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Siseca todai (Acari, Trombiculidae): A New Species of Chigger Mite Collected from a Gekkonid Lizard, *Gekko hokouensis* Pope, 1928 on Yonaguni Island, Southwestern Okinawa, Japan

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Abstract We describe and illustrate a new species, *Siseca todai* n. sp. (Acari, Trombiculidae). The type material was collected from a gekkonid lizard, *Gekko hokouensis* Pope, 1928 on Yonaguni Island in southwestern Okinawa, Japan. This new species may be distinguished from known species by the shape of its scutum, palpal setal formula of B/N/NNN/7BS, sternal formula, and dorsal setae arrangement of 2-6-6-4-2-2.

Key words : Trombiculidae, chigger, gekkonid lizard, *Gekko hokouensis, Siseca todai.*

Introduction

We conducted intensive faunistic surveys of chigger mites parasitized on various gecko specimens preserved in alcohol that had been deposited in the University of the Ryukyus, the Kyoto University Museum, the National Museum of Nature and Science, Tokyo and the Japan Wildlife Research Center from 2005 to 2010. We examined 1,151 gecko specimens consisting of *Gekko hokouensis* (891 specimens), *Lepidodactylus lugubris* (145), *Gekko* sp. (45) *G. vertebralis* (39), *Hemidactylus frenatus* (28), and *G. shibatai* (3). There were 38 *G. hokouensis* from China among the specimens, as well as *H. frenatus* specimens from Taiwan (11) and China (4).

Researchers had collected these specimens from 36 islands belonging to the Nansei Islands, and Hahajima Island, which belongs to the Ogasawara Islands. The Nansei Islands string out in a great arc called the Ryukyu Arc along the east China coast. Hahajima Island is located in the northwestern Pacific Ocean, located approximately 1,000 km south of Tokyo Bay. As a whole, these islands are situated in the subtropical climatic zone.

We found one engorged chigger mite biting onto the cloaca of a *G. hokouensis* specimen captured in Kubura on Yonaguni Island, Okinawa Prefecture on October 25, 1992 by Dr. M. Toda. This chigger was uncommon, displaying morphologically unique characteristics; it belonged to the Trombiculidae genus *Siseca* Audy, 1956 and was proven to be a distinct specimen. This chigger was mounted with Hoyer's solution for identification under a photomicroscope.

This description of *S. todai* n. sp. is based on the holotype. Describing a new species based on a single individual is not customary. However, we decided to describe this chigger species as such herein because we unable to collect another individual of the same species from more than 1,000 gecko specimens.

The abbreviations and terminology used below are those used by Goff et al. (1982) with some modifications. All measurements are in micrometers. We measured paired structures and de-

scribed the averages. The holotype (NSMT-Ac 13620) has been deposited in the collection of the Department of Zoology, National Museum of Nature and Science, Tokyo.

Siseca todai Takahashi and Misumi, new species

[Japanese name: Toda-tsutsugamushi]

(Fig. 1)

Diagnosis of larva. SIF=7BS-N-2-3111.1000; fPp=B/N/NNN/7BS; fCx=1.1.1; Ip=888; fD=2H-6-6-4-2-2; DS=22; fV=18; NDV=40.

Description of larva. Live, enlarged larva unknown in color.

Idiosoma: Body longer than wide, measuring 475 long by 375 wide. Two pairs of eyes on ocular plate located by scutum at posterolateral setae (PL) level; diameter of anterior and posterior eyes 12 and 9, respectively.

Gnathosoma: Gnathosomal base bearing a pair of branched setae, moderately large punctations 67 wide at the branched setae line; cheliceral bases merely rounded, 17 wide with large punctations; cheliceral blade 6 wide with tricuspid cap. Galeal seta nude. fPp=B/N/NNN/7BS; palpal claw stout, 2-pronged, axial or external prong 12, 1 accessory or internal prong 10.

Scutum: Roughly quadrate; anterior margin slightly sinuous; lateral margins between anterolateral setae (AL) and PL slightly indented; posterior margin not extended collinearly with lateral margins behind PL bases; anteromedian seta (AM) base slightly above AL bases. Both AM and AL well back from anterior margin; sensillary bases (SB) wide apart and approximated to AL. Scutal setae possess a moderate number of very short setules for almost their entire length. Large punctations distributed on scutum excluding area around AM. Scutal measurements : AW, 86; PW, 96; SB, 56; ASB, 23; PSB, 50; SD, 73; AP, 41; AM, lack; AL, 29; PL, 43; sens, lack.

Idiosomal setae: One pair of humeral setae (HS) measuring 49; 22 dorsal idiosomal setae (DS) arranged in 2, 6, 6, 4, 2, 2 fashion; dorsal setae covered with a moderate number of thick and very short setules for almost their entire length. HS and DS similar to scutal setae. DS lengths as follows: medial seta of first posthumeral row 35; dorsal medial seta in central position 33; posterodorsal medial seta 34; dorsal terminal seta 43; Sternal setae (StS) 2-2: anterior 41, posterior 33, covered with a moderate number of setules on the surface of their entire length, more pliant than preanal setae; 10 preanal setae (or true ventral setae , VS) similar in nature to StS but shorter; length of medial seta in first pre-anal setal row 24; 4 post-anal setae (or caudal setae, CS) similar in nature to DS but shorter and more slender; length of medial seta in first post-anal row 40.

Leg: IP=Ip 888. All 7-segmented, terminating in a pair of claws and a slender clawlike empodium. Onychotriches lacking. Conspicuous large punctations on coxae and free leg segments. No modified leg segments.

Leg I: Length 307; tarsus 81 long by 18 wide; coxa with 1 branched seta (1B); trochanter 1B; basifemur 1B; telofemur 5B; genu 4B, 3 genualae (proximal genuala 16, dorsal genuala 15, distal genuala 14); 1 microgenuala 4; tibia 8B, 2 tibialae (proximal tibiala 19, distal tibiala 19), microtibiala 4; tarsus 20B, tarsala 28, microtarsala 3, parasubterminala 14, subterminala 28, pretarsala 14.

Leg II: Length 269; tarsus 57 long by 17 wide; coxa 1B; trochanter 1B; basifemur 2B; telofemur 4B; genu 3B, genuala 18; tibia 6B, 2 tibialae (proximal tibiala 14, distal tibiala 17); tarsus 15B, tarsala 16, microtarsala 3.

Leg III: Length 312; tarsus 85 long by 16 wide; coxa 1B; trochanter 1B; basifemur 2B; telofemur 3B; genu 3B, genuala 21; tibia 6B, tibiala 24; tarsus 15B, mastitarsala 59.

Etymology. This species is dedicated to Associate Prof. Mamoru Toda, who collected the gecko specimen that hosted the present new species.

Type material. Holotype (NSMT-Ac 13620): Kubura, Yonaguni Island, Okinawa, Japan. 25-X-1992, Coll. Dr. M. Toda, ex. *Gekko hokouensis* (KUZ32469) deposited in the zoological collec-

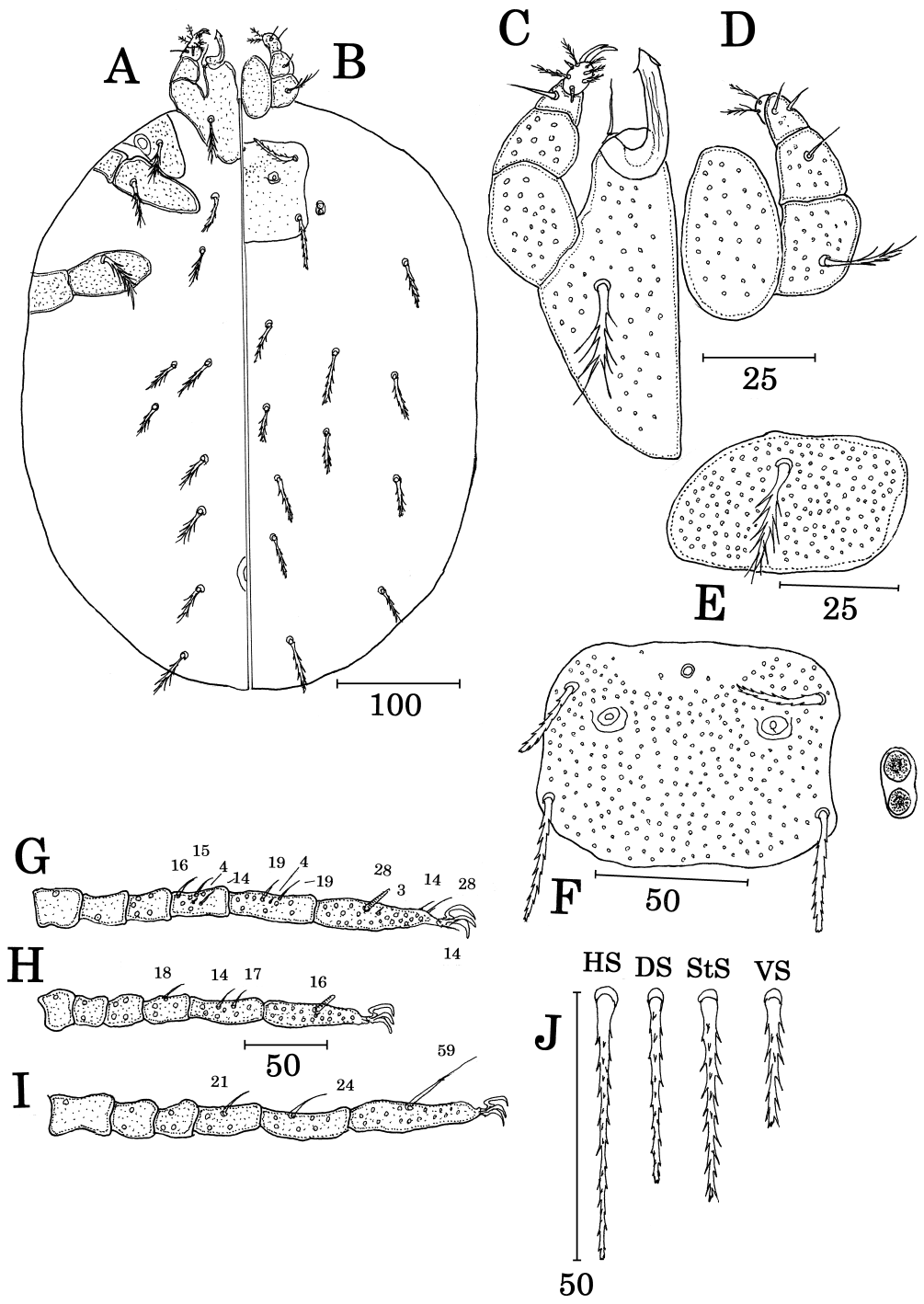

Fig. 1. *Siseca todai* n. sp., larva. — A and B, Ventral and dorsal aspects of larva; C and D, ventral and dorsal aspects of gnathosoma; E, coxa III; F, scutum and eyes on ocular plate; G, H, I, legs I, II, and III; J, details on setae: abbreviations: HS, humeral seta; DS, dorsal medial seta of first post-humeral row; StS, anterior sternal seta; VS, ventral medial seta of first post-sternal row. The length of the scale bar for each structure is in micrometers.

Table 1. World list of *Siseca*, distributions, hosts, and localities.

No.	Species	Host	Locality	Source
1	*gigarara* Brown, 1997	*Brachymeles schadenbergi*	Camiguin Is. (Philippines)	Brown, 1997
2	*haematocheiri* (Suzuki, 1976)	*Cardisoma carnifex* (land crab)	Yonaguni Is., Okinawa Pref. (Japan)	Takahashi et al. (unpublished data)
	=*Eutrombicula* (*Siseca*) *haematocheiri*	*Discoplax hirtipes* (land crab)	Kuroshima Is., Okinawa Pref. (Japan)	Takahashi et al. (unpublished data)
	Suzuki, 1976	*Discoplax hirtipes* (land crab)	Miyako Is., Okinawa Pref. (Japan)	Takahashi et al. (unpublished data)
		Discoplax hirtipes (land crab)	Yonaguni Is., Okinawa Pref. (Japan)	Takahashi et al. (unpublished data)
		Geograpsus grayi	Kodakara Is., Kagoshima Pref.(Japan)	Takahashi et al. (unpublished data)
		Geothelphusa obtusipes (freshwater crab)	Tokunoshima Is., Kagoshima Pref. (Japan)	Takahashi et al. (unpublished data)
		Potamon dehaani	Amamioshima Is., Kagoshima Pref. (Japan)	Suzuki, 1976
		Sesarma haematocheir	Amamioshima Is., Kagoshima Pref. (Japan)	Suzuki, 1976
		Sesarmops intermedium (varunid crab)	Iriomote Is., Okinawa Pref. (Japan)	Takahashi et al. (unpublished data)
		Soil (bird nest)	Hanmya Is., Kagoshima Pref. (Japan)	Suzuki, 1976
3	*lundbladi* (Womersley, 1952)	Unidentified skink	New Guinea (Indonesia)	Womersley, 1952
	=*Trombicula lundbladi* Womersley, 1952			
4	*rara* (Walch, 1923)	boots of human	New Guinea (Indonesia)	Womersley, 1952
	=*Trombicula rara* Walch,1923	*Callosciurus erythraeus*	Thailand	Lakshana, 1973
	=*Eutrombicula* (*Siseca*) *rara*	*Callosciurus finlaysoni*	Thailand	Lakshana, 1973
	Vercammen-Grandjean	*Callosciurus samarensis*	Philippine .	Brown and Goff, 1988
	and Audy, 1965	*Homo sapiens*	Sumatra Is. (Indonesia)	Walch, 1923
		Hylopetes phayrei	Thailand	Lakshana, 1973
		Insectivores	Malaysia	Nadchatram, 1966
		Lygosoma hinuliavariegatum	New Guinea (Indonesia)	Womersley, 1952
		Lygosoma rhomboidalis	Queensland (Australia)	Womersley, 1952
		Mabuya multicarina	Philippine	Brown and Goff, 1988
		Mabuya multifasciata (skink)	Malaysia	Audy, 1956
		Mabuya multifasciata (skink)	Malaysia	Nadchatram, 1966
		Mabuya multifasciata (skink)	Malaysia	Womersley and Audy, 1957
		Menetes berdmorei	Thailand	Lakshana, 1973
		Muscicapa tickelliae (bird)	Thailand	Lakshana, 1973
		Pitta moluccensis (Bird)	Thailand	Lakshana, 1973
		Rattus mulleri	Thailand	Lakshana, 1973
		Rattus rattus	Thailand	Lakshana, 1973
		Sphenomorphus jobiensis (lizard)	Madanga Prov.(Papua New Guinea)	Goff and Easton, 1989
		Sphenomorphus tenuis (lizard)	Queensland (Australia)	Domrow and Lester, 1985
		Tupaia glis	Malaysia	Nadchatram, 1966
		Tupaia glis	Thailand	Lakshana, 1973
		Unidentified rat	Sumatra Is. (Indonesia)	Walch, 1925
		Unidentified rat	Malaysia	Womersley and Audy, 1957

Table 1. (Continued)

No.	Species	Host	Locality	Source
		Unidentified rodents	Malaysia	Nadchatram, 1966
		Unidentified skink	Philippine Is.	Womersley, 1952
		Unidentified skink	New Guinea (Indonesia)	Womersley, 1952
		Unidentified snakes	Malaysia	Nadchatram, 1966
		Unidentified squirrel	Sumatra Is. (Indonesia)	Walch, 1923
		Unidentified tree shrew	Sumatra Is. (Indonesia)	Walch, 1925
		Zephronia sp. (pill-millipede)	Kuala Lumpur (Malaysia)	Womersley, 1952
5	*subrara* Audy, 1956	*Rattus rattus*	Thailand	Lakshana, 1973
		Sphaeropaeus globus-magicus (pill-millipede)	Kuala Lumpur (Malaysia)	Audy, 1956
		Sphaeropaeus globus-magicus (pill-millipede)	Malaysia	Womersley and Audy, 1957
		Tupaia glis	Thailand	Lakshana, 1973
6	*southcotti* Womersley and Audy, 1957 =*Eutrombicula* (*Siseca*) *southcotti* Vercammen-Grandjean and Audy, 1965	*Carlia rhomboidalis*	Queensland (Australia)	Womersley and Audy, 1957
		Carlia sp.	Queensland (Australia)	Womersley and Audy, 1957
		Common *Leiolopisma*	Queensland (Australia)	Domrow, 1962
		Lampropholis challengeri	Queensland (Australia)	Womersley and Audy, 1957
		Leiolopisma challengeri (swamp)	Queensland (Australia)	Domrow, 1962
		Lygosoma rhomboidalis	Queensland (Australia)	Womersley and Audy, 1957
		Unidentified skink	Queensland (Australia)	Domrow, 1962
7	*thori* (Womersley, 1952) =*Trombicula thori* Womersley, 1952 =*Eutrombicula* (*Siseca*) *thori* Vercammen-Grandjean and Audy, 1965	*Leiolopisma melanopogon*	Queensland (Australia)	Womersley, 1952
8	*todai* Takahashi and Misumi (this study)	*Gekko hokouensis*	Yonaguni Is., Okinawa Pref. (Japan)	
9	*vandiemeni* Domrow, 1962 =*Eutrombicula* (*Siseca*) *vandiemeni* Vercammen-Grandjean and Audy, 1965	*Egernia whitii* (skink)	Mara Is. (Australia)	Domrow, 1978
		Egernia whitii (skink)	Mara Is. (Australia)	Domrow and Lester, 1985
		Leiolopisma emtrecasteauxii	Tasmania (Australia)	Domrow and Lester, 1985
		Leiolopisma emtrecasteauxii	Tasmania (Australia)	Domrow, 1962
		Leiolopisma metallicum	Tasmania (Australia)	Domrow and Lester, 1985
		Leiolopisma metallicum	Tasmania (Australia)	Domrow, 1962
		Lygosoma ocellatum	Australia	Domrow, 1973
		Lygosoma ocellatum	Tasmania (Australia)	Domrow and Lester, 1985
10	*xixie* Wen and Xiang, 1984	*Potamon flexum* (freshwater crab)	Yun nan (China)	Wen and Xiang, 1984

tion of the Kyoto University Museum, Japan.

Remarks. The trombiculid genus *Siseca* was created by Audy (1956) for several chiggers normally parasitic on scincid lizards. These chiggers have a large and quadrate scutum. Moreover, their SB are also wide apart and closer to the anterior than to the posterior margin. Six species have been recorded from reptiles (especially skinks) and in the cases of *S. subrara* and *S. haematocheiri* from pill-millipedes and crabs, respectively (Audy, 1956; Suzuki, 1976), with the host range extending secondarily to birds and mammals, including man (Table 1), and distributed from the southern part of Japan to Australasian regions in the tropical and subtropical climatic zones.

In Japan, only one *Siseca* species, *S. haematokeiri* (Suzuki, 1976) has been recorded from various crabs collected on Amami-oshima Island, Kagoshima Prefecture (Suzuki, 1976). *Siseca todai* n. sp. is immediately distinguishable by its dorsal chaetotaxy. However, the general configuration and chaetotaxy of *S. todai* n. sp. resembles that of *S. vandiemeni* Domrow, 1962. *Siseca todai* n. sp. may be confidently identified by the number of posterior sternal setae it possesses.

Key to the ten species of the genus *Siseca* Audy, 1956

1. Sensillary bases (SB) nearer to line of anterolateral setae (AL) than to posterolateral setae (PL) 2
   SB almost in the center of the connecting line between AL and PL. . . . . *S. lundbladi*
2. PSB/ASB ratio of 2.5–2.7 3
   PSB/ASB ratio of 1.3–2.4 5
3. Palpal setal formula (fPp)=B/N/NNN/7BS; slender, tapering nude galeal setae 4
   fPp=N/N/NNN/7BS; peculiarly inflated nude galeal setae . . . . . *S. thori*
4. Scutum with distinct subquadrate; Posterior margin of scutum behind PL sharply turned in . . . . . *S. rara*
   Scutum almost square; Posterior margin of scutum behind PL continuing line of lateral margins. . . . . *S. southcotti*
5. Tarsus III with mastitarsala 6
   Tarsus III lack of mastitarsala. . . . . *S. gigarara*
6. Branched seta on palpal femur. 7
   Nude seta on palpal femur . . . . . *S. subrara*
7. fPp=B/N/NNN/7BS 8
   fPp=B/N/BNB/7BS . . . . . *S. xixie*
8. Dorsal setal formula (DSF) 2-6-6-4-2-2 (total 22). 9
   DSF 2-8(10)-6(8)-4(6)-4(6)-2(4)-2 (total 27-34) . . . . . *S. haematocheiri*
9. Posterior sternal setae : 2 pairs . . . . . *S. vandiemeni*
   Posterior sternal setae : 1 pair . . . . . *S. todai* n. sp.

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