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NEW GENUS AND SPECIES OF FLOWER MANTIDS (INSECTA: MANTODEA: HYMENOPODIDAE) FROM VIETNAM

E.O. Shcherbakov

Faculty of Biology, Lomonosov Moscow State University, Leninskie Gory st. 1 bldg 12, 119991 Moscow, Russia; e-mail: dracomantis@gmail.com

ABSTRACT

A peculiar new genus and species of the flower mantids (Mantodea, Hymenopodidae) from South-Eastern Vietnam, *Parapsychomantis vietnamensis* gen. et sp. nov., is described. The new genus belongs to Acromantinae, Acromantini, as indicated by the diagnostic characters of the tribe and its similarity to *Rhomantis* Giglio-Tos, 1915, *Psychomantis* Giglio-Tos, 1915 and *Oligomantis* Giglio-Tos, 1915. It differs from all of the abovementioned genera by the combination of small vertex process, small medial lobes on mesofemora and by dense, irregular cross-veins network on the forewings. The distribution of the morphological characters directly related to crypsis (leg lobes) among members of the tribe is reviewed and illustrated. The genitalia of the new genus are illustrated and described. Comparison with other species of Acromantini with known genitalia shows noticeable differences in shape of structures and level of sclerotization indicating an understudied diversity of this complex in the tribe. The finding presents an interesting biogeographical problem because all morphologically similar genera are restricted to the south of Sundaland area. Possible explanations include insufficiently dense sampling of the adjacent areas, misleading morphology and past biogeographical factors related to the distribution of Sundaland plant communities. A comprehensive revision of the subfamily is necessary to explain the evolution of crypsis characters and biogeographic distribution. We also present a modified key to the genera and species of Acromantini.

Keywords: Acromantini, Hymenopodidae, Mantodea, new genus, new species, Vietnam

НОВЫЙ РОД И ВИД ЦВЕТОЧНЫХ БОГОМОЛОВ (INSECTA: MANTODEA: HYMENOPODIDAE) ИЗ ВЬЕТНАМА

Е.О. Щербаков

Биологический факультет, Московский Государственный Университет им. М.В. Ломоносова, ул. Ленинские горы 1 с. 12, 119991 Москва, Россия; e-mail: dracomantis@gmail.com

РЕЗЮМЕ

В статье описан *Parapsychomantis vietnamensis* gen. et sp. nov., новый род и вид цветочных богомолов (Mantodea, Hymenopodidae) из Юго-Восточного Вьетнама. Новый род принадлежит к подсемейству Acromantinae, трибе Acromantini, что демонстрируется соответствующими диагностическими признаками, а также сходством с родами *Rhomantis* Giglio-Tos, 1915, *Psychomantis* Giglio-Tos, 1915 and *Oligomantis* Giglio-Tos, 1915. От указанных родов новый род отличается комбинацией небольшого теменного бугорка, небольших средних лопастей на средних бедрах и плотной, неправильной сеткой поперечных жилок надкрыльев. Рассмотрено и проиллюстрировано распределение среди членов трибы морфологических признаков, непосредственно имеющих отношение к камуфляжу (лопасти на ногах). Гениталии нового рода изображены и описаны. Сравнение с другими видами Acromantini, у которых описаны гениталии, демонстрирует заметные отличия в форме структур и уровне склеротизации. Это показывает неизученность разнообразия этого комплекса в трибе. Находка представляет интересную биогеографическую проблему, поскольку распространение морфологически сходных родов ограничено югом Зондской области. Возможные объяснения включают недостаточную обследованность прилегающих регионов, плезиоморфный или конвергентный характер сходства и палеогеографи-

ческие факторы, связанные с распределением растительных сообществ в Зондской области. Необходима полноценная ревизия подсемейства, чтобы объяснить эволюцию признаков камуфляжа и распространение. Также в статье дается модифицированная определительная таблица родов и видов трибы Acromantini.

Ключевые слова: Acromantini, Hymenopodidae, Mantodea, новый род, новый вид, Вьетнам

INTRODUCTION

Acromantinae Brunner de Wattenwyl, 1893 is a subfamily of the flower mantids (Mantodea, Hymenopodidae) consisting of 12 genera arranged in two tribes (Svenson et al. 2015) – Otomantini Giglio-Tos, 1915, which have a strictly African distribution, and Acromantini Brunner de Wattenwyl, 1893, which occur in Oriental biogeographic realm only (Ehrmann 2002). Only two genera of Acromantini, *Ambivia* Stål, 1877 and *Acromantis* Saussure, 1870, have been previously reported from Vietnam (Thinh 2010). After examining the material from Central and South-East Vietnam deposited in the Zoological Institute of the Russian Academy of Sciences, Saint Petersburg, Russia (ZIN) we encountered a new genus of this tribe, which is described herein. This is the first genus of Acromantinae discovered in 87 years since *Metacromantis* Beier, 1930 demonstrating that the diversity of the subfamily is far from being fully described even at the generic level.

MATERIAL AND METHODS

The type material comes from three localities (Fig. 51) – Bu Gia Map National Park (Binh Phuoc Province), Dong Nai Culture and Nature Reserve (= Vinh Cuu Nature Reserve, Dong Nai Province) and from the vicinity of Bao Loc city (Lam Dong Province). The average elevations in Dong Nai Culture and Nature Reserve are 70–100 m, the elevations in Bu Gia Map National Park are 700 m and below and Bao Loc city resides on 850 m. Therefore, the specimens come from both lowland and highland communities.

Specimens from Bu Gia Map National Park and Dong Nai Culture and Nature Reserve, including the holotype, were preserved in 80% ethanol, while those from Bao Loc city were dried and later relaxed in a water vapor camera for spreading and preparation. Male genitalia were extracted by cutting the membrane connecting them to tergite X and coxosternite IX, after that the latter were extracted separately. Genitalia were macerated in 10% KOH water solution for several hours, then washed in water and in 96% ethanol and are stored in microvials with glycerin together with the specimens.

The holotype male and one of the paratype females are deposited in the collection of ZIN, the rest of the paratypes – in the author's personal collection (ES).

External morphology and male genitalia were studied using an MBS-10 stereomicroscope (Lomo-Eltem, Russia) and photographed using a Canon EOS-6D digital camera with a Canon MP-E 65 mm lens. Photo stacks were combined using Zerene Stacker 1.04 (Zerene Systems LLC). Drawings of female pronotums and male genitalia were made in Adobe Photoshop CS5 software. The map was created in SimpleMappr (Shorthouse 2010).

Terminology and abbreviations as well as measurement standards largely follow Brannoch et al. (2017), with four important deviations. First, a tubercle or protrusion on a head posteriad the postfrontal sulcus is referred to as simply "vertex process"; second, the distinction between types of forewing cross-veins network is based on Shcherbakov et al. (2016); third, a couple of new abbreviations are used in the genitalia descriptions: L4A-d (dorsal sclerotization of sclerite L4A), vgr (ventral groove) and cfd (central fold), which are explained in the text; fourth, tibiae were measured from the base to the tip of the claw along the main line of a tibia.

SYSTEMATICS

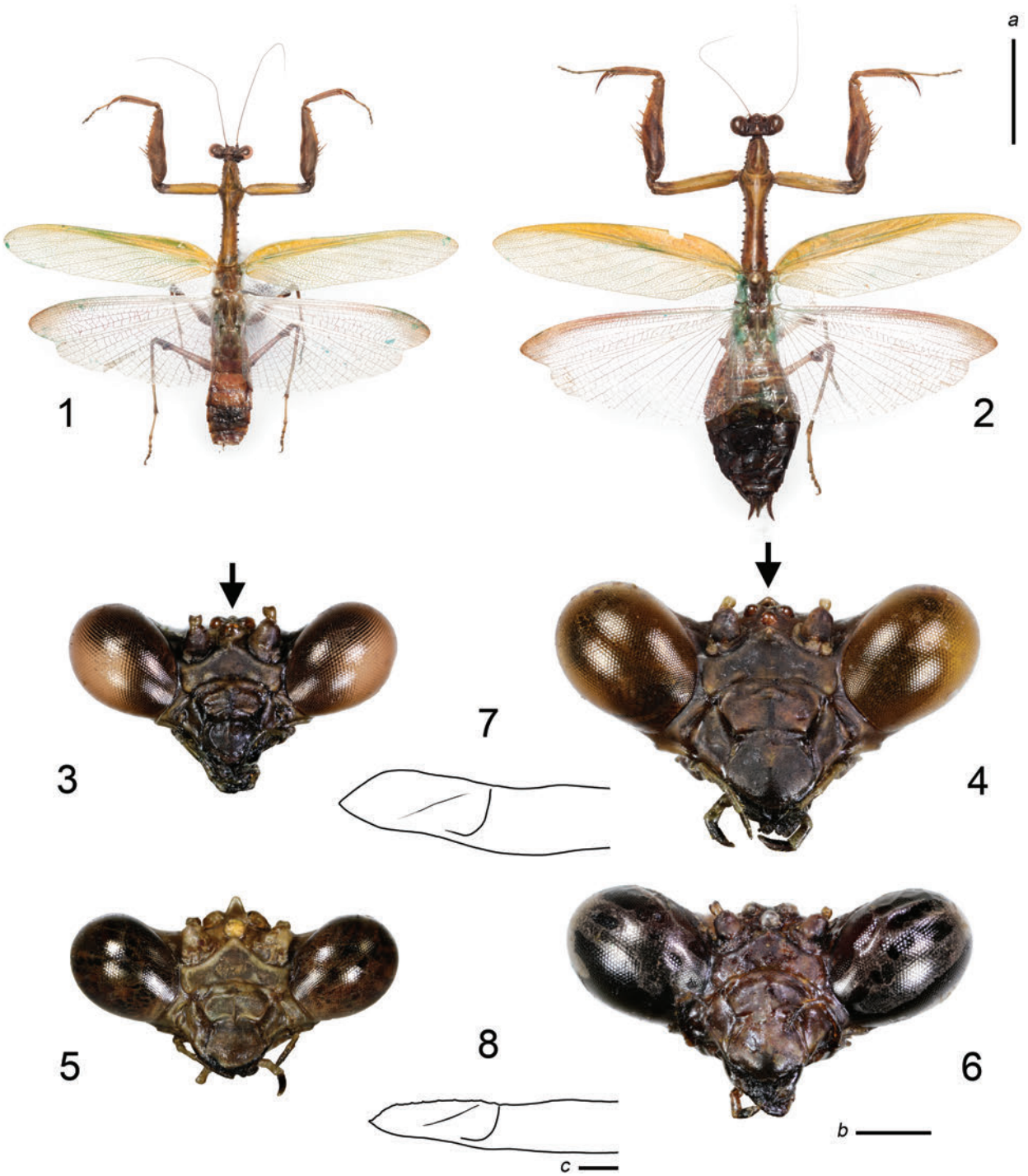
Family Hymenopodidae Giglio-Tos, 1915

Subfamily Acromantinae Brunner de Wattenwyl, 1893

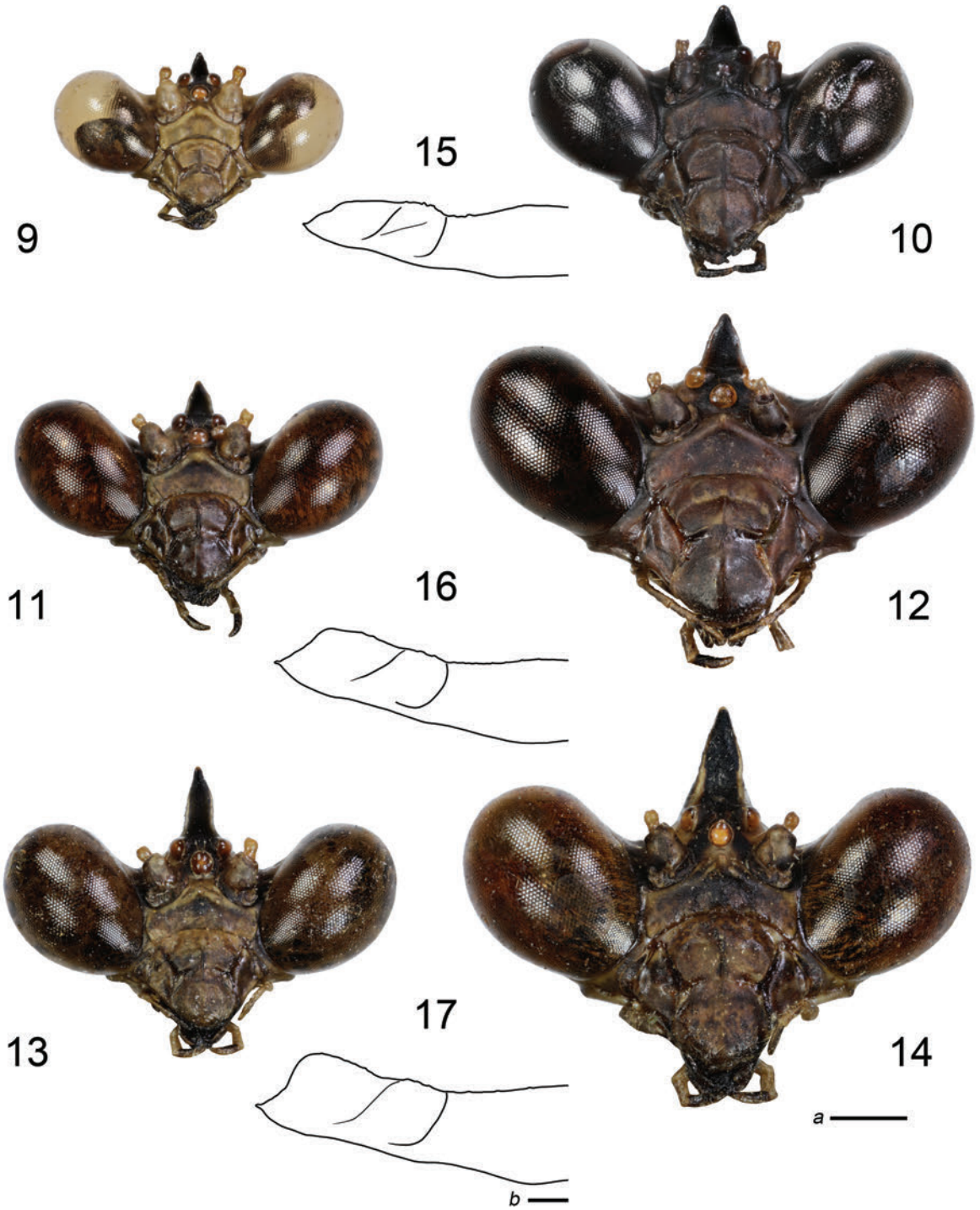
Tribe Acromantini Brunner de Wattenwyl, 1893

Genus *Parapsychomantis* gen. nov.

Type species: *Parapsychomantis vietnamensis* sp. nov. By monotypy.



Figs. 1–8. Acromantini: 1–4, 7 – *Parapsychomantis vietnamensis* gen. et sp. nov.; 5 – *Acromantis* sp.; 6–8 – *Oligomantis mentaweiana* G.-Tos. Adult male, abdominal apex removed (1), adult female (2), head of male (3, 5), head of female (4, 6) and anterior part of female pronotum in lateral perspective (7, 8). Arrows point to the vertex tubercle in *Parapsychomantis*. Scale bar 1 cm for 1–2 (a) and 1 mm: b for 3–6, c for 7, 8.



Figs. 9–17. Acromantini: 9, 10, 15 – *Rhomantis moultoni* G.-Tos; 11, 12, 16 – *Psychomantis borneensis* (De Haan); 13, 14, 17 – *P. malayensis* Beier. Head of male (9, 11, 13), head of female (10, 12, 14) and anterior part of female pronotum in lateral perspective (15–17). Scale bar 1 mm: a for 9–14, b for 15–17.

Etymology. The name is a combination of Ancient Greek "παρά" (meaning "next to") and the name of related genus *Psychomantis*. The name gender is masculine.

Differential diagnosis. New genus belongs to the family Hymenopodidae, subfamily Acromantinae, tribe Acromantini, which is evident by the small vertex tubercle, symmetrical antennomeres, lateral bulges in the metazona of pronotum, presence of distal ventral lobes on meso- and metafemora and other characters.

It is particularly very similar to the genera *Psychomantis* Giglio-Tos, 1915, *Rhomantis* Giglio-Tos, 1915, and *Oligomantis* Giglio-Tos, 1915.

Parapsychomantis gen. nov. differs from *Psychomantis* by the following characters: 1) vertex process very small, a tubercle at most (Figs. 3, 4); in *Psychomantis*, vertex process from medium to large size (Figs. 11–14); 2) dorsal surface of pronotum smooth; in *Psychomantis*, dorsal surface of pronotum covered by tubercles; 3) dorsal surface of pronotal prozona without strong bulge (Fig. 7); in *Psychomantis*, dorsal surface of prozona with a bulge making it hump-like (Figs. 16, 17); 4) base of forecoxa light (Figs. 28, 29); in *Psychomantis,* base of forecoxa black (Figs. 33–36); 5) dorsal edge of forefemur medially with a bulge (Figs. 20, 21); in *Psychomantis*, dorsal edge of forefemur medially with a developed lobe (Figs. 24–27); 6) medial posteroventral lobe on meso- and metafemur small (Figs. 37, 39); in *Psychomantis*, meso- and metafemur with a large medial posteroventral lobe (Figs. 43–46); 7) anterior forewing margin distally to the widest area of costal field straight in male and convex in female; in *Psychomantis*, anterior forewing margin distally to the widest area of costal field distinctly concave in male and straight to concave in female.

Parapsychomantis gen. nov. differs from *Rhomantis* by the following characters: 1) vertex process very small, a tubercle at most (Figs. 3, 4); in *Rhomantis,* vertex process of medium size (Figs. 9, 10); 2) dorsal depression posteriad supracoxal sulcus shallow (Fig. 7); in *Rhomantis,* a very strong depression present at supracoxal sulcus and beyond (Fig. 15); 3) dorsal surface of pronotal prozona smooth; in *Rhomantis,* pronotal prozona with two short tuberculated carinae diverging anteriorly from supracoxal sulcus; 4) lateral edges of pronotal metazona with large rounded tubercles; in *Rhomantis,* lateral edges of pronotal metazona with very large triangular tubercles; 5) mesofemur usually with medial posteroventral lobe (Figs. 37, 39); in *Rhomantis,* posteroventral carina of mesofemur medially straight (Fig. 41) or slightly convex (Fig. 42); 6) forewings with irregular network of cross-veins resembling archedyction; in *Rhomantis*, cross-veins in forewings form regular double cells; 7) apex of hindwing rounded; in *Rhomantis*, apex of hindwing truncated.

Parapsychomantis gen. nov. differs from *Oligomantis* by the following characters: 1) vertex with a process in form of a tubercle (Figs. 3, 4); in *Oligomantis*, vertex without any kind of process (Fig. 6); 2) pronotal prozona convex (Fig. 7) and compressed laterally; in *Oligomantis,* pronotal prozona with almost flat profile (Fig. 8), parabolic in cross-section; 3) dorsal edge of forefemur with medial bulge armed with several large tubercles (Figs. 20, 21); in *Oligomantis,* dorsal edge of forefemur medially nearly straight (Fig. 19); 4) mesofemur with basal and usually also with medial posteroventral lobe (Figs. 37–39); in *Oligomantis*, posteroventral carina of mesofemur basally without a lobe, medially straight (Fig. 41); 5) forewings with irregular network of cross-veins resembling archedyction; in *Oligomantis*, cross-veins in forewings form regular double cells.

Description. Medium sized (Figs. 1, 2). Head (Figs. 3, 4) triangular, wider than supracoxal dilatation. Eyes large, exophthalmic, oval. Antennae filiform, antennomeres symmetrical. Vertex with a small tubercle.

Pronotum longer than wide, with distinct roughly rhomboidal supracoxal dilatation, gradual, but clear constriction of metazona posteriad the dilatation and pair of weak lateral bulges immediately past the half-length. Lateral edges of pronotum covered by alternating large and small black tubercles. Dorsal surface of pronotum smooth (Fig. 7). Furcasternum with a pair of bulges posteriad the middle.

Forelegs. Forecoxa (Figs. 28, 29) with anterior apical lobes starting as parallel but converging distally, dorsal edge of forecoxa with small sparse denticles. Forefemur (Figs. 20, 21) dorsally with basal and medial bulges, armed with 12–14 anteroventral, 4 discoidal and 4 posteroventral spines. Discoidal spines, in order of increasing length: 1, 4, 2, 3. Anteroventral spines alternatingly large and small, ultimate and penultimate spines large with gap between them. Foretibia shorter than forefemur, with 12–13 anteroventral spines and 13–15 posteroventral spines, the latter strongly decumbent. Mesofemur (Figs. 37–39) in both sexes with three small posteroventral lobes,

metafemur with three lobes in male and two to three in female. Meso- and metatibia with very weak basal and moderate medial thickening and distal constriction. Cyclopic ear of the DK type in both sexes.

Wings well developed in both sexes, reaching the apex of abdomen in rest. Forewing with wide costal field, widest at basal 1/5 of the length and gradually narrowing distally. Anterior forewing margin distally to the widest area of costal field straight in male and convex in female. Discoidal area with irregular network of cross-veins.

Abdomen depressed dorso-ventrally. In male, all coxosternites transverse except coxosternite IX. Posterior edge of coxosternites III–VII with small medial convexity, which on coxosternites II–IV has small medial excavation. On coxosternite V the convexity more prominent and with ventral carina, on coxosternites VI and VII (if present) very small. In female, coxosternites III–VI generally bear small medial lobe along posterior edge, on coxosternites II–IV the lobe sometimes with medial excavation, on coxosternite V the lobe more prominent. Occasionally, the medial lobe on all coxosternites almost nonexistent.

Genitalia (Figs. 47–50) weakly sclerotized. L4A without distal process. Process paa very short. Apophysis afa small, trapezoidal. Process pva simple, strongly curved.

***Parapsychomantis vietnamensis* sp. nov.**
(Figs. 1–4, 7, 20, 21, 28, 29, 37–39, 47–50)

Holotype. Male, VIETNAM, Binh Phuoc Province, 13 km NE Bu Gia Map Village, Bu Gia Map National Park, 12°11′37′′N, 107°12′21′′E, 540 m, 18–31 May 2011, Anisyutkin L.N., Anichkin A.E. leg. (Expedition of Russia-Vietnam Tropical Centre), ZIN, ethanol, "Parapsychomantis vietnamensis male #1".

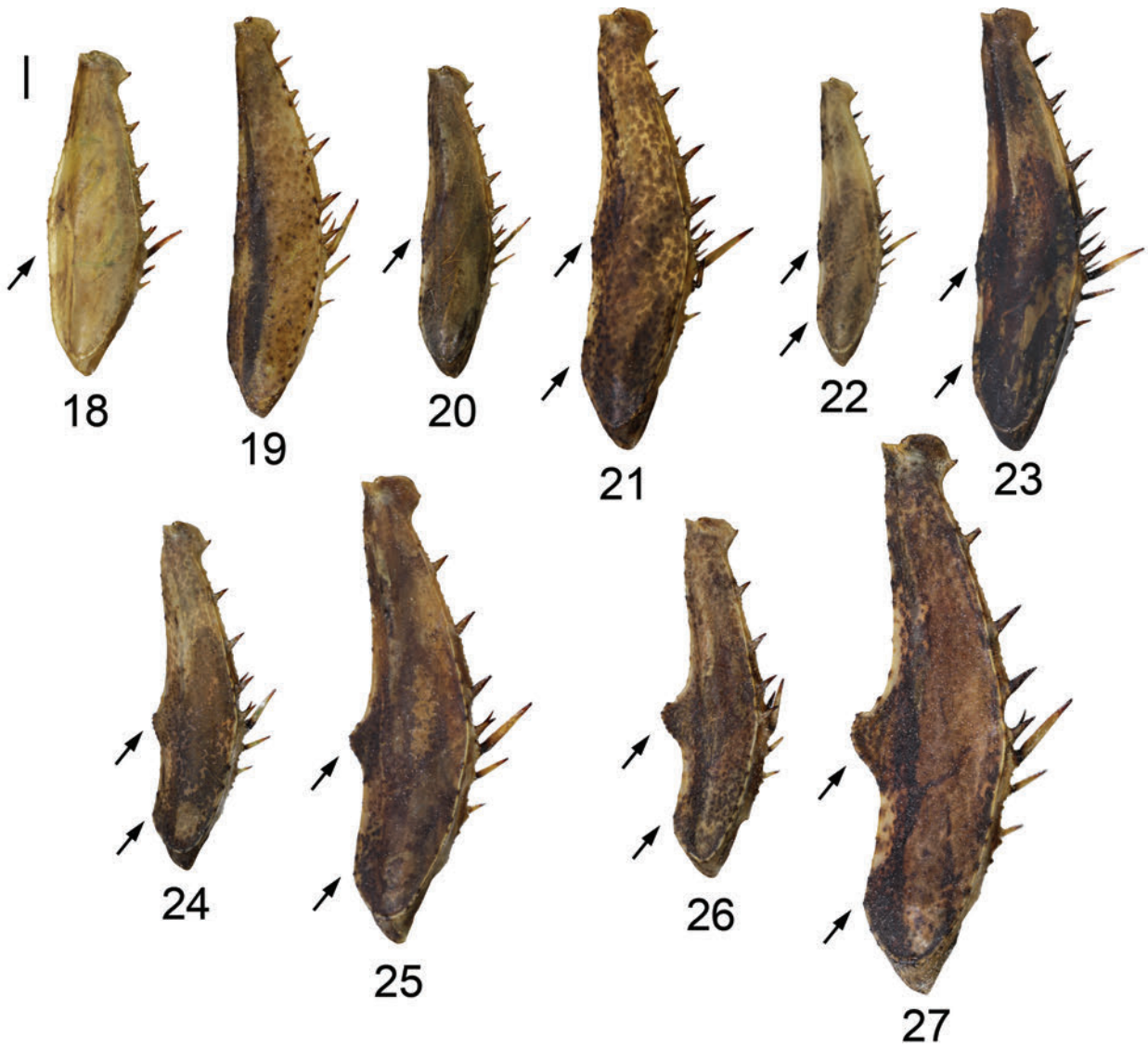
Paratypes. 1 female, Dong Nai Province, Vinh Cuu District, Vinh Cuu Nature Reserve (=Ma Da Forest), TW Cuc Forest Station, 11°22′51′′N, 107°03′44′′E, 75 m, 21–29 November 2010, Anisyutkin L.N., Anichkin A.E., Abramov A.V., Kruskop S.V. leg. (Expedition of Russia-Vietnam Tropical Centre), ZIN, ethanol, "Parapsychomantis vietnamensis female #1"; 1 male, Lam Dong province, Bao Loc pass, 11°26′59.6′′ N, 107°42′43.4′′ E, June 2017, Van Dang leg., ES, pinned, "Parapsychomantis vietnamensis male #2"; 1 female, same location, October 2016, Van Dang leg., ES, pinned, "Parapsychomantis vietnamensis female #2"; 1 female, same location, December 2016, Van Dang leg., ES, pinned, "Parapsychomantis vietnamensis female #3".

Etymology. The species is named after its type location.

Description. Male (Fig. 1). Medium sized.

Head (Fig. 3) triangular, twice wider than long, 1.7 times wider than supracoxal dilatation. Clypeus rectangular, with central tubercle and thin ventral medial carina. Lower frons pentagonal, strongly transverse, 2.6 times wider than long, anterior border almost straight, posterior angular, with strong tubercle directed anteriorly at the right angle relative to the plane of scutellum. Surface of lower frons with a pair of tubercles adjacent to ventral edge slightly laterad of medial line. Complex eyes very large, oval, bulging, dorsally with wide eye sockets. Ocelli large, tightly placed to each other; central ocellus triangular, lateral ocelli oval. Antennae filliform, reaching half the length of the body. Scapus large, barrel-shaped, 1.5 times wider than the central ocellus. Pedicellus elongated, 1.5 times shorter and two times narrower than the scapus, slightly widened distally. Other antennomeres symmetrical, basally slightly narrower than the pedicellus, elongating and narrowing toward the distal end of antenna; third and fourth antennomeres fused together. Frontal sulcus above ocelli raised into small medial tubercle slightly shorter than scutellum apical tubercle. Vertex slightly elevated posteriad the tubercle, otherwise nearly flat. Juxtaocular bulges flat, not exceeding imaginary line between complex eyes. Posterior line of the head very slightly concave toward the middle.

Pronotum elongated, slightly compressed laterally, dorsally smooth, covered with very minute setae. Prozona with almost parallel lateral and rounded anterior edge, almost triangular in cross-section. Supracoxal dilatation well developed, strongly narrowing anteriad and gradually narrowing posteriad transverse groove; the latter strongly arched backwards, crossed by very low medial carina. Metazona 2.6 times the prozona, most narrow at 3/8 of its length, then gradually expanding towards posterior edge; dorsally with a pair of small, very shallow drop-shaped paramedial depressions posteriad supracoxal sulcus, no medial carina posteriad these depressions and pair of very weak lateral bulges immediately past the half-length. Posteriormost part of metazona with very low, almost flat transverse medial bulge. Ante-

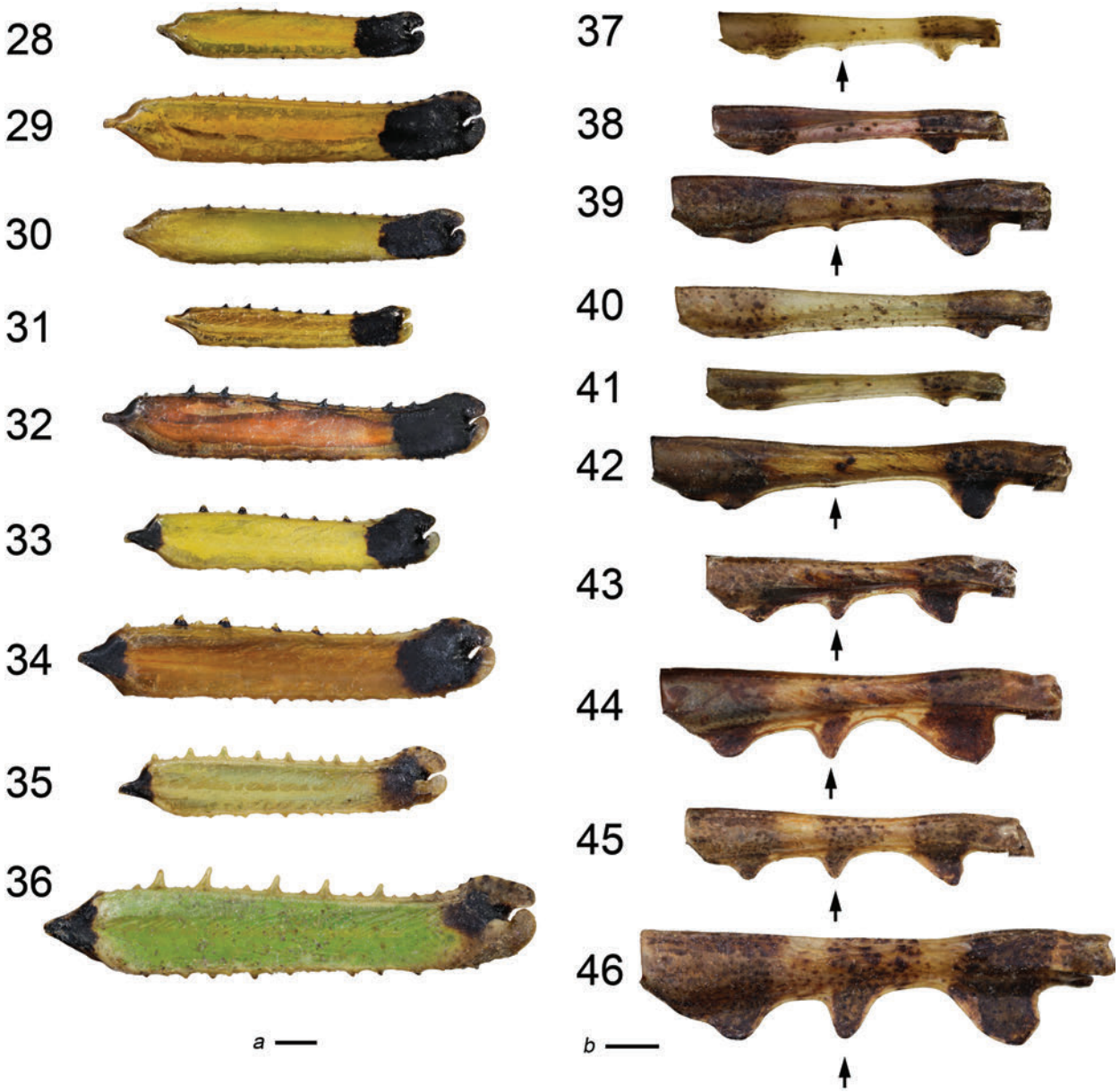


Figs. 18–27. Acromantini: 18 – *Acromantis* sp.; 19 – *Oligomantis mentaweiana* G.-Tos; 20, 21 – *Parapsychomantis vietnamensis* gen. et sp. nov.; 22, 23 – *Rhomantis moultoni* G.-Tos; 24, 25 – *Psychomantis borneensis* (De Haan); 26, 27 – *P. malayensis* Beier. Forefemur of male (18, 20, 22, 24, 26), forefemur of female (19, 21, 23, 25, 27). Arrows point to the single forefemoral lobe in *Acromantis* and homologues of basal and medial lobes in other genera. Scale bar 1 mm.

rior, posterior edges and lateral edges of supracoxal dilatation smooth. Lateral edges of prozona with several blunt spines of alternating sizes. Lateral edges of metazona with large, rounded tubercles and smaller spines in between, similar to the spines of prozona; larges tubercles on different sides alternately positioned. Cervicalia complete, posterior cervical sclerite thicker than anterior one, intercervicalia medially fused, postcervical plate saddle-shaped, smooth. Furcasternum with a pair of bulges posteriad the middle.

Metathorax with cyclopic ear of the DK type.

Forelegs typical of praying mantids. Forecoxa (Fig. 28) with anterior apical lobes starting as parallel but converging distally, rounded; its ventral surface slightly uneven, sometimes with isolated small tubercles; dorsal edge with 7 small spines, most proximal being displaced posteriorly, and very small spinules in between some of them. Anterior surface of forecoxa smooth. Forefemur (Fig. 20) widest before the middle; dorsal edge smooth apart from convex



Figs. 28–46. Acromantini: 28, 29, 37–39 – *Parapsychomantis vietnamensis* gen. et sp. nov.; 30, 40 – *Oligomantis mentaweiana* G.-Tos; 31, 32, 41, 42 – *Rhomantis moultoni* G.-Tos; 33, 34, 43, 44 – *Psychomantis borneensis* (De Haan); 35, 36, 45, 46 – *P. malayensis* Beier. Forecoxa of male (28, 31, 33, 35) and forecoxa of female (29, 30, 32, 34, 36), mesofemur of male (37, 38, 41, 43, 45) and female (39, 40, 42, 44, 46). Arrows point to medial posteroventral lobe. Scale bar 1 mm: a for 28–36, b for 37–46.

area before the middle, covered by robust, sparse tubercles; anteroventral edge with 13–14 spines of two sizes placed according to formula iIiIiIiIiIiI_(i)_I, with wide gap between two ultimate spines and very small genicular spine; posteroventral edge with 4 short spines of equal size, two proximal ones being closer to each other, while the edge in between crenulate, and very small genicular spine; ventral surface with 4 discoidal spines, row of small tubercles proximad the second discoidal spine, running almost to the base, and small pit distad the fourth discoidal spine. Second discoidal spine two times longer than

the first, third spine two time longer than the second, fourth spine slightly longer than the first. Foretibia 1.5 times shorter than forefemur, armed with 13 anteroventral spines, tibial claw and 13–15 posteroventral spines; antero-ventral spines oblique, distally elongating; tibial claw measured along its own axis two times shorter than length of tibia without it; posteroventral spines distally elongating and extremely decumbent, except ultimate one.

Middle and hindlegs shorter than forelegs. Meso- and metacoxa with strong ventral carinae. Meso- and metafemur with three ventral lobes (Fig. 37): proximal (elongated, in mesofemur concave in the middle), medial (slightly before the middle of the femur, the smallest lobe) and distal one (triangular with rounded apex, the largest lobe). One of the two males (#2), however, has medial lobes reduced (Fig. 38). Meso- and metatibia covered by short setae, with very subtle thickenings in first and second third and noticeable constriction in the beginning of the last third, two apical spines and triangular apical process.

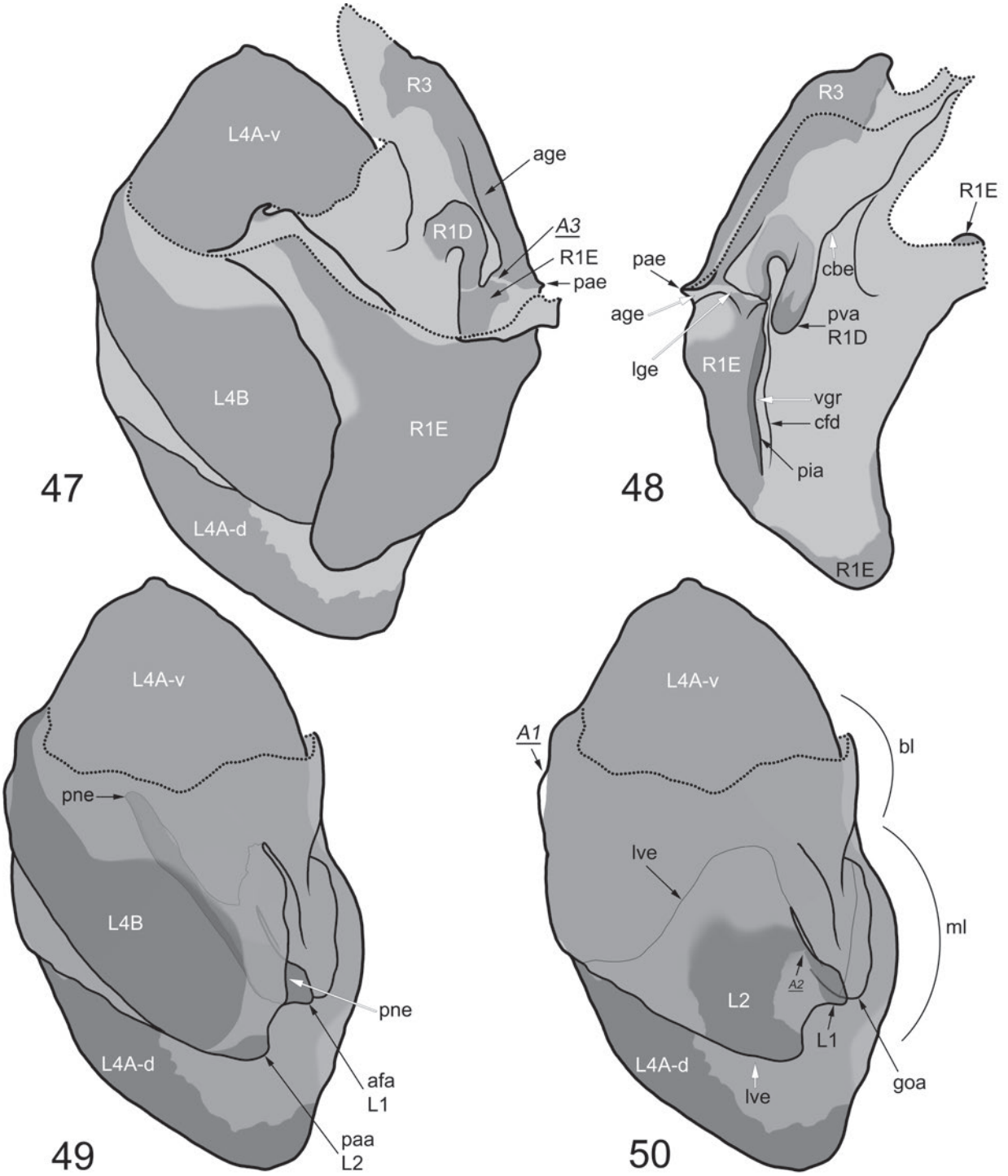
Both pair of wings well developed, reaching far beyond the end of abdomen. Forewing 4 times longer than its maximum width, with parabolic apex. Anterior edge smooth, in basal half arcuate, with correspondingly wide costal field. Stigma very elongated, parallel to R, extremely indistinct, almost absent. Venation very dense in costal field, with cross-veins very indistinct for the most part of it, more spaced in other fields, in discoidal area highly irregular with small cells, resembling archedyction. Hindwings triangular, slightly shorter than forewings, with parabolic, more pointed apex.

Abdomen depressed dorso-ventrally, with ten tergites and eight visible coxosternites (II–IX). Tergite 10 transverse, widely rounded. Cerci with 13 cercomeres, relatively short and thick, narrowing distally. All coxosternites transverse; posterior edge of coxosternites III–VII with small medial convexity, which on coxosternites II–IV has small medial excavation. On coxosternite V the convexity more prominent and with ventral carina, on coxosternites VI and VII (if present) very small.

Genitalia weakly sclerotized with diffuse borders between sclerites and membranes, compactly folded in rest (Fig. 47). Sclerite L4A occupies almost entire dorsal surface of coxosternite IX posteriad the connection to it. It is roughly bean-shaped, without distal process (Figs. 47, 49, 50, L4A). Anterior part of right edge bent dorsad forming basal lobe (Fig. 50, bl). Mesal part of L4A together with membranous dorsal surface form extension along the right edge (Fig. 50, ml). Distal part bends along the edge forming extensive dorsal sclerotization (Figs. 47, 49, 50, L4A-d). Large membranous lobe present on the right near genital opening, as a continuation of the right wall of pouch lve (Fig. 50, goa). Ventral sclerotization of sclerite L2 with indistinct anterior border (Fig. 50, L2), apex of L2 sclerotizes very short, bulge-like process paa (Fig. 49, paa). Articulation A2 very narrow, indistinct (Fig. 50, A2). Pouch pne deep and very narrow, almost completely sclerotized on the left side by sclerite L1 (Fig. 49, pne, L1). Posterior part of L1 sclerotizes short, trapezoidal process afa (Fig. 49, afa). Process loa completely absent. Sclerite L4B spoon-shaped, but with highly indistinct anterior boundary in its right part (Fig. 49, L4B). Anteriad of this indistinct border there is a deep groove in membrane running parallel to L4B (not shown in Fig. 49). Right phallomere posteriorly sclerotized by sclerite R1E (Figs. 47, 48, R1E). Its left arm forms a sclerotized hook bending dorsally and continued with membrane. Process pva sclerotized by sclerite R1D, the latter simple, strongly curved (Fig. 48, R1D). Parallel to fold pia there is another, membranous fold cfd with extremely narrow invagination vgr between pia and cfd (Fig. 48, pia, vgr, cfd).

Female (Figs. 2, 4, 7, 21, 29, 39) very similar to male, 1.3–1.4 times larger, with 13–14 posteroventral foretibial spines, shorter wings reaching only the apex of abdomen and wider costal field of the forewings: ratio of forewing's length to maximum width of the costal field 16.5 in male, 10.7 in female. Abdomen with six visible coxosternites (II–VII). Coxosternites III–VI generally bear small medial lobe along posterior edge, on coxosternites II–IV the lobe sometimes with medial excavation, on coxosternite V the lobe more prominent. In one female (#1) medial lobe on all coxosternites almost nonexistent. Cerci with 11 cercomeres.

Colouration. General colour green-brown with dark green pronotum and forewings. Head and legs light-brown, mottled with small darker spots. Tubercles and spines on lateral edges of pronotum black with small black areas near the base. Forecoxae anteriorly bright yellowish-green except black apex. Meso- and metafemora as well as meso- and metatibiae with three dark transverse bands, corresponding to ventral leg lobes and consisting of numerous darker and lighter little spots, all medial bands



Figs. 47–50. *Parapsychomantis vietnamensis* gen. et sp. nov. Male genitalia at rest dorsally (47), right phallomere ventrally (48), left phallomere dorsally whole (49) and with L4B, pne pouch and associated dorsal parts not shown (50). Solid lines are convex folds, thin dotted lines are concave folds hidden from direct view and thick dotted lines are cuts. Black arrows point to structural elements, white arrows point to openings of pouches and invaginations. For abbreviations see Brannoch et al. (2017) and the text. Scale bar 1 mm.

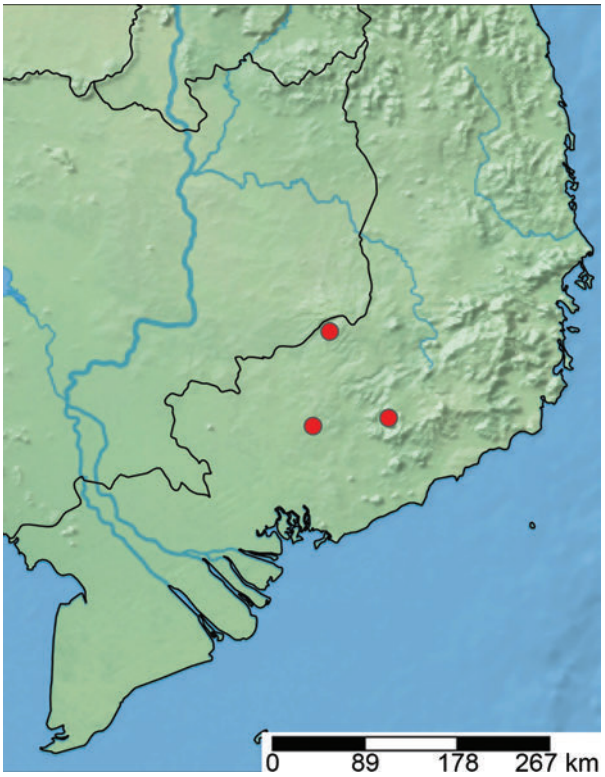


Fig. 51. Distributional records of *Parapsychomantis vietnamensis* gen. et sp. nov. in Vietnam.

Table 1. Measurements (mm) of *Parapsychomantis vietnamensis* gen. et sp. nov.

Measurement	holotype (male #1)	paratypes			
		male #2	female #1	female #2	female #3
body l.	29.0	28.0	37.0	39.0	37.0
head w.	4.7	4.4	5.4	5.6	5.2
pronotum l.	10.3	9.9	13.9	13.8	12.7
prozona l.	2.9	2.7	3.5	3.9	3.5
pronotum max. w.	2.7	2.6	3.6	3.6	3.5
pronotum min. w.	1.3	1.4	1.8	1.9	1.9
forecoxa l.	6.7	6.5	8.9	9.2	8.6
forefemur l.	7.6	7.2	9.8	10.1	9.4
foretibia l.	5.2	4.9	7.0	7.0	6.6
metafemur l.	7.2	6.8	8.0	8.6	8.6
metatibia l.	7.5	7.4	9.1	9.7	9.0
forewing l.	20.0	21.0	23.0	26.0	24.0
forewing max. w.	5.0	4.9	6.8	6.9	6.5
forewing costal field w.	1.2	1.0	2.2	1.7	1.6

highly reduced. Forewings greenish, subopaque in male, with opaque bright green costal field in female. Hindwings transparent, hyaline, except for strongly infumate apex. Posterior edges of coxosternites with four small dark spots and several smaller spots in between. Coxosternite VII in female marked by a pair of very bright yellow-green lateral spots.

Measurements are given in Table 1.

Distribution. The species is recorded from the provinces Binh Phuoc, Dong Nai and Lam Dong, Vietnam (Fig. 51).

DISCUSSION

Cryptic morphology. Although they are overshadowed by their more camouflaged cousins from the tribes Hymenopodini and Otomantini and are more similar to the generalistic green mantids like *Mantis religiosa* (Linnaeus, 1758), species of the tribe Acromantini do have some morphological characters contributing to their crypsis, mainly in form of the leg lobes. All Acromantini except a single species of *Acromantis*, *A. palauana* Beier, 1972, have distal posteroventral lobe on meso- and metafemora (Figs. 37–46). *Majangella* Giglio-Tos, 1915, *Ambivia*, *Metacromantis*, females of *Rhomantis*, *Psychomantis* and *Parapsychomantis* gen. nov. have also basal posteroventral lobe at least on mesofemora (Figs. 37–39, 42–46). Last but not least, *Psychomantis* and *Parapsychomantis* gen. nov. have additionally a medial posteroventral lobe (Figs. 37, 39, 43–46). In *Rhomantis* and *Ambivia,* this lobe is usually very underdeveloped and present only in form of slightly convex edge (like in Fig. 42); on the other hand, some populations of *Ambivia* and aberrant *Majangella carli* Giglio-Tos, 1915 specimens have this lobe more or less developed (Shcherbakov, unpubl. data). Among Otomantini only *Oxypiloidea* Schulthess, 1898 has a full set of lobes on meso- and metafemora. Outside Acromantinae the basal and especially the distal meso- and/or metafemoral lobes are very widespread in Hymenopodidae and even outside it, however the medial lobe is unknown. It should be noted that in most genera where this lobe is absent a distinct dark spot is present in its location. It seems that many Acromantinae have the potential for developing this lobe; was this lobe lost or arisen multiple times independently remains to be investigated.

Regarding forefemoral dorsal lobes, a simpler situation can be observed. Most Acromantinae have

only one dorsal lobe terminating past the half of forefemur's length (Fig. 18). However, in *Ambivia* and *Oligomantis* this lobe has been reduced (Fig. 19), in *Ambivia* completely so, while in *Rhomantis*, *Psychomantis,* and *Parapsychomantis* gen. nov. it has seemingly "disintegrated" into two small lobes: the basal one and the medial one (Figs. 20–27). The latter is fully developed only in *Psychomantis* (Figs. 24–27), while in *Rhomantis* and *Parapsychomantis* gen. nov. only homologous bulge with the same tubercle armament is present (Figs. 20–23).

As evident by different development of the homologous lobes and vertex processes in different genera, the evolution of the cryptic characters in the subfamily and tribe Acromantini in particular was probably quite complex. A comparative phylogenetic study of the subfamily is necessary to decipher this evolution and fully polarize the character states.

Male genitalia. Among Acromantini only genitalia of *Acromantis elegans* Lombardo, 1995 and *Metacromantis nigrofemorata* Ghate et Roy, 2006 have been described until now (Lombardo 1993; Ghate et al. 2006). Genitalia of *Parapsychomantis vietnamensis* gen. et sp. nov. (Figs. 47–50) significantly differ from both of these species. In particular, comparing to *M. nigrofemorata* they are significantly less sclerotized, lack developed distal process on L4A, basal lobe is gently rounded and without processes, process paa is widely rounded while afa is short and trapezoidal. Process pva has a different, more curved shape as well. *Acromantis elegans*, on the other hand, has a very large, bulky apophysis afa and a much wider L4A, with almost parallel sides and a small process on the apex. Male genitalia of *Rhomantis* and *Psychomantis* are similar to those of *Parapsychomantis* gen. nov. (Shcherbakov, unpubl. data; males of *Oligomantis* were not available). This lends support to the notion of Schwarz and Shcherbakov (2017) about currently underexplored morphological diversity of the male genitalia in Hymenopodidae.

Biogeography. The biogeography of Acromantini is still poorly understood. However, it is worth noting that the genera most similar morphologically to *Parapsychomantis* gen. nov. are distributed on Sumatra (*Oligomantis*, *Psychomantis*), Borneo (*Psychomantis*, *Rhomantis*) and the southern tip of the Malay peninsula (*Oligomantis*, *Psychomantis*), but have not been recorded from the northern parts of the peninsula and Indochina (Ehrmann 2002). An unrelated taxon, a cockroach subgenus *Prosoplecta (Areolaria)* Brunner von Wattenwyl, 1865 (Ectobiidae) has a similar distribution pattern (Anisyutkin 2012). At the same time, it is generally accepted that South Vietnam and all these areas were part of a single giant land area, Sundaland, during much of Cenozoic (Hall 2013) including as recently as 20,000 years ago, during the Last Glacial Maximum (Bird et al. 2005). Such a large distance between the distribution areas of the two groups may have several explanations. The trivial one is that Malay peninsula and western Indochina have not been sampled dense enough. A great example is the recent discovery of *Majangella moultoni* Giglio-Tos, 1915 in China that has pushed the species' known distribution more than 1500 km to the north (Wu and Liu 2017). Another explanation is that all morphological similarities discussed above are either plesiomorphies or convergencies and do not point to the close relationship of *Parapsychomantis* gen. nov. with the abovementioned genera. At last, past geographical or ecological factors might have played the role. Current reconstructions of the Sundaland vegetation dynamics during Cenozoic are highly sensitive to model parameters (Cannon 2012). However, it is plausible that at some point the dominant ecosystem in central Sundaland was savanna (Bird et al. 2005; Cannon 2012), which disrupted the habitat of rainforest genera such as *Parapsychomantis* gen. nov. Here we see again the necessity for a phylogenetic analysis of the subfamily with integrated treatment of morphology and biogeography.

A NEW KEY TO THE TRIBE ACROMANTINI

Since the tribe Otomantini is absent in Oriental realm, this key is simultaneously the key to Acromantinae of Asia. Genera are keyed out to species except *Acromantis* Saussure, 1870, which is currently undergoing generic revision.

1. Eyes conical. Apex of hindwing truncate. *Metacromantis* Beier, 1930 . . . . . **2**
– Eyes rounded. Apex of hindwing truncate or rounded **3**
2. Juxtaocular bulges large, pointed. Eyes with apical tubercle. Forefemur with dorsal lobe occupying more than half of its length (similar to Fig. 18) . . . . . *M. nigrofemorata* Ghate et Roy, 2006 (India: Andhra Pradesh)
– Juxtaocular bulges small, rounded. Eyes without apical tubercle. Forefemur without large lobe, but only with a medial bulge (similar to Figs. 20–23) . . . . . *M. oxyops* Beier, 1930 (Sri Lanka)

3. Metazona of pronotum with a pair of very large, elongated tubercles. Distal posteroventral foretibial spines not decumbent. Head always with vertex process, simple or bifid. Forefemur with dorsal lobe occupying more than half of its length (similar to Fig. 18, but much more pronounced). *Majangella* Giglio-Tos, 1915 . . . . . **4**
– Metazona of pronotum without a pair of very large, elongated tubercles. Distal posteroventral foretibial spines more or less decumbent. Head with simple vertex process or the process is absent **6**
4. Vertex process simple. ... *M. carli* Giglio-Tos, 1915 (Borneo, Sumatra, Java, Malay Peninsula, Myanmar).
– Vertex process bifid, emarginated medially **5**
5. Black spot on the anterior surface of forefemur uninterrupted, with only two pale spots situated along the dorsal edge . . . . . *M. ophirensis* (Werner, 1922) (Borneo, Sumatra)
– Black spot on the anterior surface of forefemur interrupted by light transverse band in the distal half of forefemur . . . . . *M. moultoni* Giglio-Tos, 1915 (Borneo, Sumatra, Malay Peninsula, China)
6. Forefemur dorsally without basal lobe but with a small distal triangular lobe which does not reach the apex of forefemur. Dorsal margin of forecoxa with a small expansion near the apex. Anterior surface of forecoxa with black apical spot. Head with vertex process . . . . . *Ambivia* Stål, 1877. *A. undata* (Fabricius, 1793) (from India and Nepal on the west and China on the north to Sumatra and Borneo)
– Forefemur dorsally without distal triangular lobe (Figs. 18–27). Dorsal margin of forecoxa without distal expansion (Figs. 28–36) **7**
7. Forefemur with dorsal lobe occupying more than half of its length (Fig. 18), in some species very small. Forecoxa with or without apical black spot. Medial posteroventral lobe on meso- and metafemur always absent **8**
– Forefemur with small basal dorsal lobe occupying less than half of its length; a medial forefemoral lobe or convexity developed to a varying degree (Figs. 20–27). Forecoxa always with apical black spot (Figs. 28–36). Medial posteroventral lobe on meso- and metafemur may be present (Figs. 37, 39, 42–46) **9**
8. Apex of hindwing extremely extended, forming a large lobe; when wings folded in rest, these lobes form lyre-like "tail". Forefemoral lobe strongly developed. Forecoxa with black apical spot. Head with vertex process . . . . . *Citharomantis* Rehn, 1909. *C. falcata* Rehn, 1909 (Borneo, Sumatra, Malay Peninsula)
– Apex of hindwing either forms a very small lobe, is truncated or rounded. Forecoxa always without black apical spot. Head with or without vertex process . . . . . *Acromantis* Saussure, 1870 (about 20 species from India and Nepal on the west and China and Japan on the north to North-East Australia and New Guinea on the east)
9. Cross-veins in discoidal area of forewing form mostly double rows of cells. Medial posteroventral lobe on mesofemur absent or extremely weak (Figs. 40–42), on metafemur always absent **10**
– Cross-veins in discoidal area of forewing form dense, irregular network resembling archedyction. Medial posteroventral lobe on mesofemur usually present (Figs. 37, 39, 43–46), but may be weak in occasional specimens (as in Fig. 38) **13**
10. Head with vertex process (Figs. 9–10). Pronotum with noticeable depression in the area of supracoxal sulcus and beyond (Fig. 15). Apex of hindwing truncate . . . . . *Rhomantis* Giglio-Tos, 1915. *R. moultoni* Giglio-Tos, 1915 (Borneo)
– Head without vertex process (Fig. 6). Pronotum without depression (Fig. 8). Apex of hindwing rounded. *Oligomantis* Giglio-Tos, 1915 . . . . . **11**
11. Lateral edges of pronotum with very large pointed black tubercles . . . . . *O. orientalis* Giglio-Tos, 1915 (Sumatra, Malay Peninsula)
– Black tubercles on lateral edges of pronotum either rounded or, if pointed, at most as large as dorsal tubercles of forecoxa **12**
12. Black tubercles on the edge of pronotum larger than dorsal tubercles of forecoxa . . . . . *O. hyalina* (Werner, 1916) (Sumatra)
– Black tubercles on the edge of pronotum as large or smaller than dorsal tubercles of forecoxa . . . . . *O. mentaweiana* Giglio-Tos, 1915 (Mentawai Islands)
13. Medial dorsal lobe on forefemur well developed (Figs. 24–27). Medial posteroventral lobe on meso- and metafemur also well developed (Figs. 43–46). Pronotum covered with dense tubercles, its prozona with a bulge, hump-like (Figs. 16, 17). Head with well-developed vertex process (Figs. 11–14). *Psychomantis* Giglio-Tos, 1915 . . . . . **14**
– Forefemur dorsally with a bulge instead of developed lobe (Figs. 20, 21). Medial posteroventral lobe on meso- and metafemur weakly developed (Figs. 37, 39), occasionally almost absent (Fig. 38). Pronotum with smooth surface, its prozona without strong bulge (Fig. 7). Head with tubercle (Figs. 3, 4). *Parapsychomantis* **gen. nov.** . . . . . *P. vietnamensis* **sp. nov.** (Vietnam)
14. Vertex process (Figs. 13, 14), forecoxal dorsal spines (Figs. 35–36) and medial forefemoral lobes (Figs. 26–27) strongly developed. Distal half of anterodorsal forecoxal lobe light (Figs. 35, 36) . . . . . *Psychomantis malayensis* Beier, 1931 (Malay Peninsula)
– Vertex process (Figs. 11, 12), forecoxal dorsal spines (Figs. 33, 34) and medial forefemoral lobes (Figs. 24, 25) less strongly developed. Anterodorsal forecoxal lobe completely black (Figs. 33, 34) . . . . . *Psychomantis borneensis* (De Haan, 1842) (Borneo, Sumatra)

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