

Description of a New *Dermacentor* (Acari: Ixodidae) Species from Thailand and Vietnam

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ABSTRACT A new tick species belonging to the genus *Dermacentor* Koch, 1844, namely, *Dermacentor filippovae* n. sp., is described. All stages of this species are similar to those of *D. auratus* Supino, 1897, *D. compactus* Neumann, 1901, and *D. limbooliati* Apanaskevich and Apanaskevich, 2015 with which it was previously confused. Males of *D. filippovae* may be distinguished from those of *D. auratus*, *D. compactus*, and *D. limbooliati* by the following suite of characters: conscutum broadly oval with convex lateral sides, widest posteriorly; trapezium-like shape of pseudoscutum; central brown patch on conscutum indistinct; coxa I with internal spur narrowly triangular with tapering apex and external spur fairly long, narrowly triangular with tapering apex; numerous internal spurs on coxa IV; and trochanter I with moderate, broadly triangular spur with tapering apex. Females of *D. filippovae* may be distinguished from those of *D. auratus*, *D. compactus*, and *D. limbooliati* by the following suite of characters: central patch of scutum narrow, distinct line interrupted around midlength; more rounded shape of scutum; long and distinct alloscutal setae; moderately broad U-shaped genital aperture with preatrial fold bulging anteriorly and thereafter sharply sloping to flat surface posteriorly; coxa I with internal spur narrowly triangular with tapering apex and external spur fairly long, narrowly triangular with tapering apex; and trochanter I with moderate, broadly triangular spur with tapering apex. *Dermacentor filippovae* is known from Thailand and Vietnam where the adults were collected from wild boar, *Sus scrofa* L., and vegetation.

KEY WORDS *Dermacentor filippovae* n. sp., Thailand, Vietnam

The systematics of species in the genus *Dermacentor* Koch, 1844 is still debatable in many aspects, and identification of species in this genus is one of the most difficult tasks among ixodid ticks. All primarily Oriental species of the genus, such as *D. atrosignatus* Neumann, 1906, *D. auratus* Supino, 1897, *D. compactus* Neumann, 1901, *D. confragus* (Schulze, 1933), *D. steini* (Schulze, 1933), and *D. taiwanensis* Sugimoto, 1935 were assigned to the subgenus *Indocentor* Schulze, 1933 and their systematics was critically revised and adults of most of the species were redescribed in a number of publications by Wassef and Hoogstraal (1983, 1984a, b, 1986a, b). Data on systematics of Chinese *Indocentor* species were provided by Sun and Xu (2013). Recently the seventh valid species in this subgenus, namely, *D. limbooliati* Apanaskevich & Apanaskevich, 2015, was described (Apanaskevich and Apanaskevich 2015) and the eighth species, *D. bellulus* (Schulze, 1935), reestablished (Apanaskevich and Apanaskevich, 2015). Larvae and nymphs for most of these species remain unknown.

Recent re-examination of extensive holdings of Oriental *Dermacentor* ticks in the United States National

Tick Collection (USNTC) revealed a morphologically distinct female belonging to a new species of this genus from Thailand. An additional three males and one female of this species from Vietnam were lately found in the collection of the Zoological Museum of Moscow State University. The male and female of this species are described below.

Materials and Methods

The material examined for the description is summarized in Table 1. Only field-collected ticks were available for study. The specimens that were examined are deposited in the USNTC (The James H. Oliver, Jr. Institute for Coastal Plain Science, Georgia Southern University, Statesboro, GA) and the Zoological Museum of Moscow State University (Moscow, Russia). For comparative purposes nearly 1,200 males and 770 females of *D. auratus* originating from Cambodia, China, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Sri Lanka, Thailand, and Vietnam, nearly 4,800 males and 5,900 females of *D. compactus* collected in Malaysia and Indonesia, and all known specimens (6 males and 6 females) of *D. limbooliati* from Malaysia and Vietnam were examined.

The adults were studied by means of a stereoscopic microscope (Olympus SZX16, Olympus Corporation,

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Table 1. *Dermacentor filippovae* n. sp., material examined

No. of ticks		Host	Locality; altitude (m)	Date	Collector ^a	Accession no.
♂	♀					
Thailand						
1		<i>Sus scrofa</i>	Sakon Nakhon, Sakon Nakhon, Khok Phu, Ban Sang Kho; 491	11.II.1954	REE, BL	USNMENT 00714498
Vietnam						
1		Vegetation	Gia Lai, An Khe, Buon Luoi	15.VI.1982	YMZ	USNMENT 00714745
1		Vegetation	Gia Lai, An Khe, Buon Luoi	18.X.1986		Tdi-4740
1		Vegetation	Gia Lai, An Khe, Buon Luoi	19.X.1986		Tdi-4739
	1	Clothing	Binh Phuoc, Bu Gia Map, 13 km NE of Bu Gia Map Village, Bu Gia Map National Park	IV.2009	AVA	Tdi-5803
3	2	Total				

^a AVA, A.V. Abramov; BL, B. Legakul; REE, R.E. Elbel; YMZ, Yu.M. Zaytsev.

Tokyo, Japan). Because of the very limited number of specimens available, we avoided using scanning electron microscopy in this study. Measurements for the male and female are given in millimeters. The measurements are arranged as follows: minimum–maximum (mean \pm SD; n = number of specimens measured). All illustrations have been drawn by D.A. Apanaskevich and colored and edited by M.A. Apanaskevich.

Nomenclature. This paper and the nomenclatural act it contains have been registered in Zoobank (www.zoobank.com), the official register of the International Commission on Zoological Nomenclature. The LSID (Life Science Identifier) number is: urn:lsid:zoobank.org:pub:D1781418-288C-4563-8325-33E58584211

Dermacentor filippovae n. sp. (Figs. 1–3)

Male (Figs. 1A and 2). Conscutum (Fig. 1A): broadly oval, widest posterior to mid-length; distance from scapular apices to posterior margin of conscutum 4.35–4.93 (4.63 \pm 0.29; n = 3), maximum width 3.58–3.97 (3.73 \pm 0.21; n = 3), ratio length to width 1.21–1.26 (1.24 \pm 0.02; n = 3). Coloration as illustrated: ornamentation very intensive, light- to dark-brown background forms few patches often with indistinct hazy margins; a pair of pale brown patches in cervical pits; a pair of large narrow straight patches extending from eyes posteromedially and fusing at midlength of conscutum, posteromedian margin of pseudoscutum delimited by these patches appears to be triangular- or trapezium-shaped; lateral field with one narrow brown patch extending along most of lateral margin of conscutum from eye to first festoon and with two broad projections toward lateral grooves just posterior to conscutal midlength and before 1st pair of festoons; narrow brown patches in posteromedian and paramedian regions; posteromedian strip connects to brown patches limiting pseudoscutum and does not reach median festoon; all festoons extensively ornate with brownish sutures between them; other brown patches indistinguishable or as barely visible diffused brownish speckles; all punctations light- to dark-brown. Central field posterior to pseudoscutum is flat giving a concave appearance to conscutum; combination of elevations in this field with large deep punctations imparts a rugose,

uneven appearance to the surface. Cervical grooves shallow; a pair of central depressions, and a second posterior pair that correspond to paramedian grooves; lateral grooves superficial, aligned with large punctations; 11 distinct festoons; median festoon narrower than paramedians. Large and deep punctations very dense, distributed over entire conscutum; large punctations in pseudoscutum very dense; fine punctations dense, evenly distributed. Eyes (Fig. 1A): oval, very slightly convex, at anterior one-fifth of scutal length. Setae relatively short and inconspicuous. Spiracular plates (Fig. 2A): suboval; dorsal prolongation relatively long and broad, without conspicuous unperforated widening anteriorly; perforations very small and fairly numerous. Sclerotized plaques on festoons ventrally intensively ornate. Gnathosoma (Figs. 1A, 2B and C): length from palpal apices to cornual apices dorsally 1.17–1.30 (1.22 \pm 0.07; n = 3), width of basis capituli 0.80–0.90 (0.84 \pm 0.06; n = 3), ratio length to width 1.43–1.47 (1.45 \pm 0.02; n = 3). Basis capituli (Figs. 1A, 2B and C): dorsally subrectangular; posterior margin nearly straight; length 0.46–0.54 (0.50 \pm 0.04; n = 3), ratio width to length 1.66–1.72 (1.69 \pm 0.03; n = 3); cornua broad, very short, total length of basis capituli, including cornua, 7.25–8.57 (8.11 \pm 0.74; n = 3) cornual length; with extensive whitish enameling. Basis capituli ventrally subrectangular; posterior margin convex. Palpi (Figs. 1A, 2B and C): short, broad; length dorsally (segments I–III) 0.72–0.75 (0.74 \pm 0.02; n = 3), width 0.38–0.42 (0.40 \pm 0.02; n = 3), ratio length to width 1.77–1.96 (1.85 \pm 0.10; n = 3), length of segments in descending order: 2, 3, 1, 4; segment I well-developed ventrally; segment II narrower at base and thereafter widening, without clear denticle at posterior margin dorsally; segment III subrectangular with broadly rounded apex; segments II and III with extensive whitish enameling on dorsal surfaces. Hypostome (Fig. 2C): club-shaped; dental formula 3/3. Legs (Fig. 1A): of medium length, relatively slender; with extensive whitish enameling mostly on dorsal and lateral aspects of leg segments. Coxae (Fig. 2D): coxa I with relatively short widely spaced internal and external spurs; internal spur narrowly triangular with tapering apex and slightly shorter than external spur; external spur narrowly triangular with tapering apex, straight or

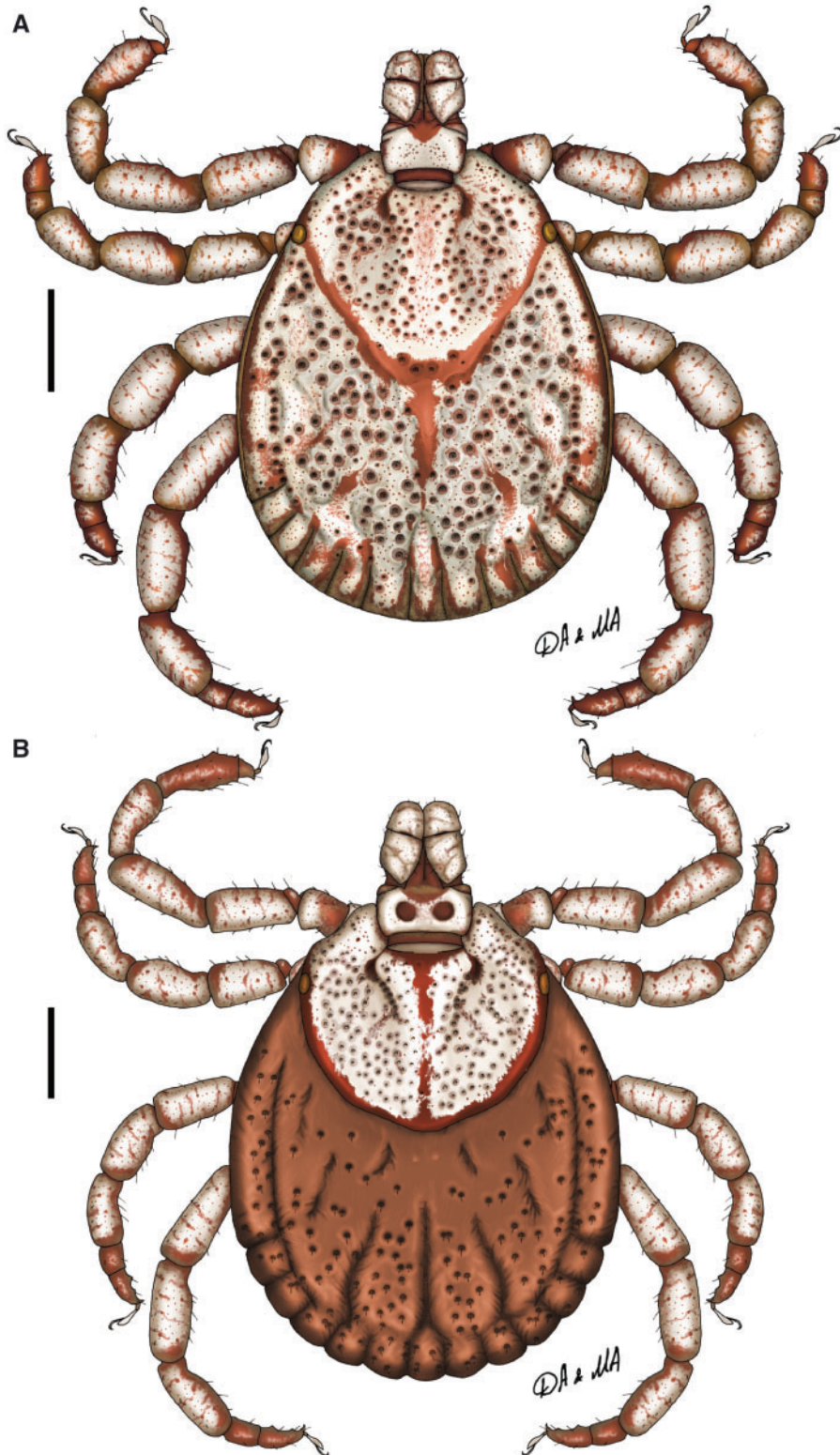


Fig. 1. *Dermacentor filippovae* n. sp., dorsally. (A) Male (Vietnam, Gia Lai, An Khe, Buon Luoi, USNMENT 00714745). (B) Female (Vietnam, Binh Phuoc, Bu Gia Map, 13 km NE of Bu Gia Map Village, Bu Gia Map National Park, Tdi-5803). Scale bar = 1 mm.

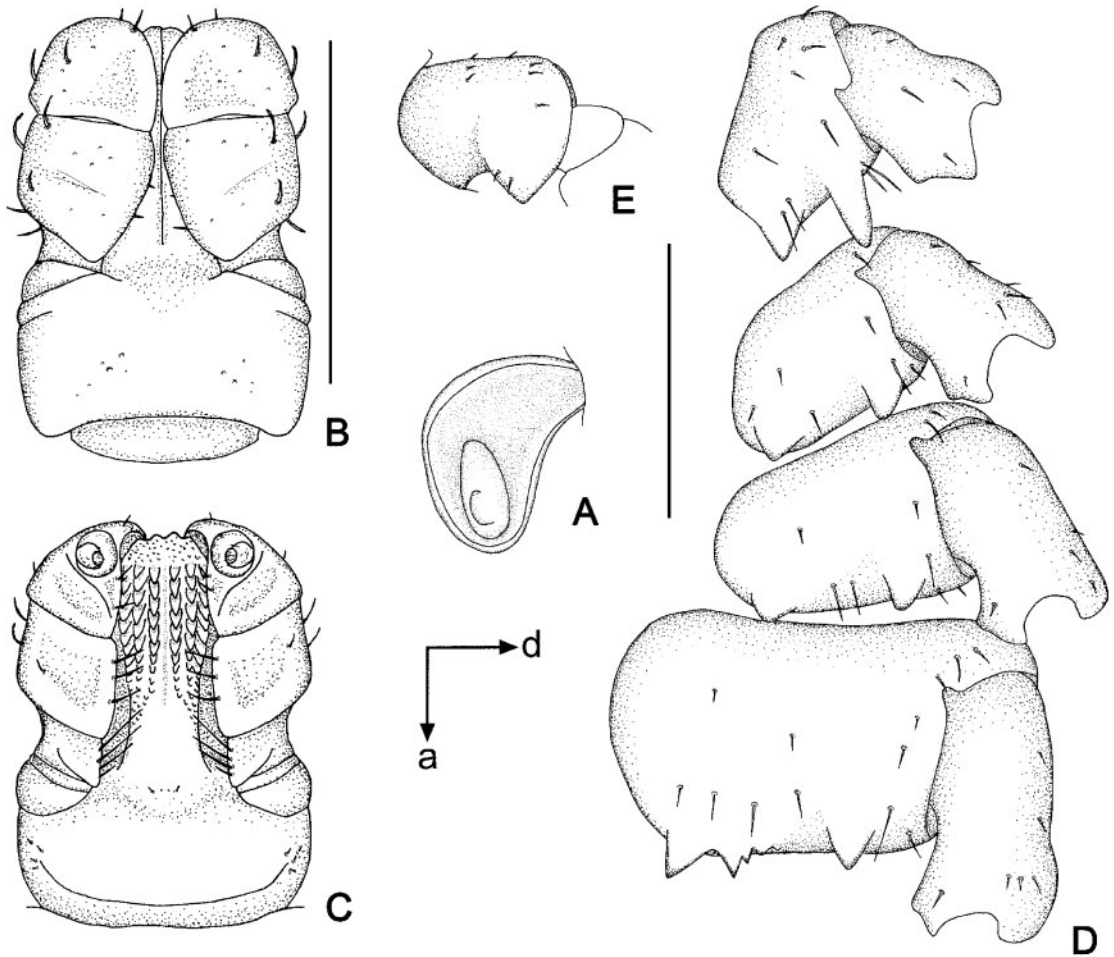


Fig. 2. *Dermacentor filippovae* n. sp., male (Vietnam, Gia Lai, An Khe, Buon Luoi, USNM 00714745). (A) Spiracular plate. Scale bar = 1 mm. Arrows show orientation of spiracular plate (a—anterior; d—dorsal). (B) Gnathosoma dorsally. Scale bar = 1 mm. (C) Gnathosoma ventrally. Scale bar = 1 mm. (D) Coxae. Scale bar = 1 mm. (E) Trochanter I. Scale bar = 1 mm.

slightly curved medially; both spurs of coxa I generally directed posteriorly; coxae II and III each with triangular external and internal spurs with tapering or narrowly rounded apex, external spur slightly larger than internal; coxa IV with moderate triangular external spur tapering at apex and with several moderate triangular internal spurs, all with tapering apices; coxa IV enlarged, ratio length to width 0.77–0.81 (0.79 ± 0.02 ; $n = 3$); coxae I with small spots of whitish enameling. Trochanter I (Figs. 1A and 2E) with moderate, broadly triangular dorsal spur with tapering apex. Genu IV and Tibia IV (Fig. 1A) with two rows of very short projections ventrally. Genu IV length 1.04–1.14 (1.08 ± 0.05 ; $n = 3$), width 0.45–0.50 (0.47 ± 0.02 ; $n = 3$), ratio length to width 2.23–2.32 (2.28 ± 0.04 ; $n = 3$).

Female (Figs. 1B and 3). Idiosoma (Fig. 1B): broadly oval, widest posterior to mid-length. Scutum (Fig. 1B): length 2.16–2.42 (2.29 ; $n = 2$), width 2.66–2.70 (2.68 ; $n = 2$), ratio length to width 0.81–0.90 (0.85 ; $n = 2$), margins in anterior half of scutum diverge

posteriorly, thereafter gradually converging to broadly rounded posterior margin with slight posterolateral angular projections. Coloration of scutum: ornamentation very intensive, brown colored patches arranged as follows: two pairs of small patches in cervical pits, two indistinct diffuse patches in cervical fields, narrow central stripe extending from anterior margin to posterior margin of scutum, entirely lacking in anterior half or incomplete in middle with speck-like small, darker patches, two narrow patches bordering posterior margin of scutum extending from just anterior to eyes and connecting at the posterior apex of scutum. Cervical grooves distinct, moderately deep. Surface of scutum slightly rugose; large and deep punctations very dense and situated mostly in cervical grooves and lateral fields; fine punctations dense, evenly distributed over scutum. Eyes oval, very slightly convex, positioned at anterior to mid-length. Setae relatively sparse and short. Alloscutum (Fig. 1B): as illustrated; 11 festoons. Setae of alloscutum relatively long (ca. 0.13), dense.

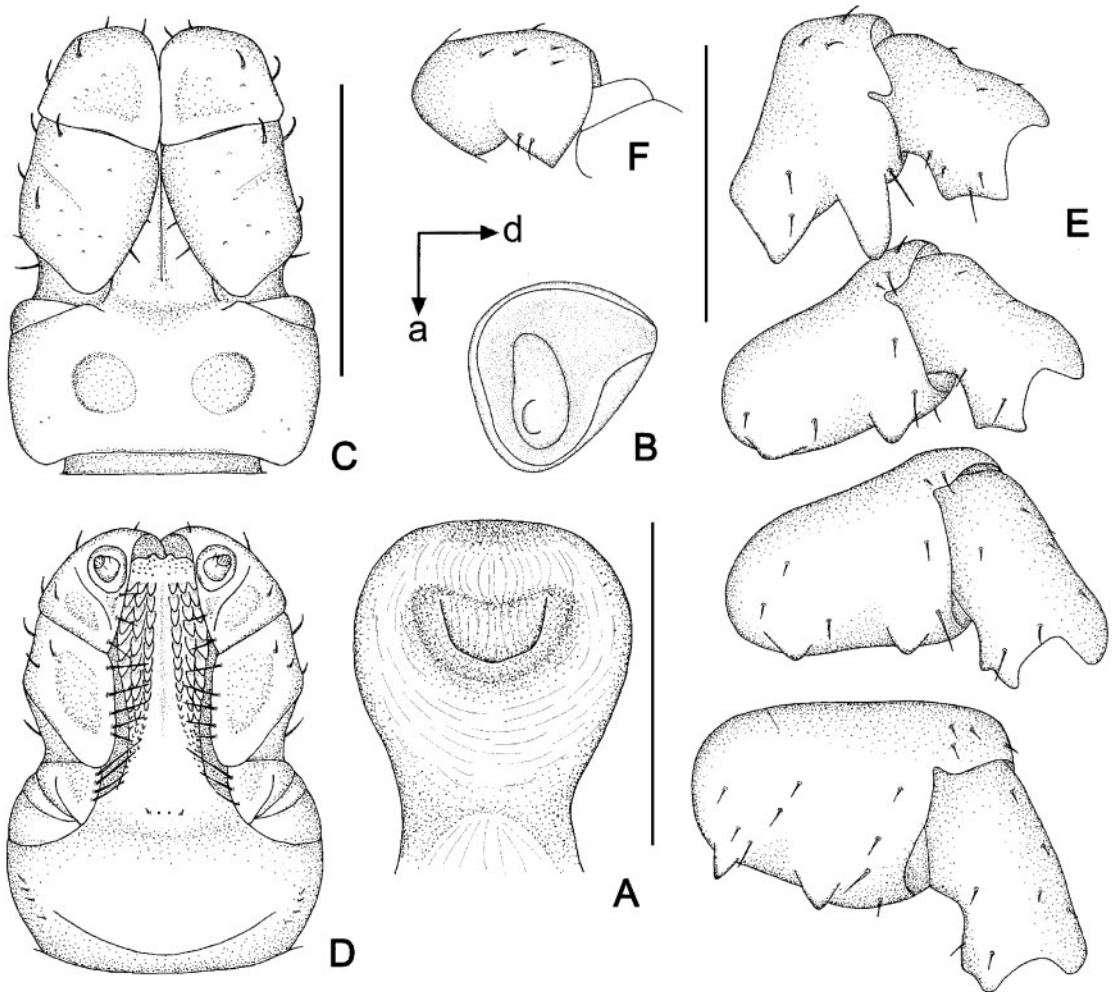


Fig. 3. *Dermacentor filippovae* n. sp., female (Vietnam, Binh Phuoc, Bu Gia Map, 13 km NE of Bu Gia Map Village, Bu Gia Map National Park, Tdi-5803). (A) Genital aperture. Scale bar = 0.5 mm. (B) Spiracular plate. Scale bar = 1 mm. Arrows show orientation of spiracular plate (a—anterior; d—dorsal). (C) Gnathosoma dorsally. Scale bar = 1 mm. (D) Gnathosoma ventrally. Scale bar = 1 mm. (E) Coxae. Scale bar = 1 mm. (F) Trochanter I. Scale bar = 1 mm.

Venter: setae numerous and relatively short. Genital aperture (Fig. 3A): at level of coxae II, moderately broad U-shaped, sclerites bordering genital aperture laterally very narrow; preatrial fold bulging anteriorly and thereafter sharply sloping to flat surface posteriorly. Spiracular plates (Fig. 3B): suboval; dorsal prolongation relatively long and broad, rounded at its apex, with conspicuous broad unperforated widening anteriorly; perforations very small and fairly numerous. Gnathosoma (Figs. 1B, 3C and D): length from palpal apices to posterior margin of basis capituli dorsally 1.36–1.49 (1.42; $n=2$), width of basis capituli 1.00–1.02 (1.01; $n=2$), ratio length to width 1.36–1.45 (1.41; $n=2$). Basis capituli (Figs. 1B, 3C and D): dorsally subrectangular; posterior margin nearly straight; length 0.50–0.54 (0.52; $n=2$), ratio width to length 1.88–2.00 (1.94; $n=2$); cornua broad, very short, total length of basis capituli, including cornua, 9.71–12.50 (11.11; $n=2$) cornual

length; dorsally intensively ornate with whitish enameling. Porose areas moderate: width of basis capituli 4.26–4.73 (4.49; $n=2$) porose area width, circular, deeply sunken with clearly circumscribed borders, separated by space less than their width. Basis capituli ventrally subrectangular; with convex posterior margin. Palpi (Figs. 1B, 3C and D): short and broad; length dorsally (segments I–III) 0.86–0.96 (0.91; $n=2$), width 0.38–0.41 (0.39; $n=2$), ratio length to width 2.26–2.35 (2.31; $n=2$), length of segments in descending order: 2, 3, 1, 4; segment I well developed ventrally; segment II narrower at base and thereafter parallel-sided, without clear denticle at posterior margin dorsally; segment III broad, subrectangular with broadly rounded apex; segments II and III with intense whitish enameling on dorsal surfaces. Hypostome (Fig. 3D): club-shaped; dental formula 3/3. Legs (Fig. 1B): of medium length, slender; intensively ornate with whitish enameling on

dorsal and lateral aspects of leg segments. Coxae (Fig. 3E): coxa I with relatively short widely spaced internal and external spurs; internal spur narrowly triangular with tapering apex and slightly shorter than external spur; external spur narrowly triangular with tapering apex, straight or slightly curved medially; both spurs of coxa I generally directed posteriorly; coxae II and III each with triangular external and internal spurs with narrowly to broadly rounded apex, external spur slightly larger than internal; coxa IV with moderate subequal triangular external and internal spur with tapering apex; coxa I with small spots of ivory enameling. Trochanter I (Fig. 3F) with moderate, broadly triangular dorsal spur with tapering apex. Genu IV length 1.08–1.14 (1.11; $n = 2$), width 0.41–0.46 (0.44; $n = 2$), ratio length to width 2.45–2.61 (2.53; $n = 2$).

Nymph and Larva remain unknown.

HOLOTYPE. Male, from vegetation, Buon Luoi (~14° 20' N, 108° 36' E), An Khe District, Gia Lai Province, Vietnam, 15.VI.1982, Yu.M. Zaytsev; deposited in the USNTC (USNMENT 00714745).

ALLOTYPE. Female, from *Sus scrofa* L., Ban Sang Kho (16° 52' N, 103° 55' E), Khok Phu, Sakon Nakhon, Sakon Nakhon Province, Thailand, 491 m alt., 11.II.1954, R.E. Elbel, B. Legakul; deposited in the USNTC (USNMENT 00714498).

PARATYPES. Vietnam: 1 male, from vegetation, Buon Luoi, An Khe District, Gia Lai Province, 19.X.1986; deposited in the Zoological Museum of Moscow State University (Tdi-4739); 1 male, from vegetation, Buon Luoi, An Khe District, Gia Lai Province, 18.X.1986; deposited in the Zoological Museum of Moscow State University (Tdi-4740); 1 female, from clothing, Bu Gia Map National Park (12° 11'37" N, 107° 12'21" E), 13 km NE of Bu Gia Map Village, Bu Gia Map District, Binh Phuoc Province, IV.2009, A.V. Abramov; deposited in the Zoological Museum of Moscow State University (Tdi-5803).

Distribution and Hosts. The collection data for *D. filippovae* are those of the type series (Table 1). This species is confined to Thailand (Sakon Nakhon Province) and Vietnam (Binh Phuoc and Gia Lai Provinces; Fig. 4). Visible disjunction in the distribution of *D. filippovae* is most probably artificial and can be explained by the absence or extreme scarcity of available *Dermacentor* collections from Cambodia and Laos. We hope that our work will promote tick studies in the region and this new species will also be found in these countries. One female was collected from wild boar, *Sus scrofa* L. while another female (unengorged) was found on human clothing. Three males were collected from vegetation. Probably as with the other species of Oriental *Dermacentor* the major host for the adults is wild boar.

Five known adult ticks of this species were collected in February, April, June, and October.

Etymology. The species is named after Dr. Natalia A. Filippova (Zoological Institute, Russian Academy of Sciences, St Petersburg, Russia), an eminent taxonomist who has significantly contributed to our knowledge on tick systematics, evolution and ecology.



Fig. 4. *Dermacentor filippovae* n. sp., map of geographical distribution. Star shows type locality, filled circles show confirmed localities.

Related Species. Morphologically the adults of *D. filippovae* are most similar to those of *D. auratus*, *D. compactus*, and *D. limbooliati*. Adults of these four species have widely spaced internal and external spurs on coxae I. Considering the male conscutal and female scutal shape, the sculpture and coloration male and female *D. filippovae* are closest to *D. auratus*, while the shape of the spurs on coxa I is most similar to that of *D. compactus*.

Males of *D. filippovae* can be distinguished from those of *D. auratus*, *D. compactus* and *D. limbooliati* by the following suite of characters: conscutum broadly oval with convex lateral sides, widest posteriorly (less broadly oval conscutum, lateral sides straightened and widest near mid-length in *D. compactus* and *D. limbooliati*), trapezium-like shape of pseudoscutum (broadly oval in *D. compactus* and *D. limbooliati*), central brown patch indistinct on pseudoscutum and incomplete in posteromedian area of conscutum (narrow distinct line through the center of pseudoscutum often continuous to posteromedian area in *D. auratus*; wide and diffuse in the center of pseudoscutum, not continuous with center patch in posteromedian area in *D. limbooliati*); coxa I with internal spur narrowly triangular with tapering apex and external spur fairly long, narrowly triangular with tapering apex (short and blunt internal and external spurs in *D. auratus*, short, broadly triangular, blunt internal spur in *D. limbooliati*); numerous internal spurs on coxa IV (only 1 in *D. compactus*) and trochanter I with moderate, broadly triangular spur with tapering apex (very short, broad spur with blunt apex in *D. compactus*).

Females of *D. limbooliati* can be distinguished from those of *D. auratus*, *D. compactus*, and *D. limbooliati* by the following suite of characters: central patch of scutum narrow distinct line entirely lacking in anterior half or not solid in the middle with speckles of darker little patches (broad diffuse patch in *D. limbooliati*; not

distinguished in *D. compactus*), more rounded shape of scutum (transversally oval in *D. compactus*), long and distinct alloscutal setae (very short and indistinct setae in *D. compactus*), moderately broad U-shaped genital aperture with preatrial fold bulging anteriorly and thereafter sharply sloping to flat surface posteriorly (very broadly U-shaped with slightly bulging and sloping preatrial fold in *D. auratus*; narrowly V-shaped with strongly bulging preatrial fold in *D. limbooliati*; very narrow U-shaped with very slightly bulging preatrial fold in *D. compactus*), coxa I with internal spur narrowly triangular with tapering apex and external spur fairly long, narrowly triangular with tapering apex (short and blunt internal and external spurs in *D. auratus*; short, broadly triangular, blunt internal spur in *D. limbooliati*) and trochanter I with moderate, broadly triangular spur with tapering apex (very short, broad spur with blunt apex in *D. compactus*).

Current study is an integral part of a global taxonomic revision of the *Dermacentor* ticks comprising subgenus *Indocentor* that occur in South and Southeast Asia. In the course of this research the authors have examined all available specimens (ca. 15,000 adults) in several major natural history collections. Clear diagnostic criteria as well as individual and geographic variability for each taxon were defined. This allowed us to find several new species that were previously misidentified. While some of the found new species are represented by hundreds or even thousands of specimens, others, unfortunately, have originated from poorly sampled regions and represented only by few specimens. We hope that this study will promote more intensive research on these ticks. This may provide specimens for further morphological as well as molecular studies. Molecular data on *Dermacentor* ticks occurring in the Oriental region may help us to understand the relationships among these species as well as provide some data that may be used in their systematics.

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