

FIVE NEW SPECIES OF URANOTAENIA FROM SOUTHEAST ASIA
(DIPTERA: CULICIDAE)^{1,2}

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ABSTRACT—Five new species of *Uranotaenia* from Southeast Asia are described: **rampae** from Cambodia, South Vietnam and Thailand; **diraphati**, **gouldi**, **koli** and **sombooni** from Cambodia and Thailand.

During the course of studies on the *Uranotaenia* of Southeast Asia several new species have been discovered. So far these have been referred to by number but this is now becoming cumbersome and in any case field workers want to have names to use in their reports and representative specimens returned for local reference collections. For this and other reasons it has been decided to describe the new species giving only the salient and most striking features which will allow them to be recognized from among their closest relatives.

It must be mentioned that, with the exception of *hongayi* Galliard and Ngu and *husaini* Qutubuddin, all species so far known from Southeast Asia and most species from bordering areas have been available to us for study so that our opinion is not based on the literature alone. This paper is the first of a two part series dealing with most of the undescribed species presently in the SEAMP collection. In the near future a full, complete account of the whole fauna of the area will be submitted at which time the new species here described will be fully dealt with according to SEAMP standards.

***Uranotaenia rampae*, n. sp.**

ADULT: This is a member of a group of closely related species which includes the following: *U. albescens* Taylor, *arguellesi* Baisas, *campestris* Leic., *christophersi* Barraud, *macfarlanei* Edwards, *mendiolai* Baisas and *solomonis* Belkin. Members of this group possess the following adult characters in common: small in size; most scaling and integument dark brown to black with a supraalar line of broad white scales between wing base and scutal angle; a similar line around the ocular margin and across *apn* and *stp*; wing mostly dark scaled but with some pale scales at base of one or more veins; abdominal terga variously marked, but tV always (?) with a narrow to moderately broad apical band. Male terminalia

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with distimere short, stout, with inner apical half slightly distended and with a few distal bristles; aedeagus with dorsal bridge only; lateral plates usually with 2 apical or subapical, ventrally directed teeth, a cluster of 3-4 submedian ventral, basolaterally directed teeth.

U. rampae differs from all the above in the adult stage by the absence of pale scaling on all abdominal terga except tV. It is further distinguished from *albescens*, *christophersi*, *mendiolai* and *solomonis* by the absence of pale markings on the legs and from *campestris* and *macfarlanei* by the restriction of dull greyish white scales to the extreme basal posterior side of vein R and the presence of a few (3-5) pale greyish, translucent scales at base of vein Cu, and from *arguellesi* by the absence of greyish translucent scales at base of vein 1A.

The male of *rampae* has a conspicuous patch of moderately long, slender, curved erect bristles and scales on anterior surface of hind tarsomere I somewhat as occurs in *christophersi* which, of course, differs in other characters mentioned. The male terminalia can be readily differentiated from all of the above species by the peculiar median process arising from the dorsal subbasal bridge of the aedeagus. This process is narrowed at base with a broadly expanded truncate end and appearing as a broad flat leaflet or shield extending above the lateral plates to near apex of aedeagus.

IMMATURE STAGES. Only the pupa of this species is known for certain. The known immatures of this group of species are extremely similar. Though some can be recognized, the differences are in most cases not very obvious and further study is required before listing such differences.

This species is named in honor of Mrs. Rampa Rattnarithikul in recognition of her many years of devoted service as chief technician of the mosquito taxonomy section, Department of Medical Entomology, SEATO Medical Research Laboratory, Bangkok, Thailand and for many hours of personal assistance rendered the senior author during 1964-1967.

TYPE DATA. Holotype female, Svay Chrom, *Kompong Chhnang*, CAMBODIA, 7 January 1968, resting in tree hole, J. M. Klein (USNM); allotype male with terminalia on slide, Ari-Ksatr, *Kandal*, CAMBODIA, 1 May 1967, resting in vegetation, J. M. Klein (USNM); paratypes 2 females and 2 males with terminalia on slides, same data as holotype (USNM); 1 male with terminalia on slide, same locality as allotype, 23 May 1967, resting in vegetation, J. M. Klein (Centre ORSTOM, Bondy, France); 1 female, Prey Totung, *Kandal*, CAMBODIA, 25 February 1968, J. M. Klein (Centre ORSTOM, Bondy, France); 1 male with terminalia on slide, Chruai Chang War, *Kandal*, CAMBODIA, 20 December 1967, J. M. Klein (Centre ORSTOM, Bondy, France).

DISTRIBUTION. Specimens examined: 7 males, 6 females, 2 associated pupal skins. CAMBODIA, as listed for type series. SOUTH VIETNAM, *Con Son*, 1 female (2512), 16 November 1966, 20th PMU, 1 male (3115), 20th PMU. THAILAND, *Pathum Thani*, 1 female, 1 pupal skin (01004), 12 April 1966, K. Mongkolpanya; *Phuket*, Bang

Kian, 1 male, 1 pupal skin (02520), 26 February 1968, K. Mongkolpanya.

BIOLOGY. The two specimens from Thailand were collected as pupae from a partially shaded swamp with abundant vegetation at about 70 m. elevation and a heavily shaded spring fed well with dead leaves near sea level. One female from South Vietnam is indicated as reared from a collection from swamp. All other specimens have been collected as resting adults.

***Uranotaenia diraphati*, n. sp.**

ADULT. A minute dark brownish-black species, with striking patterns of light and dark scales on the wings and brilliant, iridescent scales on head, mesonotum and pleuron. Though a number of species in Southeast Asia have pictured wings and bright iridescent scales, *diraphati* is readily distinguished by the following combination of characters: 2-3 moderately long stiff bristles on inner dorsal surface of torus; decumbent head scales all pale, varying in color with light angle, from dull grey-white to brilliant blue-white in male and more brilliant violet in female; frontal tuft moderately developed, scales very broad; erect scales absent; mesonotum dark brownish-black with a line of broad scales in front of wing, beginning at wing base as a short line of semi erect scales and expanding dorso-anteriorly into a very broad dense patch of short, flat, oval scales to scutal angle, scales dull grey or colorless transparent, undetectable in direct light, brilliant iridescent violet in indirect light; a narrow line of broad black scales across prescutellar space; short, flat, oval scales covering *apn* and entire upper third of *stp*, of same color and intensity as those on mesonotum in front of wing; legs dark; wings with veins C, Sc, R and R₁ black from about basal one fourth to about apical one third of wing, veins R₂₊₃, R₃₊₄, M and Cu₁ with 3-4 light brown scales each, forming a band across wing just beyond middle, remainder of wing including fringe pale whitish, translucent. The colors in the females before us are somewhat darker and more intense than the single reared male available but this is due to the obvious teneral condition of the male. The male terminalia is distinctive; distimere short, stout, slightly distended on inner margin apically, broadly rounded at apex, strongly pilose on inner and ventral sides from basal fourth to and including apex, spiniform moderate; basimere with basal mesal lobe apparently undeveloped, 3 stout bristles near basomesal margin and 1 stout subbasal, ventral bristle; lateral plates of aedeagus rather simple, narrowly connected dorsally, each plate with a small pointed, apical, ventrolaterally directed tooth, and a long stout, strongly curved, subapical, ventral, basally directed tooth.

IMMATURE STAGES. Only a single slide of larval and pupal skins in rather poor condition is available. There appear to be no significant differences between these and the immatures of *micans* Liec. and *bimaculata* Leic. and therefore characters will not be listed at this time.

This species is named in honor of Mr. Chaliou Diraphat, technician-collector of the taxonomy field team, Department of Medical Entomology, SEATO Medical Research Laboratory for his loyalty and

conscientious performance of duties under the senior author from 1964-1967.

TYPE DATA. Holotype male (NV38-6) with slides of terminalia and larval and pupal skins; type locality: Turien Nok, *Narathiwat*, THAILAND, 16 January 1965, from heavily shaded swamp, E. L. Peyton (USNM); paratypes 3 females (SL42) in very poor condition, Boriphat water falls, *Songkhla*, THAILAND, 20 March 1965, from light trap, K. Mongkolpanya and S. Maniwongse (USNM); 1 female in fair condition, Phnom Penh, Chruai Chang War, *Kandal*, CAMBODIA, 17 May 1967, at light, J. M. Klein (Centre ORSTOM, Bondy, France); 1 female in very poor condition, Phnom Penh, *Kandal*, CAMBODIA, 15 July 1967, at light in stable, J. M. Klein (Centre ORSTOM, Bondy, France). No other specimens available for examination.

Uranotaenia koli, n. sp.

ADULT. An easily recognized species in the adult stage by the following combination of characters: moderate to small in size; numerous long, slender, apically expanded and serrated erect scales over entire dorsal surface of head; without lines of broad pale scales on mesonotum or pleuron, but with a few flat brown scales on *apn*, upper posterior corner of *ppn*, an inconspicuous patch of flat almost colorless translucent scales crossing just above middle and narrowly extending down lower posterior margin of *stp*, 2-3 pale translucent scales intermixed with upper *mep* bristles; postnotum dark brownish-black; pleural integument yellowish-white with conspicuous brownish-black patches, *apn*, *ppn*, *psp*, *pra* and *ppl* dark, *stp* with an upper and mid anterior dark patch, *mep* with a dark patch on upper and lower margin, area between the dark patches yellowish-white; legs dark, mid femora with numerous long, slender bristles encircling middle, fore femora with similar but fewer bristles; wings dark, alula with a few broad dorso-marginal scales; abdominal terga with narrow basal ochreous bands. Closest to *stricklandi* Barraud which differs only in ornamentation of *mep*, which is all dark except for very narrow rim on lower and posterior margins and with a conspicuous patch of flat, pale white, translucent scales at middle. Male terminalia very similar to other related species, differences only minor and among some there are none; distimere long, slender, curved; essentially as described and illustrated for *hirsutifemora* Peters, *husaini* Qutubuddin, *luteola* Edwards, *mattinglyi* Qutubuddin, *philippinensis* Delfinado, *rossi* Delfinado, *stonei* Bohart and Ingram and *stricklandi* Barraud; aedeagus with narrow median, dorsal and ventral bridge, teeth of lateral plates arranged essentially as described and illustrated for *hirsutifemora*, *hongayi* Galliard and Ngu, *philippinensis* and *stonei*.

IMMATURE STAGES: The larva is easily distinguished from all other known species except *stonei* and *stricklandi* by the long delicate, multiple branched (6-9) head hair 5-C and the development of abdominal hairs 2, 11-I; 2, 9-II; 5, 9-III-V and 5-VI into a darkly pigmented, stout, pointed spine as long as or longer than the segments. In *stonei* head hair 5-C is 2-4 branched and abdominal hair 5-III is reduced to a very short moderately stout, simple spine. Only a single larval skin of *stricklandi* is available for examination and apparently differs from *koli* only in the narrowly incomplete anal saddle and the 2 branched abdominal

hair I-VIII (3-4 branched in *koli*). These small differences may or may not hold up in a series of *stricklandi*. The pupae of the above species are very similar, all of which have uniformly yellowish-brown integument; trumpet inserted nearer to wing pad than to mid dorsal line, indistinctly tracheoid on anterior basal side, pinna shallow, meatus without slit; abdominal hair 5-IV-VI well developed, single or double and longer than succeeding segments; hair I-IX undeveloped. The presence of rather uniform well spaced, moderately long, stout spines or teeth along the inner margin of paddle distinguishes *koli* from the others.

This species is named in honor of Mr. Kol Mongkolpanya, chief technician of the taxonomy field team, Department of Medical Entomology, SEATO Medical Research Laboratory, whose conscientious and enthusiastic efforts have helped to assemble one of the most complete mosquito collections in existence for Thailand.

TYPE DATA: Holotype female (00937-1) with slide of larval and pupal skins; type locality: Khao Sai Dao Mountain, *Chanthaburi*, THAILAND, 24 March 1966, K. Mongkolpanya (USNM); allotype male (00937-105) with slides of terminalia and pupal skin, same data as holotype (USNM); paratypes 14 males, 4 females, 14 pupal skins and 1 larva, same data as holotype; 2 males, 4 females, 6 pupal skins and 23 larvae (00959) same locality as holotype, 26 March 1966, K. Mongkolpanya (USNM).

DISTRIBUTION: Specimens examined: 37 males, 38 females, 88 larvae, 69 associated skins (9 larval, 60 pupal). CAMBODIA, *Kompong Speu*, Kirirom, O Tachat, 1 male, 23 May 1968, 1 male, 27 January 1969, J. M. Klein. THAILAND, as listed for type series; same locality as holotype, 2 males, 1 female, 3 pupal skins, 3 larvae (00940), 24 March 1966, S. Maneechai; 1 male, 3 females, 3 pupal skins, (00955), 25 March 1966, S. Maneechai; 1 male, 1 female, 2 larvae (00960-00962), 26 March 1966, S. Maneechai; 3 larvae (00837), 13 March 1966, E. L. Peyton; *Chon Buri*, Khao Mai Ha Wa, 4 males, 9 females, 6 larval skins, 11 pupal skins, 22 larvae (00238, 00239, 00241-00245, 00247, 00248), 30 June 1965, E. L. Peyton, S. Maneechai, K. Mongkolpanya and S. Chunchulcherm; 1 male, 1 pupal skin, 1 larva (00416), 19 August 1965, E. L. Peyton; *Lampang* Ban Pa Khoi, 4 larvae (01877), 28 March 1967, K. Mongkolpanya; *Nakhon Ratchasima*, Khao Suan Hom, 3 males, 3 females, 4 pupal skins, 7 larvae (02014, 02015, 02017), 23 May 1967, S. Maneechai, K. Mongkolpanya and C. Diraphat; Khai Phai, 4 larvae (02044), 26 May 1967, S. Maneechai; *Prachin Buri*, Ban Bu Phram, 6 males, 11 females, 17 pupal skins, 16 larvae, (00712, 00714-00716), 20 January 1966, E. L. Peyton, K. Mongkolpanya, S. Maneechai; *Tak*, Khao Salak Phra, 1 female, 1 pupal skin, 1 larval skin, 4 larvae, (00306), 1 August 1965, K. Mongkolpanya.

BIOLOGY: Apparently restricted to forested hill and mountainous areas. The immatures have been collected in Thailand on 28 occasions from crab-holes along the banks of shallow fresh running streams and once from an elephant foot print in a bog where crab holes were present at elevations ranging from 150 m. to 700 m. Adults have been collected once resting on vegetation along stream margin in Thailand and resting on rocks along stream in Cambodia. Nothing else is known of its habits.

***Uranotaenia gouldi*, n. sp.**

ADULT: A small uniformly light brown species without striking ornamentation, but easily recognized by the following combination of characters: head with a very narrow, but distinct ocular line of pale greyish-white scales, continuing forward as short, broad, greyish, translucent scales on interocular space to frons, sides entirely dull white with blue-green reflections, long, apically expanded and serrated erect scales over entire dorsal surface; mesonotum uniformly light orange brown, without pale lines or patches of broad scales; pleuron uniformly pale yellowish or greyish-brown, *apn* dark; pale greyish-white translucent scales on upper margin of *ppn*, other pleural scales absent; legs dark, undersides of femora greyish-white for entire length; wings dark, alula with a few broad dorso-marginal scales; abdominal terga light brown (beige); sterna grey.

This species is closest to *obscura* Edwards and the extralimital species *diagonalis* Brug and *papua* Brug in the overall unornamented appearance of the adult and especially in the absence of scales on pleural *stp* which is rather uncommon in the genus. These similarities are only superficial and do not necessarily imply a close relationship. The three above species are considerably darker than *gouldi* and have small patches of moderately broad greyish translucent scales on anterior margin of mesonotum in front of acrostichals and dorsocentrals; *apn* covered with flat scales; interocular space without scales extending to frons. As far as presently known the latter character occurs only in *gouldi*. The male terminalia is distinctive; distimere long, slightly curved, uniform on basal two thirds and tapered to narrow pointed apex on apical third, numerous moderately long distal bristles, spiniform small; lateral plates of aedeagus with narrow subapical, dorsal and ventral bridge, each plate with a rather straight dorsal, subapical, pointed tooth and three curved, laterally directed, apical teeth on a dorso-ventral line, the most ventral tooth strongest; basal mesal lobe moderately developed, with 5 stout, dorsal bristles, 1 stout ventral bristle and a number of smaller bristles.

IMMATURE STAGES: The immature stages of this species are also distinctive and there are no similarities to the other above mentioned species. The larva is easily recognized by the following combination of characters: basal two thirds of antenna with numerous short, stout spines, hair 1-A single, stiff, nearly two thirds as long as antenna, 2-A as long as 1-A; head hairs, 5, 6-C very long, single, moderately stout and lightly barbed on basal half, terminating into long delicate ends, inserted on diagonal line with 7-C; siphonal index about 5.0; saddle hair 1-X, very stout, barbed, 2 branched. The pupa is easily recognized by the development of the trumpet which is inserted nearer to wing pad than mid dorsal line, very short, broad, bell shaped, indistinctly tracheoid on anterior

basal fifth, meatus without slit, pinna with outer margin produced into a triangular leaflet, extending beyond an otherwise truncate end.

This species is named in honor of Dr. Douglas J. Gould, Chief, Department of Medical Entomology, U. S. Army Medical Component, SEATO Medical Research Laboratory for his continued interest and support of mosquito studies in Southeast Asia and for his personal encouragement and counsel to the senior author.

TYPE DATA: Holotype female (01711-1) with slide of pupal skin; type locality: Khao Sung, *Phangnga*, THAILAND, 17 October 1966, from swamp at about 15 m. elevation, E. L. Peyton (USNM); allotype male (01711-8) with slides of terminalia and larval and pupal skins, same data as holotype (USNM); paratypes 1 male in very poor condition, 2 females, 3 pupal skins, 3 larval skins (01711), same data as holotype (USNM); 1 larva (TG46), Tung Ka Bua, *Trang*, THAILAND, 8 October 1964, from seepage bog, E. L. Peyton (USNM); 1 female, 1 pupal skin, 1 larval skin (00437-1), Khao Lau, Waeng, *Narathiwat*, THAILAND, 7 September 1965, from stream pool at about 75 m. elevation, E. L. Peyton and S. Chunchulcherm (USNM); 1 female, Kirirom, *Kompong Speu*, CAMBODIA, 1 March 1968, resting on rocks along stream, J. M. Klein (Centre ORSTOM, Bondy, France). No other specimens available for examination.

Uranotaenia sombooni, n. sp.

ADULT: A rather small brown obscure species very similar to *annandalei* Barraud and *hebes* Barraud, with a narrow ocular line of dull white scales and an irregular dorso-lateral line of 5-8 slender erect scales on anterior margin of vertex and a similar line of fewer (4-5) smaller scales on occiput; mesonotum without a supraalar line of broad pale scales between wing base and scutal angle, but with a broad inconspicuous supraalar patch of moderately broad, pale greyish or brownish scales above wing base with a few scattered scales extending down in front of wing; a line of broad silvery translucent scales across *apn*, a few pale translucent scales on upper posterior corner of *ppn* and a broad patch of flat silvery translucent scales on upper *stp* narrowly extending down posterior margin; wings dark, alula without scales; abdomen and legs dark.

U. hebes differs from *sombooni* by the presence of a patch of broad flat silvery translucent scales at middle of pleural *mep*. *U. annandalei* differs in the ocular line of head scales which are distinctly silvery-bluish translucent or colorless, depending on light angle and in the absence of scales on *ppn*. The male terminalia is also very similar in these three species; distimere short, stout, slightly curved, of near uniform width from basal third to apex, a few small distal bristles and a moderately stout spiniform; basal mesal lobe of basimere poorly developed, limits ill defined, 3 stout dorsal bristles; aedeagus with lateral plates simple, narrowly connected mid dorsally, without dorsal or apical teeth but with a few (4-5) small, short, simple, basally directed teeth on subapical, ventral margin. *U. sombooni* is distinguished from the others by the shape of distimere. In *annandalei* the distimere is shorter and straight, very stout at base and strongly

tapered to narrow apex, a few delicate distal bristles, spiniform slender, weak. In *hebes* the distimere is longer, rather uniform but with inner apical fifth distended and with 3 long, stout, curved bristles along distended edge and a few smaller distal bristles, spiniform moderate.

IMMATURE STAGES: The larva is easily recognized by the development of antennal hairs 1-4, hair 1-A is a short, stout, pointed spine, hairs 2-4-A, broad, flat, leaflets. The pupa is also easily recognized by the peculiar development of the trumpet, which is inserted nearer to mid dorsal line than to wing pad, very short, strongly flared from base, bell shaped, tracheoid strong on basal one half, meatus with slit to near base, pinna deep, with a long apical triangular, tongue shaped leaflet extending above rim on posterior lateral side.

This species is named in honor of Mr. Somboon Maneechai, technician-collector of the taxonomy field team, Department of Medical Entomology, SEATO Medical Research Laboratory for his loyalty and conscientious performance of duties under the senior author from 1964-1967.

TYPE DATA: Holotype male (00887-8) with slides of terminalia and larval and pupal skins; type locality: Khao Sai Dao Mountain, *Chanthaburi*, THAILAND, 16 March 1966, from seepage pool at about 1100 m. elevation, E. L. Peyton and K. Mongkolpanya; allotype female (00954-1) with slide of larval and pupal skin, same locality as holotype, 25 March 1966, stream pool at 700 m. elevation, S. Maneechai; paratypes 1 male, 5 females, 4 pupal skins, 3 larval skins and 1 larva (00954), same data as allotype; 9 males, 4 females, 11 pupal skins, 9 larval skins and 6 larvae (00901), same locality as holotype, 20 March 1966, large stream pool at 750 m. elevation, E. L. Peyton and S. Maneechai. All types deposited in USNM.

DISTRIBUTION: Specimens examined: 27 males, 35 females, 60 larvae, 65 associated skins (27 larval, 38 pupal). CAMBODIA, *Kompong Speu*, Kirirom, 3 males, 4 females, 1 March 1968, 1 male, 19 March 1968, J. M. Klein. THAILAND, as listed for type series; same locality as type series, 2 males (00888), 16 March 1966, C. Diraphat; 13 females (00900), 20 March 1966, E. L. Peyton; 1 male, 1 female, 2 larval skins, 2 pupal skins (00916), 21 March 1966, C. Diraphat; 2 larvae (00944), 24 March 1966, and 1 larva (00955), 25 March 1966, S. Maneechai; 2 males, 3 females, 3 larval skins, 4 pupal skins, 13 larvae (00966, 00969), 26 March 1966, K. Mongkolpanya, C. Diraphat; 1 larva (00977), 29 March 1966, C. Diraphat; *Chaing Mai*, Doi Sutep, 1 male, 3 females, 4 pupal skins, 2 larval skins, 4 larvae (CM137), 1 October 1963, S. Esah; 1 female, 1 pupal skin, 1 larval skin, 5 larvae (CM158), 4 October 1963, S. Esah; 7 larvae (T1173), 2 May 1962, S. Esah; Huey Mao Lai, 2 larvae (T2658), 3 June 1963, S. Esah; *Lampang*, 1 male, 1 pupal skin, 1 larval skin, 2 larvae (NY94), 6 January 1964, J. E. Scanlon; *Nakhon Nayok*, Khao Yai, Pha Kluay

Mai, 2 males, 3 females, 5 pupal skins, 2 larval skins, 5 larvae (NY35), 6 January 1964, SEATO; Muang, 1 larva (T9337), 14 August 1963, K. Mongkolpanya; *Prachin Buri*, Ban Thung Faek, 4 larvae (00682-00683), 3 December 1965, S. Chunchulcherm, S. Maneechai; *Tak*, Doi Sam Sao, 2 males, 2 pupal skins, 1 larval skin, 1 larva (00260), 29 July 1965, S. Maneechai; 1 male, 1 pupal skin, 1 larval skin, 4 larvae (00274), 3 July 1965, K. Mongkolpanya; Khao Salak Phra, 1 female, 1 pupal skin, (00299), 31 July 1965, S. Maneechai; *Trat*, Ban Klong Thian, Ko Chang Island, 2 larvae (02488), 19 December 1967, C. Diraphat.

BIOLOGY: Apparently restricted to forested hill and mountainous areas at elevations of 100 to 1100 m. in Thailand. Breeds most commonly in partially to heavily shaded stream and seepage pools with lots of dead leaves and sticks, but has also been collected from rock pools, a tin can in stream bed, stream margin, a running ditch and once from an open split bamboo with dead leaves by edge of stream. Adults have been collected resting on rocks along stream banks.

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