Songklanakarin J. Sci. Technol.
41 (6), 1319-1327, Nov. - Dec. 2019

http://www.sjst.psu.ac.th

Original Article

Cyrtodactylus leegrismeri Chan and Norhayati, 2010 (Sauria: Gekkonidae): A first country record for Thailand

Pechrkawin Nurngsomsri[1], Chantip Chuaynkern[1], Prateep Duengkae[2, 3], Wachara Sanguansombat[4], Larry Lee Grismer[5], and Yodchaiy Chuaynkern[1*]

[1] *Department of Biology, Faculty of Science, Khon Kaen University, Mueang, Khon Kaen, 40002 Thailand*

[2] *Department of Forest Biology, Faculty of Forestry, Kasetsart University, Chatuchak, Bangkok, 10900 Thailand*

[3] *Center for Advanced Studies in Tropical Natural Resources, Kasetsart University, Chatuchak, Bangkok, 10900 Thailand*

[4] *Thailand Natural History Museum, National Science Museum, Technopolis, Khlong Luang, Pathum Thani, 12120 Thailand*

[5] *Herpetology Laboratory, Department of Biology, La Sierra University, Riverside, California, 92515-8247 United States of America*

Received: 17 March 2017; Revised: 15 June 2018; Accepted: 29 July 2018

Abstract

A new country record of the bent-toed gecko, *Cyrtodactylus leegrismeri* Chan and Norhayati, 2010 for Thailand was reported based on three specimens collected from Kra Island, Nakhon Si Thammarat Province in southern Thailand. Previously, the known distribution of the species was from islands in the Gulf of Thailand ranging from Malaysia to Vietnam. The present work reports an additional locality which lies between the northern-most and southern-most ranges of its distribution and is approximately 550 kilometers away from the type locality (Tenggol Island Resort, Pulau Tenggol, Terengganu, Peninsular Malaysia).

Keywords: *Cyrtodactylus condorensis* species complex, new record, Kra Island, Nakhon Si Thammarat, Gulf of Thailand

1. Introduction

Chan and Norhayati (2010) described *Cyrtodactylus leegrismeri* based on six specimens collected along the forest edge at Tenggol Island Resort (N 04° 48 ′ 36.4 ″ E 103° 40′ 48.3″, 9 m elevation), Pulau Tenggol, Terengganu, Peninsular Malaysia. The type specimens consisted of one holotype and five paratypes found in a wide variety of habitats where juveniles were found on leaves or branches of low vegetation and adults were encountered on tree trunks. Since *C. leegrismeri* was abundant throughout the entire island, it was possible that the species may also inhabit nearby islands. Recently, Grismer, Wood, Ngo, and Murdoch (2015) considered *C. thochuensis* Ngo and Grismer, 2012 from islands off the south coast of Vietnam as a junior synonym of *C. leegrismeri*. To date, the known habitat of *C. leegrismeri* is restricted to islands in the Gulf of Thailand (Chan & Norhayati, 2010;

*Corresponding author
Email address: yodchaiy@kku.ac.th

Grismer, 2011; Grismer *et al.*, 2011, 2015; Grismer, Wood, & Lim, 2012).

Although many new species of the genus *Cyrtodactylus* have been described since the discovery of *C. leegrismeri*, additional records or specimens of this species have not been reported. In the present work, three specimens of *Cyrtodactylus* were obtained during a field survey conducted in 20 10 by Wachara Sanguansombat on Kra Island, Nakhon Si Thammarat Province, Gulf of Thailand (Figure 1). These specimens were examined and assigned to the species *C. leegrismeri* based on their morphology and comparison with the type description of this species.

2. Materials and Methods

The specimens were photographed *ex situ* in life, euthanized by injecting pentobarbital, preserved in 10% buffered formalin and transferred to 70% ethanol. Before preservation in formalin, liver samples were taken and preserved in 99% ethanol. The specimens were catalogued and deposited in the collection of the Thailand Natural History Museum (THNHM), Pathum Thani Province. Another museum abbreviation used in this study is UKMHC (Herpetological Collection of Universiti Kebangsaan Malaysia), Bangi, Selangor, Peninsular Malaysia).

Measurements were taken with a digital slide-caliper (to the nearest 0.1 mm). The measurements are presented in Table 1. Symmetrical characters are given in the form of "left/right". The subdigital lamellae formula of fingers and toes are given in the form of "(basal lamellae-0-distal lamellae)". The "0" indicates that there are no small scales between the basal and distal lamella.

Principal component analysis (PCA) and discriminate analysis of principal components (DAPC) were used to determine if the new species occupied unique positions in morphospace and the degree to which the variation in morphospace coincided with the species boundaries delimited by the molecular phylogenetic analyses. PCA, implemented by the prcomp command in R v 3.2.1 (R Core Team, 2015), searched for the best overall low-dimensional representation of significant morphological variation in the data. Femoroprecloacal pore counts were excluded from the PCA because they are present only in males. We used a concatenated data set composed of the discrete meristic data from the scale counts, chin scales, circumnasal scales, supranasals, supralabials, infralabials, dorsal scales, ventral scales, subdigital lamellae of the first finger, and subdigital lamellae of the first toe and the continuous mensural data from TrunkL, HeadL, HeadW, SnEye, NarEye, and ED. To remove the effects of body size from the mensural data, we used the following equation: $X_{adj} = X - \beta(SVL - SVL_{mean})$ where X_{adj}=adjusted value; X=measured value; β=unstandardized regression coefficient for each operational taxonomic unit (OTU); SVL= measured snout-vent length; and SVL_{mean}=overall average SVL of all OTU's (Lleonart, Salat, & Torres, 2000; Thorpe, 1975, 1983; Turan, 1999). All PCA data were log-transformed prior to analysis and scaled to their standard deviation in order to normalize their distribution so as to ensure characters with very large and very low values did not over-leverage the results owing to intervariable nonlinearity. To characterize clustering and separation in morphospace, a DAPC was performed to search for linear combinations of morphological variables having the greatest between-group variance and the smallest within-group variance (Jombart, Devillard, & Balloux, 2010). DAPC relied on log transformed data from the

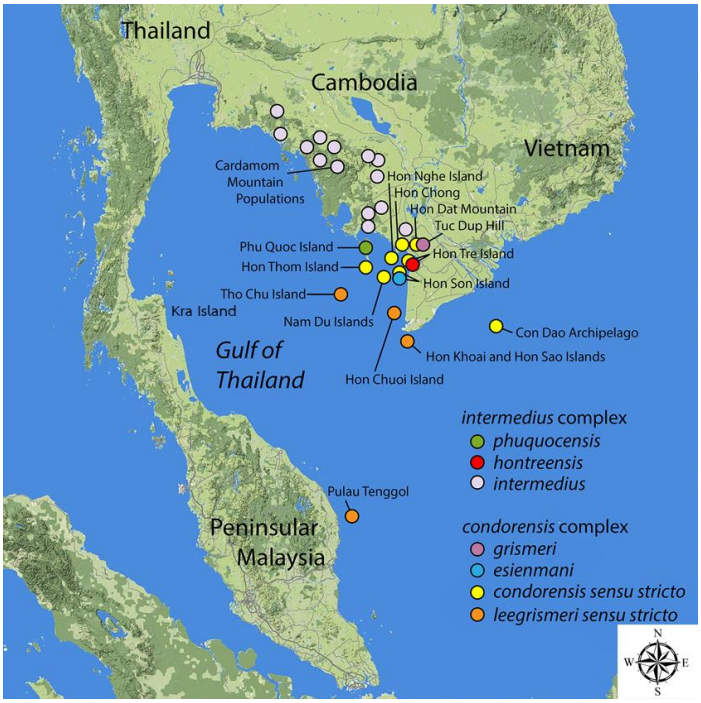

Figure 1. Known distribution of *Cyrtodactylus leegrismeri* and other species of the *C. intermedius* and *C. condorensis* complexes. Modified from Grismer *et al.* (2015).

Table 1. Abbreviations and definition of measurements used in this study.

Abb.	Characteristic	Definition
SVL	Snout-vent length.	Measured from tip of snout to vent.
HL	Head length.	Measured from tip of snout to back of mandible.
HW	Head width.	Measured at the widest position.
HH	Head height.	Measured at the highest position.
RW	Rostral width.	Measured the widest distance of rostral.
RH	Rostral height.	Measured the highest distance between lower and upper edges of rostral in vertical direction.
ML	Mental length.	Measured the longest distance of mental.
MW	Mental width.	Measured at the widest of mental.
UEW	Upper eyelid width.	Measured at the widest position of upper eyelid.
TYD	Ear opening length.	Measured distance between anterior and posterior through at horizontal position.
SS	Snout to shoulder length.	Measured from tip of snout to shoulder.
SL	Snout length.	Measured from tip of snout to anterior eye.
ED	Diameter of eye.	Measured distance between anterior and posterior at horizontal position.
TYE	Tympanum to eye distance.	Measured distance between eye and tympanum.
SN	Snout to nostril length.	Measured from tip of snout to anterior nostril.
IN	Internarial distance.	Measured distance between nostrils.
EN	Eye to nostril distance.	Measured distance between nostril and eye.
IFE	Distance between fronts of eyes.	Measured distance between fronts of eyes.
IUE	Distance between upper eyelids.	Measured distance between upper eyelids at narrowest position.
IBE	Distance between backs of eyes.	Measured distance between backs of eyes.
SPL	Supranasal length.	Measured at the longest position of supranasal.
SPW	Supranasal width.	Measured at the widest position of supranasal.
AG	Trunk length.	Measured distance between axillary to groin.
BH	Body height.	Measured at midbody position.
UAL	Upper arm length.	Measured from the tip of shoulder to elbow.
LAL	Lower arm length.	Measured from elbow to base of palmar.
FL	Femur length.	Measured from center of cloacal to knee.
TL	Tibia length.	Measured from knee to base of plantar.
PAL	Palmar length.	Measured distance from base of palmar to base of finger III.
PLL	Plantar length.	Measured distance from base of plantar to base of toe III.
TAL	Tail length.	Measured from center cloacal to tip of tail.
Finger 1-5	Length of fingers.	Measured from base of finger to tip of finger.
Toes 1-5	Length of toes.	Measured from base of toe to tip of toe.

PCA as a prior step to ensure that variables analyzed were not correlated or numbered fewer than the sample size. Principal components with eigenvalues greater than one were retained for the DAPC analysis according to the criterion of Kaiser (19 60), thus further reducing the dimensionality of the data set. All statistical analyses were performed using the platform R v 3.2.1 (R Core Team, 2015).

3. Results

3.1 *Cyrtodactylus leegrismeri* Chan and Norhayati, 2010

Cyrtodactylus leegrismeri Chan and Norhayati, 20 10: 49. Holotype: UKMHC 545. Type locality: "along the forest edge at Tenggol Island Resort (N 04° 48 ′ 36.4 ″ E 103° 40′ 48.3″, 9 m elevation)", Pulau Tenggol, Terengganu, Malaysia (Figures 2-5).

3.2 Material examined

THNHM 26270-72, collected by Wachara Saguansombat in 2009 from Kra Island, Nakhon Si Thammarat Province, Gulf of Thailand. Description of specimen based on the adult male THNHM 26272.

3.2.1 Description of the specimens

3.2.1.1 Size and general aspects

(1) *Cyrtodactylus* of medium size (SVL 81 mm), body robust. (2) Tail slender (regenerated), rounded in cross-section.

Figure 2. Living specimens of *Cyrtodactylus leegrismeri* from Pulau Tenggol of Malaysia (A, LSUDPC 5136; Photograph: L.L. Grismer) compared with specimens from Kra Island of Thailand (B, THNHM 26272, C, THNHM 26270, D, THNHM 26271; Photographs: Y. Chuaynkern). Photographs were taken *ex situ*.

Figure 3. Dorsal views of *Cyrtodactylus leegrismeri* Kra Island, Nakhon Si Thammarat Province, Gulf of Thailand in preservative. Above, THNHM 26272, middle=THNHM 26270, and bottom=THNHM 26271. Scale bar=10 mm.

Figure 4. Ventral view of *Cyrtodactylus leegrismeri* from Kra Island, Nakhon Si Thammarat Province, Gulf of Thailand in preservative. Above, THNHM 26272, middle =THNHM 26270, and bottom=THNHM 26271. Scale bar=10 mm.

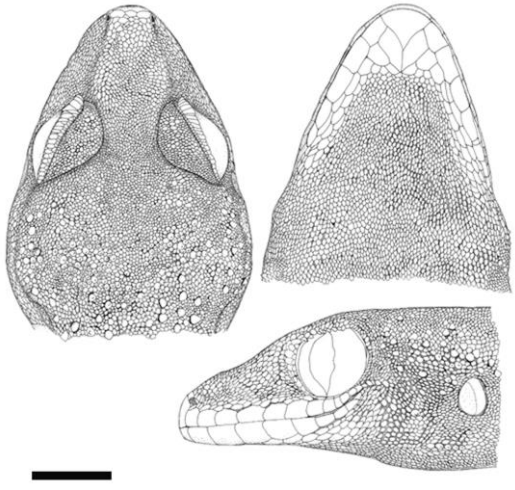

Figure 5. Dorsal (left), ventral (upper right), and lateral (lower right) views of the head of *Cyrtodactylus leegrismeri* (THNHM 26272, SVL 81 mm) from Kra Island, Nakhon Si Thammarat Province, Gulf of Thailand. Scale bar=5 mm.

3.2.1.2 Head

(3) Head triangular in dorsal view; short (HL/SVL ratio 0.3), 1.5 times longer than width (HL 23.6 mm; HW 16 mm); moderately wide, moderately high, 2.4 times longer than height (HH 10 mm). (4) Snout triangular in shape in dorsal view, acuminate in shape in lateral view, 1.4 times longer (SL 9 mm) than diameter of eye (ED 6.5 mm). (5) Canthus rostralis indistinct, rounded; loreal region concave. (6) Interorbital space flat, wider (IUE 4.4 mm) than upper eyelid (UEW 2.9 mm) and wider than internarial distance (IN 2.7 mm); distance between anterior margins of eyes (IFE 5.3 mm) 2.3 times in distance between posterior margins of eyes (IBE 12.3 mm). (7) Nostrils rounded, directed posterodorsally, 3.3 times closer to tip of snout (SN 2 mm) than to eye (NE 6.6 mm). (8) Eyes large (ED 6.5 mm), 1.6 times shorter than distance between snout to anterior eyeball. (9) Pupil crenulated, vertical. (10) Ear opening oval (TYD 1.5 mm), 4.3 times shorter than diameter of eyeball; ear opening to eyeball distance (TYE 6.4 mm) 4.3 times longer than ear opening diameter.

3.2.1.3 Body

(11) Body robust, triangular in cross-section; 1.1 times longer (AG 33.5 mm) than snout-shoulder length (ST 31.5 mm), 0.4 times shorter than snout-vent length.

3.2.1.4 Forelimbs

(12) Forelimbs moderately short; brachia 1.1 times longer (UAL 13 mm) than forearm (LAL 11.5 mm); forearm 3.4 times longer than manus (PAL 3.4 mm). (13) Finger lengths: F_4 (7 mm) and F_3 (6.8 mm) long; F_5 (6.6 mm) and F_2 (6.5 mm) moderately long; F_1 (5 mm) shortest. (14) Relative lengths of fingers: $F_4>F_3>F_5>F_2>F_1$. (15) Webbing between fingers absent.

3.2.1.5 Hind limbs

(16) Hind limbs moderately short; thigh 1.3 times longer (FL 21 mm) than foreleg (TL 15.8 mm); foreleg 2.5 times longer than pes (PLL 6.3 mm). (17) Toe lengths: T_4 (9.5 mm) longest, T_5 (8.6 mm) and T_3 (8 mm) moderately long, T_2 (7.5 mm) moderately short, T1 (5 mm) shortest. (18) Relative lengths of toes: $T_4>T_5>T_3>T_2>T_1$. (19) Webbing between toes absent.

3.2.1.6 Scalation

(20) Rostral rectangular, 1.8 times wider (RW 4 mm) than long (RH 2.3 mm), divided dorsally downward approximately ½ of rostral height and terminating with Y shape; posterior bordered by two supranasals and one internasal, laterally bordered by the first supralabial and nostril. (21) Supranasal oval, 1.2 times wider (SPW 1 mm) than long (SPL 0.8 mm); anteriorly bordered by rostral, posteriorly by granular scales on snout, separated from each other by an internasal. (22) One internasal, small, anteriorly bordered by rostral, posteriorly bordered by numerous granular scales on snout, laterally bordered by supranasals. (23) Supralabials 12/11 (left /right), one to eight equal in size and then gradually reduced posteriorly. (24) Infralabials 9/8 (left/right); the 1st infralabial

boarded by mental, the 1st chinshield and the 2nd chinshield; the 2nd infralabial bordered by the 2nd chinshield and the 3rd chinshield; infralabials 3–9 boarded by subinfralabials. (25) Snout region composed of homogeneous granular scales. (26) Upper eyelid scales homogeneous, granular. (27) Interorbital region scales homogeneous, granular. (28) Occipital region scales granular, mixed with conical tubercles. (29) Temporal region scales granular, mixed with conical tubercles. (30) Loreal region scales, homogeneous, granular. (31) Mental triangular, 1.3 times wider (MW 4 mm) than long (ML 3 mm); laterally bordered by the first infralabial; posteriorly bordered by the 1st chinshield. (32) The 1st chinshield trapezoidal, anteriorly bordered by mental and the 1st infralabial, posteriorly bordered by divided chinshield; the 2nd chinshield trapezoidal, anteriorly bordered by 1st chinshield, 1st infralabial and 2nd infralabial, posteriorly bordered by divided chinshield; the 3rd chinshield rounded, anteriorly bordered by the 2nd infralabial, posteriorly bordered by divided chinshield and granular gular scales; the divided chinshield rounded, anteriorly bordered by 1st chinshield, 2nd chinshield and 3rd chinshield, posteriorly bordered by granular gular scales; subinfralabials oval, bordered by infralabials and granular gular scales. (33) Gular region composed of homogeneous granular scales. (34) Dorsal granular scales mixed with conical tubercles, more dense laterally. (35) Dorsal longitudinal rows of tubercles at midbody 18. (36) Paravertebral tubercles 29. (37) Ventral scales rounded, overlapping; ventral scale rows at midbody 36. (38) Non-denticulate ventrolateral folds. (39) Preanal scales enlarged, largest at posteriorly. (40) Femoral scales enlarged. (41) Preanal pores four (absent in females). (42) Dorsal part of brachia composed of homogeneous granular scales, ventral part bearing rounded scales. (43) Dorsal parts of forearm bearing granular scales mixed with conical tubercles, ventral surface bearing rounded scales. (44) Manus: dorsal surface bearing granular scales, ventral surface rounded scales. (45) Subdigital lamellae of fingers continuous. (46) Subdigital lamellae formula: F_1 (2-0-9), F_2 (5-0-9), F_3 (5-0-8), F_4 (5-0-12), F_5 (6-0-7). (47) Dorsum of thigh bearing rounded granular scales mixed with conical tubercles, ventral surface bearing rounded scales. (48) Dorsum of foreleg bearing rounded granular scales mixed with conical tubercles, ventral surface bearing rounded scales. (49) Pes: dorsal surface bearing rounded granular scales, ventral surface bearing rounded scales. (50) Subdigital lamellae of toes continuous. (51) Subdigital lamellae formula: T_1 (2-0-7), T_2 (4-0-8), T_3 (5-0-10), T_4 (6-0-10), T_5 (7-0-12). (52) Dorsal part at base of tail bearing rounded granular scales mixed with conical tubercles, the regenerated portion of the tail covered with rounded, homogeneous scales; subcaudal region bearing enlarged scales, the regenerated tail bearing narrow, transverse subcaudal scales. (53) Ventrolateral caudal fringe absent.

3.2.1.7 Coloration (in preservative)

(54) Top of head, body, forelimbs, hind limbs and tail brown with dark-brown stripe extending from loreal region through the eye to temporal region and curving upwards to form a "V" shape on nape; dark-brown reticulated pattern on top of head; irregular dark-brown bands on body and tail; irregular dark-brown on dorsal part of forelimbs and hind limbs. (55) Gular region, abdomen, and undersides of forelimbs, hind limbs and tail uniform grayish brown.

4. Discussion

The specimens from Thailand were allocated to *C. leegrismeri* based on a comparison with the original description of the species given by Chan and Norhayati (2010). The morphological characters were similar to *C. leegrismeri* as follows (Tables 2 and 3): SVL 73.7–81 mm; conical, keeled, tubercles occurring on the occiput, body, hind limbs, and beyond base of tail; no enlarged tubercles on forelimbs; 18–20 longitudinal tubercle rows at midbody; 30–36 ventral scales at midbody; single row of transversely enlarged median subcaudal scales; abrupt transition between posterior and ventral femoral scales; four precloacal pores in males arranged in an arch; single row of enlarged femoral scales beneath each thigh which are not continuous with the pore-bearing precloacal scales; precloacal depression present; weak reticulations on head (adults); dark, indistinct symmetrical blotches on body. Selected measurements and morphological characters of the Thai specimens compared to the type series (data obtained from Chan and Norhayati (2010)) are presented in Table 2. However, the specimens from Thailand show some morphological differences from the type series (in parenthesis): adult male SVL 81 mm (91.6 mm in the holotype), supralabials 10-12 (10–11 in the holotype and paratypes), internasal separated by 1 scale (3 in the holotype), dorsal tubercle rows at midbody 18 (18–19 in the holotype and paratypes), ventral scale rows at midbody 36 (27–35 in the holotype and paratypes), few tubercles on forelimbs present (absent in holotype and paratypes), and fourth toe subdigital lamallae 16 (18–20 in the holotype and paratypes).

Since the species was described as new to science in 2010, no additional specimens have been reported. Our work added three additional specimens to the species collection, bringing the total known number of specimens to ten. However, Grismer *et al.* (2015) recently presented molecular analyses of the distantly related *C. condorensis* and *intermedius* species complexes of the Mekong Delta and islands in the Gulf of Thailand. The *C. condorensis* complex *sensu* Grismer *et al.* (2015) contains *C. condorensis* (Smith, 1921), *C. grismeri* Ngo, 2008 and *C. eisenmanae* Ngo, 2008, and six insular populations from the eastern Gulf of Thailand (Grismer *et al.*, 2011) and two more populations from the associated continental borderlands that have been variably referred to as *C. condorensis*, *C.* cf. *condorensis*, *C. paradoxus*, *C. thochuensis*, *C. leegrismeri*, *Cyrtodactylus* sp. 1, *Cyrotdactylus* sp. 2, *Cyrtodactylus* sp. 3, or *Cyrtodactylus* sp. 4. The results indicated that a junior synonym occurred within the *C. condorensis* complex. Therefore, Grismer *et al.* (2015) considered *C. paradoxus* a junior synonym of *C. condorensis* (Smith, 1921), and *C. thochuensis* a junior synonym of *C. leegrismeri* Chan and Norhayati (2010) based on nomenclatural priority. Grismer *et al.* (2015) further defined two distinct ecomorphs in both species complexes: a cave-dwelling ecomorph (CDE) and a general scansorial ecomorph (GSE). The analyses revealed that CDE evolved independently early on in the evolution of both complexes (represented by *C. grismeri* and *C. eisenmanae*).

In the population from Thailand (Kra Island, Nakhon Si Thammarat Province), *C. leegrismeri* bears the characteristics of a GSE including a blotched to irregularly banded dorsum pattern (Figures 2–3; see also in Figure 2, page 116 of Grismer *et al.* (2015)), relatively thick head

Table 2. Selected measurements (mm) and morphological characteristics of *Cyrtodactylus leegrismeri* from Thailand.

	Type series		THNHM 26270	THNHM 26271	THNHM 26272
	Male (*n*=4)	Female (*n*=2)	Female	Sub-adult	Male
SVL	88.3±5.3 (80.6-92)	90	73.7	59	81
TAL	89.7±16.2 (71-99)	77±7.1 (72-82)	88.2	82.5	60.7*
TAW	8.5±1.3 (6.9-10)	7.9±0.1 (7.8-8)	7.6	6	9
TL	12.7±0.7 (11.7-13.4)	13±0.1 (12.9-13.1)	11	9	11.5
FL	15.1±0.3 (14.6-15.3)	15.3±0.6 (14.8-15.7)	14.7	11.2	15.8
AG	37.3±2.4 (33.7-38.7)	38.9±0.1 (38.8-39)	29.2	23.4	33.5
HL	24.5±1.4 (22.6-25.9)	24.5±0.3 (24.3-24.7)	21.6	18	23.6
HW	15.3±0.8 (14.2-15.8)	15.8±0.1 (15.7-15.8)	13.9	11	16
HH	11.5±0.8 (10.3-12)	10.6±0.3 (10.4-10.8)	8.5	7	10
EL	4.8±0.3 (4.5-5.1)	5.2±0.2 (5-5.3)	5.7	5	6.5
TYE	7.6±0.4 (7.1-8)	7.7±0.1 (7.6-7.7)	5.5	4.4	6.4
SL	10.7±0.6 (10.1-11.2)	10.8±0.1 (10.7-10.8)	8.8	7	9
NE	8.2±0.5 (7.6-8.6)	7.9±0.1 (7.8-8)	6.8	5.1	6.6
IUE	6±0.3 (5.6-6.2)	6.2±0.8 (5.6-6.8)	3.6	1.8	4.4
TYD	1.9±0.3 (1.5-2.1)	2±0.1 (1.9-2)	1.5	1.5	1.5
IN	2.95±0.2 (2.7-3.1)	2.8	2	2	2.7
Supralabials	10-11	10	10-12	10-11	11
Infralabials	7-9	7-8	9	9	7-8
Paravertebral tubercles	25-29	27-28	32	26	29
Tubercles across midbody	18-19	19	20	20	18
Ventral scales	30-35	27-30	31	30	36
Subdigital lamellae On 4th toe	20	18-20	14	17	15
Preanal pores	4	0	0	0	4
Enlarged femoral scales	5-9/6-10	5-6/5-8	7/6	4/3	9/7
Postanal tubercles	2-3/2-3	2/2	2/2	2/3	3/1

* indicates regenerated tail.

(HH/HL 0.38–0.42), short snout (SL/HL 0.38–0.4), small eyes (EL/HH 0.65–0.71), long trunk (AG/SVL 0.39–0.41), and strong tuberculation. *C. leegrismeri* from Thailand was found on the ground or moving on rocks, which was similarly congruent with the GSE group.

The PCA analysis indicated that the Kra Island population varies slightly from the other populations along PC2 which accounts for 16% of the variation but is embedded within the remaining populations (except Pulau Tenggol, Terengganu) along PC1 which accounts for 60% of the variation (Figure 6). The first four PCs were retained for the DAPC which indicated that the 95% confidence ellipse of the Kra Island population only slightly overlaps that of Hon Chuoi Island (Figure 7). Therefore, in the absence of molecular data, we consider the Kra population as a member of *C. leegrismeri*.

The occurrence of *C. leegrismeri* on Kra Island implies there may be more undiscovered populations of this species in the Gulf of Thailand or of the *C. condorensis* complex that exist on other islands within the distributional range of this species complex.

Table 3. Comparison of *Cyrtodactylus leegrismeri* and other Sunda Shelf species of the genus *Cyrtodactylus*. 1=presence of characteristic state, 0=absence of characteristic state; /=unable to assess. Information on *C. leegrismeri*, *C. condorensis* and *C. paradoxus* followed Chan and Norhayati (2010).

	leegrismeri (Thailand)	*leegrismeri* (Malaysia)	*condorensis*	*paradoxus*
SVL	73.7–81	80.6–92	80	84
Supralabials	10–12	10–11	10–11	9–10
Infralabials	7–9	7–9	8–9	9
Tubercles across midbody	18–20	18–19	22–24	16
Tuberculation moderate to strong	1	1	1	1
Tubercles on forelimbs	1	0	1	1
Tubercles on hind limbs	1	1	1	1
Tubercles on head and/or occiput	1	1	1	/
Tubercles on at least 1/3 of tail	1	1	1	1
Ventral scales	30–36	27–35	35–40	26–36
Enlarged median subcaudals	1	1	1	1
Proximal subdigital lamellae broad	1	1	1	1
Subdigital lamellae on 4th toe	14–17	18–20	14–16	17–25
Contact of posterior thigh scales abrupt	1	1	/	1
Enlarged femoral scales	1	1	1	1
Femoral pores	0	0	0	0
Precloacal groove	0	0	0	0
Enlarged precloacal scales	1	1	1	1
Precloacal pores	4	4	4–7	0–4
Precloacal and femoral pores/ scales continuous	0	0	0	0
Reticulate pattern on head	1	1	0	1
Body banded	0	0	1	0
Body blotched	1	1	0	1
Body striped	0	0	0	0

Table 4. Meristic characteristics for the populations of *Cyrtodactylus leegrismeri sensu stricto.*

	C. leegrismeri sensu stricto				
	leegrismeri Tenggol	*thochuensis* Tho Chu	Hon Chuoi sp.1	Hon Khoai sp.3	*leegrismeri* Kra island
Supralabials	10.4±0.55 (10-11)	11.78±1.09 (10-14)	11±0.71 (10-12)	10.7±0.86 (9-12)	11±1 (10-12)
Infralabials	8.2±0.45 (8-9)	9.11±0.6 (8-10)	9.2±0.84 (8-10)	8±0.56 (7-9)	8±1 (7-9)
Paravertebral tubercles	33.2±2.05 (30-35)	32±1.66 (29-34)	28.4±0.89 (27-29)	33.55±2.28 (30-39)	29±3 (26-32)
Ventral scales	41.8±0.84 (41-43)	34.78±3.42 (30-40)	37.4±3.78 (34-43)	38.15±3.27 (34-46)	32.33±3.22 (30-36)
4th toe lamellae	19.2±0.84 (18-20)	17.22±2.82 (10-19)	15.2±0.84 (14-16)	19.25±1.48 (17-22)	15.33±1.53 (14-17)
Enlarged femoral scales	16.2±2.95 (14-21)	23±1.32 (22-25)	18.6±3.05 (15-23)	16.15±2.46 (12-21)	12±4.58 (7-16)
Sample size	6	7	5	20	3

The current conservation status of the species has not yet been assessed for the IUCN Red List (IUCN, 2017). This might be due to the fact that the species was recently described. As in this case, intensive fieldwork will likely be necessary to reveal the additional geographical distribution of *C. leegrismeri*.

5. Conclusions

Three specimens of the genus *Cyrtodactylus* collected from southern Thailand (Kra Island, Nakhon Si Thammarat Province) were assigned to *C. leegrismeri* based on the similarity of their external morphology to that described in the

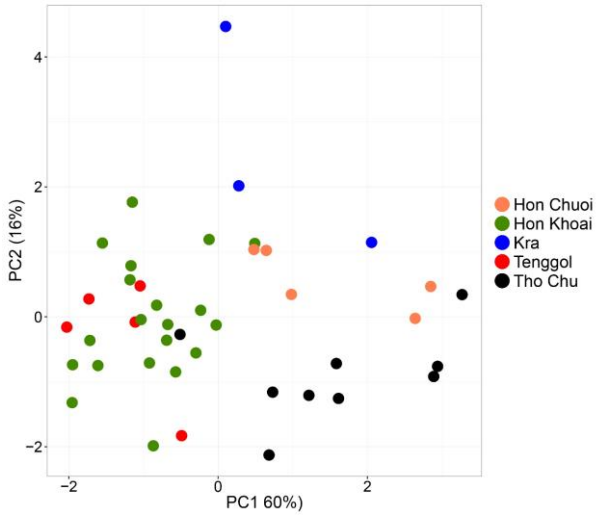

Figure 6. Plot of principal component analysis of morphometric ratios and meristic characteristics for all known populations of *Cyrtodactylus leegrismeri sensu stricto*.

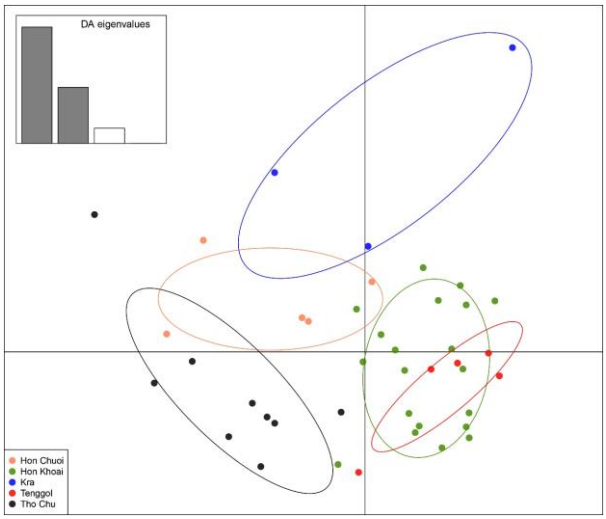

Figure 7. Plot of DAP2 analysis of morphometric ratios and meristic characteristics for all known populations of *Cyrtodactylus leegrismeri sensu stricto*.

description of the species. This work documents the first country record of this species in Thailand. The insular distribution of the species is known to occur in Peninsular Malaysia, Vietnam, and Thailand.

Acknowledgements

The authors are grateful to the following institutes for facilitating this study: Khon Kaen University (Khon Kaen Province, Thailand), Kasetsart University (Bangkok, Thailand), and the National Science Museum (Pathum Thani Province, Thailand). We are grateful to the following institutes and persons for lending to us the examined specimens: Khon Kaen University Vertebrates Collection (KKU, Khon Kaen Province) and the Thailand Natural History Museum (Somchai Bussarawit, Tanya Chan-ard, and Sunchai Makchai). For grants, this work was partially supported by the following: 1) the Research Support Scholarship (PN), 2) Funding for graduate students to study abroad (PN), 3) Funding for strengthening the research of professors by supporting graduate students (YC and PN), and 4) Funding for constructing researcher KKU (YC). Prateep Duengkae is the recipient of the Research Chair Grant of the National Science and Technology Development Agency (NSTDA), Thailand. Our special thanks go to Robert H. Orr for assistance with the English language presentation of an earlier manuscript.

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