillensis (Saussure, 1870) (Figs 3–5, 10)

Material. One male; **Philippines**, Luzon, Laguna, Los Banos, 5 April 1917, coll. N. Ikonnikov (ZMMU).

Additional description. Basisternum short, with relatively large tubercles, unlike *Euchomenella* having basisternum almost always smooth (see above for *E. matilei*). Intercervicalia elongated, curved. Left foretibia with 17 internal and 12 external spines, right one with 16 internal and 11 external spines.

Structure of genitalia typical of praying mantids. L4A (hypophallus) elongated, with proximal lobe and distal process (Fig. 5, *pda*) situated on the left side of the posterior edge and turned to right side. L4B (left epiphallus) bucket-like shaped, with heavily sclerotised fold on ventral side, beginning approximately in middle of bigger lobe, then continuing along bigger and smaller lobes, and fusing with left edge of smaller lobe. L2 (titillator) arcuate, narrowed to distal end, forming flat hook (Fig. 3, *pa*). Right edge of titillator curved ventro-dorsally and forming L1 (pseudophallus). L1 wide, forked proximally, and strongly narrowed distally. Two touching elongated and stronger sclerotised areas presented on L1: first one situated along right proximal fork; second area situated more distal than first area, along middle part of L1. Very heavily sclerotised area also presented along right side of L1, more latero-distal than

aforementioned areas; this heavily sclerotised area transforming on right border into multiple long, thin spines (apophysis of pseudophallus). Distal end of L1 forming tight bundle of these spines, while its left edge near this end sclerotised very weakly. R1 (right epiphallus) triangle, with strong cut along the anterior edge. Sclerites R1A and R1B demarcated by weakly sclerotised but noticeable fold running ventrally along right "branch" of R1. R1B divided into two contraposed parts of complicate form; posterior part (Fig. 4, *pia*) with elevated platform having five prominent "ledges" (Fig. 4, *el*) and with two heavily sclerotised areas near this platform (Fig. 4, *scl*); anterior part (apophysis of right epiphallus) thick, strongly curved, and smooth excepting apical part (Fig. 4, *pva*). R3 narrow, strongly elongated.

Measurements in mm. Body length 30; head width 4.7; pronotum: total length 19, maximum width 2.4, length of prozone 3.5; length of forecoxa 8.7; length of forefemur 10; length of foretibia 5.6; length of hindfemur 10.9; forewing: total length 28.5, maximum width 5.5.

Remarks. The genitalia of this species have not been described so far because of the damage of all known specimens.

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