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A new species of *Hemiphyllodactylus* (Squamata: Gekkonidae) from Hong Kong

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Abstract

A new species of gekkonid, *Hemiphyllodactylus hongkongensis* **sp. nov.**, is described based on a series of specimens collected from Hong Kong SAR, China. The new species can be distinguished from other known congeners by molecular divergence in the mitochondrial ND2 gene and morphological characters including 5–6 chin scales; a manual lamellar formula of 3–3(4)–4–4; a pedal lamellar formula of 3(4)–4(5)–4(5)–4; 24–25 continuous femoral and precloacal pores; 12–15 dorsal scales and 9–10 ventral scales contained in diameter of eye. At present, the genus *Hemiphyllodactylus* comprises 22 described species.

Key words: China, *Hemiphyllodactylus hongkongensis* **sp. nov.,** mitochondrial ND2, molecular phylogeny, morphology, slender gecko

Introduction

The gekkonid genus *Hemiphyllodactylus* Bleeker, 1860 currently comprises 21 described species and at least eight undescribed species (Grismer *et al.* 2013; Yan *et al.* 2016). The members of this genus are widely distributed throughout South and Southeast Asia, and Indo-Pacific islands (Uetz *et al.* 2014). Recent studies have demonstrated that this genus is far more diverse than previously recognized (Grismer *et al.* 2013)—10 species were described in the last five years (Cobos *et al.* 2016; Grismer *et al.* 2014; Grismer *et al.* 2013; Grismer *et al.* 2015; Grismer, Wood, *et al.* 2014; Guo *et al.* 2015; Nguyen *et al.* 2014; Yan *et al.* 2016). In mainland China, only one species (*Hemiphyllodactylus yunnanensis* Boulenger) was recognized (Zhao *et al.* 1999), with three subspecies (*H. yunnanensis longlingensis*, *H. yunnanensis jinpingensis*, *H. yunnanensis dushanensis*) from Southwest China, including Guangxi, Guizhou and Yunnan provinces (Zhao *et al.* 1999). Recent studies have elevated the three subspecies to full species status (Grismer *et al.* 2013) and described two new species from Guizhou and Yunnan Province (Guo *et al.* 2015; Yan *et al.* 2016). Very little is known about the taxonomic status of *Hemiphyllodactylus* in South China owing to the scarcity of specimens collected (Zug 2010).

We conducted field surveys to search for *Hemiphyllodactylus* specimens in an attempt to resolve the taxonomic status of the population in South China from Hong Kong. We collected eight *Hemiphyllodactylus* specimens and found that the population differs from all known species of *Hemiphyllodactylus* by distinctive morphological characters and substantial genetic divergences. We herein describe them as a new species.

Materials and methods

Taxon sampling. We collected a total of eight specimens from Hong Kong. All specimens were preserved in 70% ethanol after preserving liver or muscle tissue in 95% ethanol, and deposited at The Museum of Biology, Sun Yat-sen University (SYS), Guangzhou.

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Extraction, PCR amplification, and sequencing. We extracted DNA from the liver or muscle tissue removed from the specimens using Qiagen DNeasy Blood and Tissue Kit (Valencia, CA, USA) following the manufacturer's protocol. We amplified and sequenced the mitochondrial ND2 gene from all samples using the primer pair ND2f101A [5'-CAACAGAAGCCACAACAAAAT-3'] (Greenbaum *et al.* 2007) and HemiR [5'-GAAGAAGAGGCTTGGKAGGCT-3'] (Nguyen *et al.* 2013) following Nguyen *et al.* (2014). We performed PCR amplifications using Promega PCR Master Mix with the following cycling conditions: an initial denaturing step at 95°C for 5 min; 42 cycles of denaturing at 95°C for 30 s, annealing at 45°C for 45 s and extending at 72°C for 60 s, and a final extending step of 72°C for 6 min. PCR products were purified using Qiagen QIAquick PCR Purification Kit. PCR products were sent to BGI Hong Kong Co. Limited for sequencing. All sequences were deposited in GenBank (Table 1).

TABLE 1. Localities, voucher information, and Genbank accession numbers for specimens used in this study.

Species	Genbank accession no.	Locality	Specimen voucher No.
H. hongkongensis **sp. nov.**	MF893330	Aberdeen Country Park, Hong Kong	SYS r001735
H. hongkongensis **sp. nov.**	MF893331	Aberdeen Country Park, Hong Kong	SYS r001728
H. hongkongensis **sp. nov.**	MF893332	Aberdeen Country Park, Hong Kong	SYS r001729
H. hongkongensis **sp. nov.**	MF893333	Aberdeen Country Park, Hong Kong	SYS r001730
H. aurantiacus	JN393933	Yercaud, Tamil Nadu, India	N/A
H. banaensis	KF219783	Ba Na-Nui Chua, Vietnam	TBCZ2450
H. changningensis	KP732436	Changning, Yunnan, China	NJNUh00315
H. dushanensis	FJ971016	Dushan, Guizhou, China	NJNUh00001
H. engganoensis	KF219776	Pulau, Engano, Sumatra, Indonesia	MVZ239346
H. ganoklonis	JN393950	Ngercheu, Palau	USNM 563671
H. harterti	KF219760	Bukit Larut, Malaysia	LSUHC10383
H. huishuiensis	KU519709	Huishui, Guizhou, China	NJNUh00851
H. jinpingensis	FJ971041	Jinping,Yunnan, China	NJNUh00138
H. kiziriani	KJ676800	Luang Prabang, Laos	IEBR A.2014.3
H. longlingensis	FJ971046	Baoshan, Yunnan, China	NJNUh00104
H. titiwangsaensis	KF219785	Cameron Highlands, Malaysia	LSUHC10717
H. typus	GQ257745	Suva, Fiji	ABTC 32736
H. yunnanensis	FJ971021	Kunming ,Yunnan, China	NJNUh00056
H. zugi	KF575152	Ha Lang, Cao Bang, Vietnam	IEBR A.2013.21
H. **sp. nov.** 8	JN393949	Mandalay, Pyin Oo Lwin, Myanmar	USNM-FS 36836
H. **sp. nov.** 9	JN393935	Champasak, Pakxong, Laos	FMNH 258695

Phylogenetic analyses. We included sequences of *Hemiphyllodactylus* available from GenBank in the analysis (Table 1). We also included sequences of undescribed species, namely *H.* **sp. nov**. 8 and *H.* **sp. nov**. 9, revealed in Grismer *et al.* (2013). *Gehyra multilata* Wiegmann was used as outgroup. We aligned the sequences using Clustal W (Thompson *et al.* 1994) with default parameters in the software MEGA 6 (Tamura *et al.* 2013). We calculated uncorrected pairwise divergences using MEGA 6. We used Maximum likelihood (ML) and Bayesian inference (BI) for the phylogenetic analyses. ND2 fragments from different species were aligned and processed following Zhang *et al.* (2015). Sequences were aligned using Muscle in Mesquite, and poorly aligned positions were removed using Glocks. jModeltest2 was used to predict the most suitable model based on Akaike Information Criterion (AIC) (Darriba *et al.* 2012). Maximum Likelihood (ML) analysis was conducted with raxml GUI1.3 using GTR+I+G model. The Bayesian inference (BI) analysis was carried out using Mr Bayes 3.12 (Ronquist & Huelsenbeck 2003) following the methods in Sung *et al.* (2016).

Morphological characters. We took the following measurements from the specimens of the new species to the nearest 0.1 mm with digital calipers (Mitotoyo, Japan) under a dissecting microscope following the methods of Zug (2010): snout-vent length (SVL, distance from the tip of snout to the vent), tail length (TailL, from the vent to

the tip of tail), trunk length (TrunkL, taken from the posterior margin of the forelimb at its insertion point on the body to the anterior margin of the hind limb at its insertion point on the body), eye diameter (EyeD, the horizontal diameter of the eyeball); head length (HeadL, distance between retroarticular process of jaw to snout-tip), head width (HeadW, maximum width of head), nares-eye length (NarEye, measured from the anterior margin of the eye ball to the posterior margin of the external nares), snout-eye length (SnEye, distance between anteriormost point of eye and the tip of snout). We followed Zug (2010) and Grismer *et al.* (2013) for evaluation of meristic characters and color pattern.

We obtained comparative morphological data of all members of the genus *Hemiphyllodactylus* from the literature (Barbour 1924; Boulenger 1903; Cobos *et al.* 2016; Grismer *et al.* 2014; Grismer *et al.* 2013; Grismer *et al.* 2015; Guo *et al.* 2015; Ngo *et al.* 2014; Nguyen *et al.* 2013; Yan *et al.* 2016; Zhou *et al.* 1981; Zug 2010).

Results

Molecular phylogenetic analyses. The ML and BI phylogenetic trees were constructed based on DNA sequences of mitochondrial ND2 gene with a total length of 711 bp. The two analyses resulted in identical topologies, suggesting that the population of *Hemiphyllodactylus* from Hong Kong is sister to a clade comprising *H. zugi* Nguyen, Lehmann Le Duc, Duong, Bonkowski & Ziegler and *H. dushanensis* Zhou & Liu (Fig. 1). Furthermore, uncorrected *p*-distances among the four specimens sequenced from Hong Kong were ≤ 2.0 %, but the lowest *p*-distance between them and any known species of *Hemiphyllodactylus* was 8.3 %. These values are higher than those observed between several pairs of well-distinguished species (6.2 % between *H. dushanensis* and *H. zugi*; 7.2 % between *H. dushanensis* and *H. huishuiensis* Yan, Lin, Guo, Li & Zhou; and 8.1 % between *H. huishuiensis* and *H. zugi*; see Table 2). These results indicate that substantial genetic divergences occur between the specimens from Hong Kong and other described *Hemiphyllodactylus* species, and thus likely representing an undescribed species. In addition, this population presents a combination of morphological characters that are not observed in other known *Hemiphyllodactylus* species (see below). We herein describe the Hong Kong taxon as a new species:

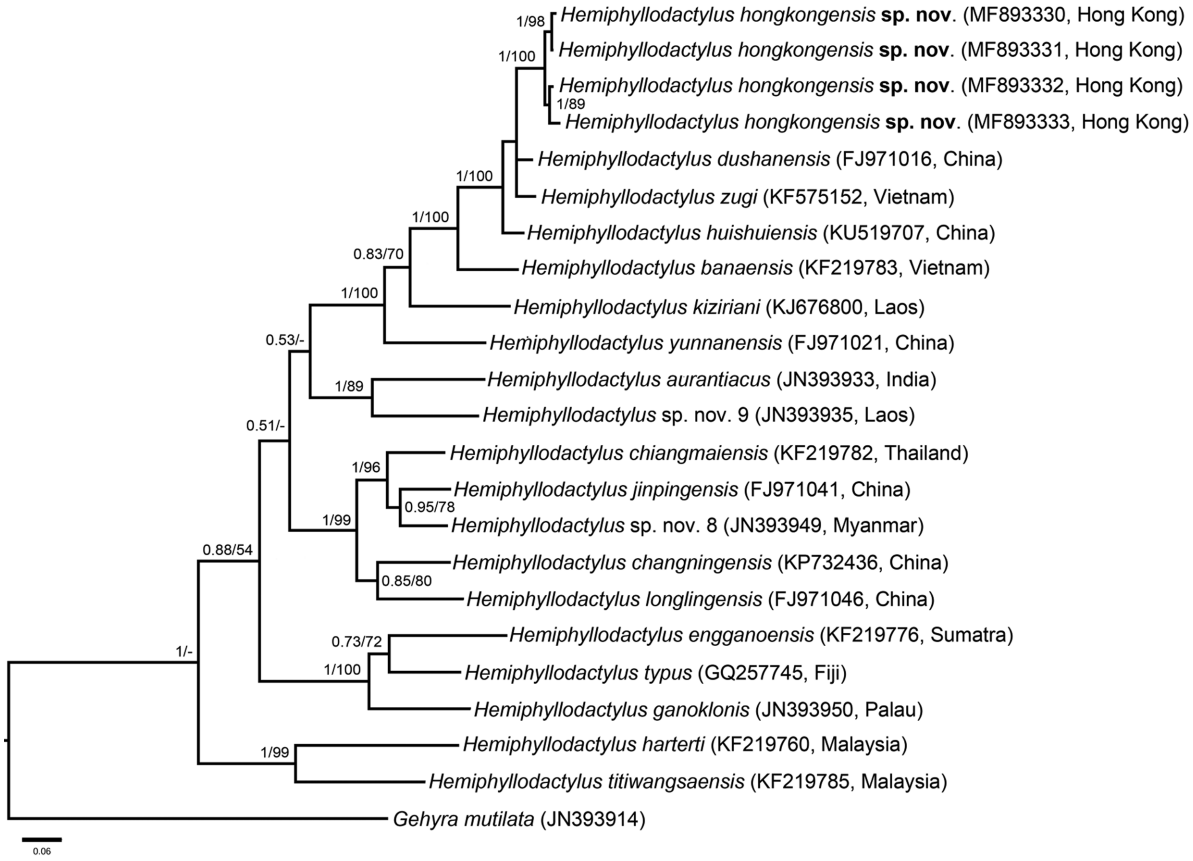

FIGURE 1. Phylogenetic tree based on mitochondrial ND2 gene. Numbers by the nodes indicate posterior probability values of the BI and ML bootstrap support values, respectively.

TABLE 2. Uncorrected *p*-distance among the *Hemiphyllodactylus* species studied based on mitochondrial ND2 gene fragments.

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. *Hemiphyllodactylus hongkongensis* **sp. nov.**	0–2.0																		
2. *H. aurantiacus*	**37.2–39.8**	-																	
3. *H. banaensis*	**19.2–20.0**	39.5	-																
4. *H. changningensis*	**30.0–30.4**	34.1	33.9	-															
5. *H. chiangmaiensis*	**30.7–33.5**	33.7	31.6	22.5	-														
6. *H. dushanensis*	**8.3–8.5**	40.5	20.7	30.7	34.0	-													
7. *H. engganoensis*	**35.0–37.5**	39.3	41.4	35.1	33.8	37.4	-												
8. *H. ganoklonis*	**35.5–37.8**	32.4	38.7	35.1	34.2	37.9	25.9	-											
9. *H. harterti*	**38.3–41.1**	46.2	43.6	40.0	37.7	41.8	41.3	38.5	-										
10. *H. huishuiensis*	**9.7–9.9**	38.6	19.0	32.4	33.2	7.2	37.4	38.5	42.1	-									
11. *H. jinpingensis*	**32.5–33.0**	31.0	34.5	20.3	17.0	32.0	35.0	33.8	39.5	32.0	-								
12. *H. kiziriani*	**24.5–25.6**	32.7	27.8	32.0	34.4	24.4	38.4	37.9	42.5	24.9	35.4	-							
13. *H. longlingensis*	**35.1–35.5**	31.0	39.8	21.7	22.0	37.9	36.0	36.1	42.9	36.8	21.5	34.9	-						
14. *H. titiwangsaensis*	**38.1–40.9**	36.9	37.5	34.8	38.5	38.7	39.2	37.0	31.5	39.5	35.3	42.4	35.9	-					
15. *H. typus*	**36.7–39.3**	32.0	41.5	37.7	33.3	38.8	23.6	20.7	41.1	37.1	35.6	35.7	35.8	38.8	-				
16. *H. yunnanensis*	**24.2–24.4**	34.5	26.5	29.0	30.6	24.9	35.5	33.8	38.4	25.0	31.5	24.5	32.9	37.8	35.2	-			
17. *H. zugi*	**8.3–9.9**	36.5	18.9	31.3	31.0	6.2	36.7	38.8	39.1	8.1	31.8	24.5	39.3	39.4	38.8	25.3	-		
18. *H.* sp. nov. 8	**31.9–34.0**	30.5	34.5	24.2	15.8	35.2	33.7	32.5	39.4	34.9	14.7	35.6	22.1	36.0	32.9	31.6	32.9	-	
19. *H* sp. nov. 9	**35.1–37.0**	24.2	34.6	35.2	31.6	37.4	39.8	36.3	39.1	36.0	33.0	32.7	36.5	38.4	38.0	34.0	34.4	33.0	-

***Hemiphyllodactylus hongkongensis* sp. nov.**
Hong Kong Slender Gecko
Fig. 2, 3

Holotype. SYS r001735 (Museum of Biology, Sun Yat-sen University), adult male collected by Wing-Ho Lee and Ho-Nam Ng on 20 April 2017 in Aberdeen Country Park, Hong Kong (22°15.51' N , 114°9.69' E; 120 m a.s.l.; Fig. 4)

Paratypes. SYS r001728, SYS r001729 and SYS r001730, three adult female specimens were collected by Yik-Hei Sung, Wing-Ho Lee and Ho-Nam Ng on 7 June 2016 and 14 October 2016 in Aberdeen Country Park, Hong Kong (22°15.51' N, 114°9.69' E; 120 m a.s.l.). SYS r001732, SYS r001733 and SYS r001734, two adult females and one adult male, were collected by Yik-Hei Sung, Wing-Ho Lee and Ho-Nam Ng on 20 April 2017 in Aberdeen Country Park, Hong Kong (22°15.51' N, 114°9.69' E; 120 m a.s.l.). SYS r001731, one adult female, was collected by Yik-Hei Sung, Wing-Ho Lee and Ho-Nam Ng on 8 April 2017 on Po Toi Island, Hong Kong (22°9.83' N, 114°15.33' E; 50 m a.s.l.).

FIGURE 2. Adult male holotype (SYS r001735) of *Hemiphyllodactylus hongkongensis* **sp. nov.** in life from Aberdeen Country Park, Hong Kong SAR, China.

Diagnosis. *Hemiphyllodactylus hongkongensis* **sp. nov.** can be separated from all other species of *Hemiphyllodactylus* by having the unique combination of 5–6 chin scales; a manual lamellar formula of 3–3(4)–4–4; a pedal lamellar formula of 3(4)–4(5)–4(5)–4; 24–25 continuous femoral and precloacal pores; 12–15 dorsal scales contained in diameter of eye; and 9–10 ventral scales contained in diameter of eye.

Description of Holotype: Adult male; head triangular in dorsal profile, depressed, distinct from neck; lores and interorbital regions flat; rostrum relatively long (NarEye/ HeadL = 0.26); prefrontal region flat to weakly

concave; canthus rostralis smoothly rounded, snout moderate, rounded in dorsal profile; eye large; ear opening oval, small; eye to ear distance greater than diameter of eye; rostral wider than high, bordered posteriorly by large supranasals; three internasals (=postnasals); external nares bordered anteriorly by rostral, dorsally by supranasal, posteriorly by one postnasals, ventrally by first supralabial (=circumnasals 3R,L); 10/10 (right/left, hereafter) square supralabials tapering to below posterior margin of orbit; 9/10 square infralabials tapering to below posterior margin of orbit; dorsal superciliaries flat, rectangular, imbricate; mental triangular, bordered laterally by first infralabials and posteriorly by two large postmentals; each postmental bordered laterally by a single sublabial; row of smaller scales extending transversely from juncture of second and third infralabials and contacting mental; gular scales triangular small, granular, grading posteriorly into slightly larger, subimbricate, throat and pectoral scales which grade into slightly larger, subimbricate ventrals.

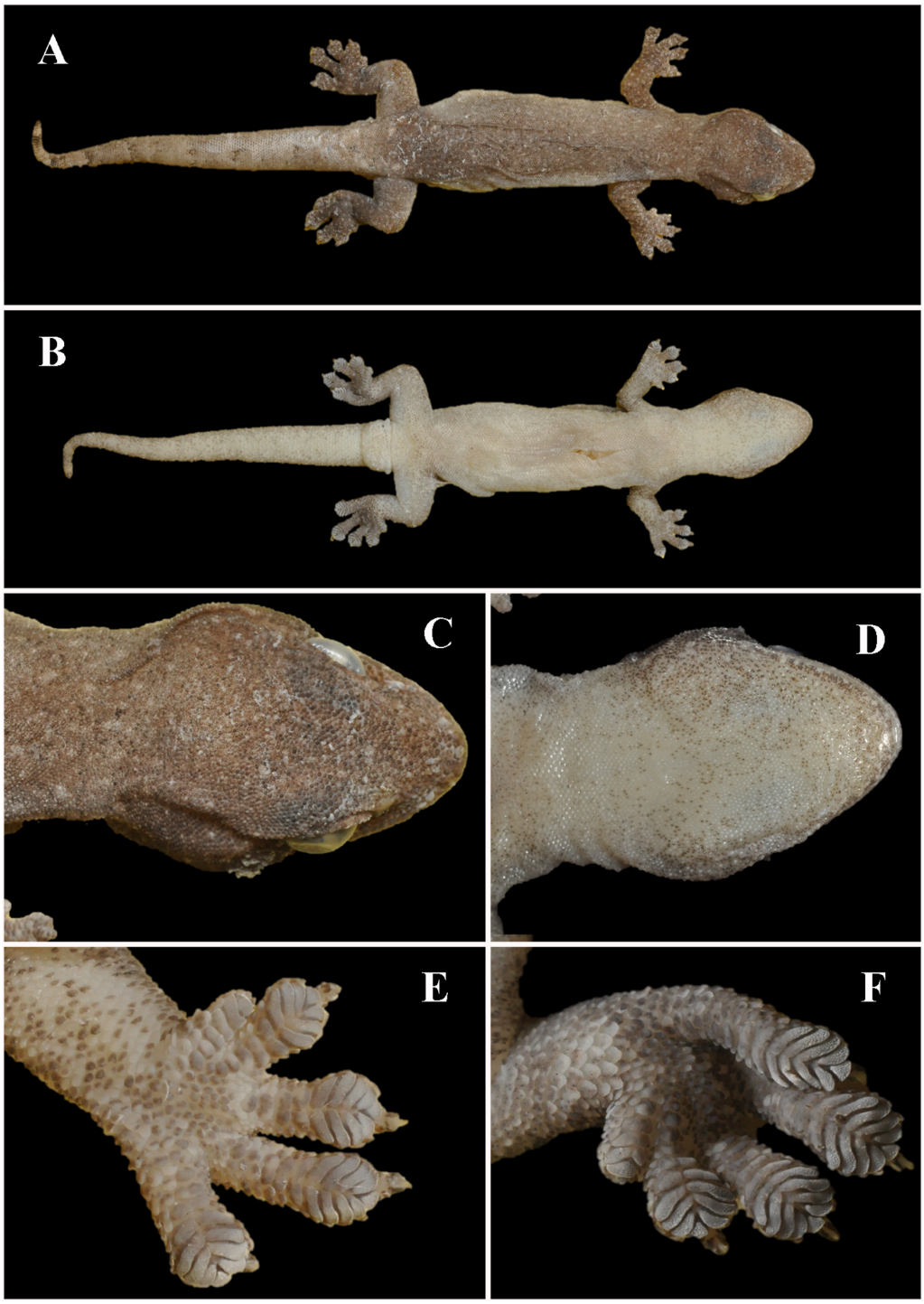

FIGURE 3. Male holotype (SYS r001735) of *Hemiphyllodactylus hongkongensis* **sp. nov.** collected from Aberdeen Country Park, Hong Kong SAR, China.

Body somewhat elongate, dorsoventrally compressed; ventrolateral folds absent; dorsal scales small, granular, 15 scales contained within one eye diameter; ventral scales, flat, subimbricate, larger than dorsal scales, 10 scales contained within one eye diameter; no enlarged, precloacal scales; 24 pore-bearing scales extending from midway between the knee and hind limb insertion of one leg to the other; forelimbs short, robust in stature, covered with granular scales dorsally and with slightly larger, flat, subimbricate scales ventrally; palmar scales flat, imbricate; all digits except digit I well developed; digit I vestigial, clawless; distal, subdigital lamellae of digits II–V undivided, angular and U-shaped; lamellae proximal to these transversely expanded; lamellar formula of digits II–V 3–4–4–4 on both hands; five transversely expanded lamellae on digit I; claws on digits II–V well developed, unsheathed; distal portions of digits strongly curved, terminal joint free, arising from central portion of lamellar pad; hind limbs short, more robust than forelimbs, covered with slightly pointed, juxtaposed scales dorsally and by larger, flat subimbricate scales ventrally; all digits except digit I well developed; digit I vestigial, clawless; distal, subdigital lamellae of digits II–V undivided, angular and U-shaped; lamellae proximal to these transversely expanded; lamellar formula of digits II–V 4–5–5–4 on both feet; five transversely expanded lamellae on digit I; claws on digits II–V well developed, unsheathed; distal portions of digits strongly curved, terminal joint free, arising from central portion of lamellar pad; posterior section of tail broken, round in cross-section; all caudal scales flat, subimbricate, not forming distinct caudal segments. Morphometric data are presented in Table 3.

TABLE 3. Scalation of the type series of *Hemiphyllodactylus hongkongensis* **sp. nov.** from Hong Kong SAR, China.

	Holotype	Paratypes						
	SYS r001735	SYS r001728	SYS r001729	SYS r001730	SYS r001731	SYS r001732	SYS r001733	SYS r001734
Sex	male	female	female	female	female	female	female	male
Dorsal scales	15	13	14	13	12	14	13	14
Ventral scales	10	10	9	9	9	9	10	9
Cloacal spurs on each side	1	1	1	1	1	0	1	1
Circumnasal scales	3	3	3	3	3	4	3	3
Scales between supranasals	3	3	3	3	4	3	3	3
Supralabial scales	10,10	11,11	12,12	12,12	10,10	12,11	11,11	11,11
Infralabial scales	9,10	10,10	10,10	10,10	10,10	11,10	11,10	10,11
Chin scales	5	6	5	6	6	5	6	6
Manual lamellar formula	3444	3444	3444	3444	3344	3444	3444	3444
Pedal lamellar formula	4554	4444	4444	4554	3444	4554	4554	4554
Subdigital lamellae on first finger	5	4	4	4	3	4	4	5
Subdigital lamellae on first toe	5	5	5	5	5	5	5	5
Precloacal and femoral pores	24	0	0	0	0	0	0	25

Color in preservative (Fig. 3). Dorsal surface of head, body, and limbs dull brown, with diffused dark and cream mottling; dorsal surface of tail light grey, faint diffuse light and dark bands; ventral surface of the head, limbs and body cream, dark mottling on throat, limbs and tail; caecum unpigmented.

Variation. The coloration of most specimens is similar to the holotype, having dark transverse blotches on the dorsal surface of body and distinctive postsacral mark (Fig. 2). However, one female paratype (SYS r001732) has a more uniform color on the dorsal surface, without dark dorsal transverse blotches and postsacral mark (Fig. 5).

Comparisons. We compared *Hemiphyllodactylus hongkongensis* with other members of the genus *Hemiphyllodactylus* from China and Indochina based on data obtained from the literature. We show the diagnostic characters separating this species from other nominal taxa of *Hemiphyllodactylus* in Table 4.

Hemiphyllodactylus hongkongensis **sp. nov.** has 5–6 chin scales, which separates it from *H. changningensis* Guo, Zhou, Yan & Li (7–8), *H. chiangmaiensis* Grismer, Wood & Cota (8–12), *H. dushanensis* (8–10), *H.*

huishuiensis (8–10), *H. jinpingensis* Zhou & Liu (7–9), *H. longlingensis* Zhou & Liu (7–9), *H. typus* Bleeker (9–14), *H. yunnanensis* (7–8), and *H. zugi* (9–12). *Hemiphyllodactylus hongkongensis* **sp. nov.** has a manual lamellar formula of 3–4–4–4 or 3–3–4–4 which distinguish it from *H. changningensis* (3–3(4) –3(4) –3), *H. chiangmaiensis* (3–3–3–3, 3–4–3–3), and *H. dushanensis* (3–4–5–4, 4–5–5–4). It differs from *H. banaensis* Ngo, Grismer, Thai & Wood (4–5–5–5), *H. dushanensis* (4–5–5–5, 5–6–6–5), and *H. zugi* (4–5–5–5) by having a pedal lamellar formula of 3–4–4–4, 4–4–4–4 or 4–5–5–4. It differs from *H. banaensis* (18–21), *H. changningensis* (19–22), *H. kiziriani* Nguyen, Botov, Le, Nophaseud, Zug, Bonkowski & Ziegler (10–13), *H. huishuiensis* (0–20), *H. yunnanensis* (0–20), and *H. zugi* (18–21) by having 24–25 continuous femoral and precloacal pores in adult males. *Hemiphyllodactylus hongkongensis* **sp. nov.** has 12–15 dorsal scales contained in the diameter of the eye, which separates it from *H. banaensis* (17–20), and *H. zugi* (20–22). It differs from *H. changningensis* (6–8), *H. jinpingensis* (5–7), *H. kiziriani* (11–15), *H. longlingensis* (6–7), *H. yunnanensis* (5–7) and *H. zugi* (15–16) by having 9–10 ventral scales contained in the diameter of the eye.

TABLE 4. Measurement (in mm) of the type series of *Hemiphyllodactylus hongkongensis* **sp. nov.** from Hong Kong SAR, China.

	Mean ± SD (range)		Holotype	Paratypes						
			SYS r001735	SYS r001728	SYS r001729	SYS r001730	SYS r001731	SYS r001732	SYS r001733	SYS r001734
Sex	males (n=2)	female (n=6)	male	female	female	female	female	female	female	male
SVL	33.0±0.9	39.9±2.4	33.6	37.5	37.4	40.8	42.1	43.0	38.9	32.3
TailL	25.6±2.4	25.4±13.8	27.3	3.8	29.4	36.3	36.1	34.2	12.7	23.9
Trunk	15.7±0.1	20.6±1.1	15.8	19.4	19.3	21.0	21.3	22.0	20.4	15.6
HeadL	9.0±0.4	10.3±0.6	9.3	9.5	9.9	10.4	10.3	11.2	10.4	8.7
HeadW	6.9±0.0	7.3±1.2	6.9	5.2	6.4	8.0	7.5	8.2	8.2	7.0
SnEye	3.1±0.1	3.6±0.3	3.1	3.2	3.7	3.8	3.6	4.0	3.6	3.2
NarEye	2.5±0.1	2.8±0.2	2.4	2.6	2.5	2.9	3.1	3.0	3.0	2.6
EyeD	2.2±0.2	2.3±0.1	2.0	2.2	2.3	2.4	2.3	2.5	2.3	2.3
SnW	1.1±0.0	1.2±0.1	1.1	1.2	1.1	1.2	1.3	1.4	1.3	1.1
Trunk/SVL	0.48±0.01	0.51±0.01	0.47	0.52	0.52	0.51	0.50	0.51	0.53	0.48
HeadL/SVL	0.27±0.01	0.26±0.01	0.28	0.25	0.27	0.26	0.24	0.26	0.27	0.27
HeadW/SVL	0.21±0.01	0.18±0.02	0.21	0.14	0.17	0.20	0.18	0.19	0.21	0.22
HeadW/HeadL	0.77±0.04	0.70±0.09	0.74	0.55	0.64	0.76	0.73	0.74	0.79	0.80
SnEye/HeadL	0.35±0.03	0.35±0.01	0.33	0.33	0.37	0.36	0.35	0.36	0.35	0.37
NarEye/HeadL	0.28±0.03	0.28±0.01	0.26	0.27	0.26	0.28	0.30	0.27	0.29	0.30
EyeD/HeadL	0.24±0.03	0.23±0.01	0.22	0.24	0.23	0.23	0.23	0.22	0.22	0.27
SnW//HeadL	0.12±0.00	0.12±0.01	0.12	0.12	0.11	0.11	0.12	0.12	0.12	0.13
EyeD/NarEye	0.87±0.03	0.82±0.05	0.85	0.87	0.89	0.81	0.76	0.82	0.78	0.89
SnW/HeadW	0.16±0.00	0.17±0.03	0.24	0.33	0.28	0.26	0.24	0.23	0.22	0.23

Etymology. The specific epithet "*hongkongensis*' is in reference to the type locality, Hong Kong SAR, China. As an English common name, we suggest "Hong Kong Slender Gecko".

Distribution. In Hong Kong, records of *Hemiphyllodactylus* have been made on Hong Kong Island (including Aberdeen Country Park and Pokfulam Country Park), Shek Kwu Chau, and Po Toi Island (Karsen *et al.* 1998) (Fig. 4).

TABLE 5. Diagnostic characters separating *Hemiphyllodactylus hongkongensis* **sp. nov.** from other nominal taxa of *Hemiphyllodactylus* from China and Indochina.

	banaensis	*changningensis*	*chiangmaiensis*	*dushanensis*	*huishuiensis*	*jinpingensis*	*kiziriani*	*longlingensis*	*yunnanensis*	*zugi*	*hongkongensis* **sp. nov.**
Max SVL	51.0	43.8	41.2	50.6	51.2	39.6	40.8	45.7	45.8	46.6	43.0
Chin scales	6–7	7–8	8–12	8–10	8–10	7–9	6–9	7–9	7–8	9–12	5–6
Postmentals distinctlyly enlarged (1) or not (0)	1	1	1	1	1	1	1	1	1	1	1
Circumnasal scales	3	3–4	3–4	3–4	3	3–4	4	4–5	3–4	2–3	3–4
Scales between supranasals	4–11	2–3	1–3	2–3	2–3	2–3	2–3	1–3	2–4	3–5	3–4
Supralabial scales	9–12	8–11	9–11	11–13	9–11	9–11	10–11	9–1	9–12	10–13	10–12
Infralabial scales	9–11	8–10	9–12	10–11	9–11	9–11	9–11	8–10	9–11	10 or 11	9–11
Dorsal scales	17–20	11–15	11–21	14–15	13–15	11–12	18–27	10–14	8–14	20–22	12–15
Ventral scales	9–12	6–8	6–10	8–9	7–9	5–7	11–15	6–7	5–7	15–16	9–10
Manual Lamellar formulat	3444, 4554	33(4)3(4)3	3333, 3433	3454, 4554	3444, 44(5)54	3444, 4444	3444	3444(3), 444(5)4	3444, 3444(3)	3444	3444, 3344
Pedal lamellar formulat	4555	3444, 3333	3333, 3444	4555, 5665	44(5)54(5)	4444	44(5)4(5)4	44(5)4(5)4	4554, 3455	4555	3444, 44(5)4(5)4
Subdigital lamellae on first finger	5	3–4	3–4	4–5	3	4	5	4–5	4–6	4–5	3–5
Subdigital lamellae on first toe	5	3–4	3–4	5–6	3	4–5	5	4–6	4–6	4–5	5
Precloacal and femoral pore series separate (1) or continuous (0)	0	0	0	0	0	0	0	0	0	0	0
Precloacal and femoral pores	18–21	19–22	17–25	24–26	0–20	20–24	10–13	16–27	0–20	18–21	24–25
Cloacal spurs on each side	1	1–2	1	1	1	1	1–2	1–2	1	1	1
Subcaudals enlarged, plate–like (1) or not (0)	0	0	0	0	0	0	0	0	0	0	0
Dark postorbital stripe present (1) or absent (0)	1	1	1	0	1	1	1	1	1	1	1 or 0
Light postocular or trunk spots (1) or absent (0)	1	0	1	1	0	0	1	1	0	1	1
Dark dorsolateral stripe on trunk (1) or not (0)	1	1	0	0	1	1	1	1	0 or 1	0	0

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TABLE 5. (Continued)

	banaensis	*changningensis*	*chiangmaiensis*	*dushanensis*	*huishuiensis*	*jinpingensis*	*kiziriani*	*longlingensis*	*yunnanensis*	*zugi*	*hongkongensis* **sp. nov.**
Dorsal pattern unicolor (1) or not (0)	0	0	0	1	0	0	0	0	0	0	0
Dark dorsal transverse blotches (1) or not (0)	1	1	1	0	1	1	1	1	1	0	1 or 0
Longitudinal series of white (1) or yellow or red (0) dorsal spots	0	NA	0	NA	NA	NA	NA	1	NA	0	NA
Postsacral mark brown or orange (2), outer edge yellow or red (1), outer edge red (0)	0	2	2	2	2	2	2	2	2	0	2
Postsacral mark lacking anterior arms (1) or arms present (0)	1	0	0	1	0	1	0	1	1	0	0
Caecum pigmented (1) or (0)	0	0	1	0	0	0	0	0	0	0	0
Gonads pigmented (1) or not (0)	0	0	1	0	0	0	0	0	0	0	0
Trunk/SVL	0.44–0.49	0.46–0.51	0.46–0.56	0.45–0.49	0.47–0.50	0.47–0.51	0.45–0.55	0.47–0.52	0.48–0.53	0.50–0.56	0.47–0.53
HeadL/SVL	0.22–0.24	0.22–0.25	0.25–0.43	0.22–0.23	0.21–0.29	0.23–0.24	0.17–0.18	0.22–0.24	0.22–0.23	0.21–0.24	0.24–0.28
HeadW/SVL	0.15–0.16	0.17–0.18	0.18–0.23	0.17–0.18	0.16–0.19	0.17	0.17–0.18	0.17–0.19	0.17–0.19	0.17–0.18	0.14–0.22
HeadW/HeadL	0.65–0.70	0.72–0.80	0.41–0.8	0.73–0.80	0.61–0.84	0.73–0.76	0.93–1.10	0.75–0.80	0.76–0.81	0.74–0.79	0.55–0.80
SnEye/HeadL	0.34–0.45	0.41–0.49	0.23–0.49	0.42–0.46	0.31–0.45	0.41–0.43	0.56–0.62	0.42–0.45	0.41–0.47	0.43–0.49	0.33–0.37
NarEye/HeadL	0.25–0.32	0.30–0.37	0.17–0.33	0.30–0.35	0.22–0.34	0.29–0.32	0.45–0.48	0.29–0.34	0.30–0.33	0.29–0.39	0.26–0.30
EyeD/HeadL	0.22–0..5	0.21–0.25	0.13–0.24	0.24–0.25	0.20–0.28	0.22–0.26	0.36–0.39	0.22–0.25	0.20–0.24	NA	0.22–0.27
SnW/HeadL	0.13–0.17	0.12–0.16	0.08–0.23	0.14–0.15	0.10–0.14	0.13–0.15	0.19–0.23	0.12–0.14	0.13–0.15	0.16–0.17	0.11–0.13
EyeD/NarEye	0.71–0.84	0.61–0.77	0.68–0.81	0.76–0.82	0.71–0.97	0.71–0.83	0.79–0.83	0.66–0.82	0.64–0.72	NA	0.76–0.89
SnW/HeadW	0.20–0.24	0.16–0.20	0.17–0.32	0.19	0.14–0.17	0.18–0.21	0.19–0.21	0.15–0.18	0.15–0.19	0.21–0.23	0.22–0.32

Discussion

With the description of *Hemiphyllodactylus hongkongensis*, 22 described species in the gekkonid genus *Hemiphyllodactylus* are now recognized, eight of which occur in China. Zug (2010) examined the morphology of *Hemiphyllodactylus* specimens from Hong Kong and found that they potentially represented a unique species, a result with which this study concurs. However, the number of precloacal and femoral pores in males are different for the series of specimens in Zug (2010) and this study (<18 vs 24–25). As the number of precloacal and femoral pores is a feature commonly used to separate gecko species, further examination of specimens from Hong Kong may be needed to determine whether the population from Hong Kong exhibit a greater morphological variation than observed in this study, or if two *Hemiphyllodactylus* species occur in Hong Kong.

Species of *Hemiphyllodactylus* have been recorded in two localities in the western part of Guangdong Province (Kadoorie Farm and Botanic Garden 2004a, 2004b), however, data on the specimens have not been available. Given the high divergence of *Hemiphyllodactylus* species in Southeast Asia discovered recently (Grismer *et al.* 2013); we urge that more field surveys be conducted so as to resolve the currently unknown taxonomic status of *Hemiphyllodactylus* species in South China.

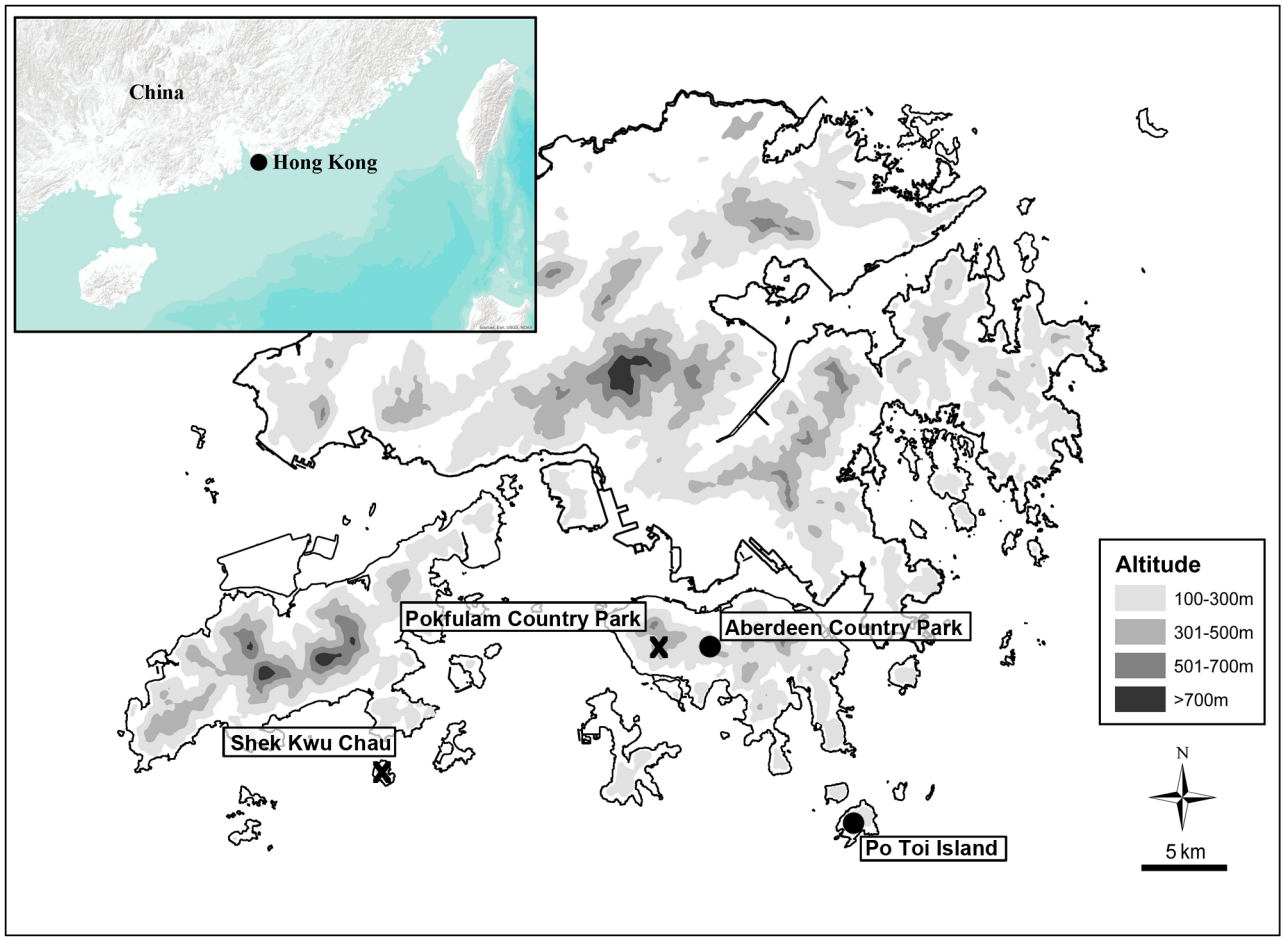

FIGURE 4. Map showing the collection localities of *Hemiphyllodactylus hongkongensis* **sp. nov.** from Aberdeen Country Park and Po Toi Island (black dots), Hong Kong SAR, China. Black crosses, including Shek Kwu Chau and Pokfulam Country Park, indicates the localities where *Hemiphyllodactylus* individuals were recorded but could not be collected nor examined in this study.

FIGURE 5. Female paratype (SYS r001732) of *Hemiphyllodactylus hongkongensis* **sp. nov.** having uniform color on the dorsal surface.

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