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Studies on the taxonomy of the *Gekko vittatus* Houttuyn, 1782 complex (Squamata: Gekkonidae) I. On the variability of *G. vittatus* Houttuyn, 1782 sensu lato, with the description of a new species from Palau Islands, Micronesia

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Abstract. The present study focuses on morphological variation among conspicuous geographic colour morphs of *Gekko vittatus* (sensu lato). Meristic data revealed four distinct, allopatric groups of phenotypes, whereas the morphometric characters examined do not differ among colour morphs. One of these, endemic to the Palau Islands in the Pacific, is also genetically distinct and is here described as a new species.

Key words. *Gekko vittatus* phenotypes; taxonomy; Palau Islands; *Gekko remotus* sp.n.

INTRODUCTION

Gekko vittatus Houttuyn, 1782 is one of the few gecko species which is known to science already since the end of the 18th century. Its conspicuous white vertebral stripe on a light brown background, bifurcating in the neck, and its banded tail give this gecko a characteristic appearance. Subsequently, several new taxa, regarded as closely related to *G. vittatus*, were described, as well as some colour or pattern morphs which did not receive taxonomic recognition so far (e.g. Duméril & Bibron 1836, Peters 1872, Mertens 1934, McCoy 1980, 2006).

Generally, the taxonomy of the nominal species *G. vittatus*, including the known morphs, synonyms and putative taxa, is far from being satisfactorily solved. Here, we investigate whether forms differing in colouration pattern from typical *G. vittatus* can also be characterized by meristic and morphometric characters. We identify several axes of variation among the populations analysed, and formally describe a new species from the Pacific Palau Islands.

MATERIAL AND METHODS

A total of 48 specimens tentative assigned to *G. vittatus* (sensu lato) were examined (listed in the Appendix). The following characters (morphometric, meristic and qualitative) were recorded for each complete specimen (damaged specimen resulted in partially reduced data sets): SVL – snout vent length, TL – tail length, HL – maximum head length (from tip to snout to posterior margin of ear), HW – maximum head width, HH – maximum head height, SE – length from snout tip to anterior margin of eye, EE – length between posterior margin of eye to anterior margin of ear, RW – maximum rostral width, RH – maximum rostral height, MW – maximum mental width, ML – maximum mental length, DTL – dorsal tubercle length (in one of the two median dorsal rows, DTW – dorsal tubercle width (in one of the two median vertebral rows), SPL – supralabials, IF – infralabials, N – nasals (in direction from rostral to labial: nasorostrals, supranasals, postnasals), NP – nostril contact rostral, I – internasals, S6S – scales between the 6th supralabials across the snout, IO – interorbitals, SC – spiny ciliaries, PM – postmentals, GP – gulars bordering postmentals, ESRM – enlarged scale row behind mental, DTR – dorsal tubercle rows, GSDT – granules surrounding dorsal tubercles, GTL – granules between two dorsal tubercles in longitudinal direction, GTC – granules crosswise between two dorsal tubercles , SMC – gular and ventral scales between mental and cloacal slit, V – ventrals, TVF – tubercles on ventrolateral fold, SR – scales around mid-body, LF1 – subdigital lamellae under 1st finger, LF4 – subdigital lamellae under 4th finger, LT1 – subdigital lamellae under 1st toe, LT4 – subdigital lamellae under 4th toe, FTW – webbing present between finger

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and toes, TFL – tubercles fore limbs, THL – tubercles hind limbs, PP – precloacal and femoral pores (in males only), PS – precloacal and femoral scales with minute pores or shallow depressions (in females only), PCT – postcloacal tubercles, T1W – tubercle rows in the 1st caudal whorl, T3W – tubercle rows in the 3rd caudal whorl, S1W – dorsal scale rows in the middle of the first caudal whorl, S3W – dorsal scale rows in the middle of the third caudal whorl, SC1W – subcaudal rows in the 1st whorl, SC3W – subcaudal rows in the 3rd whorl, and SC5W – subcaudal rows in the 5th whorl. Bilateral scale counts were given as right/left. Measurements were recorded with a dial calliper to the nearest 0.5 mm (except the values for rostral, mental and dorsal tubercle size which were measured to the nearest 0.02 mm).

Collection acronyms. CPHR – Herbert Rösler private collection, Thale; MNHN – Muséum national d'Histoire naturelle, Paris; SMF – Senckenbergmuseum, Frankfurt am Main, now Forschungsinstitut Senckenberg, Frankfurt; ZMB – Zoologisches Museum Berlin, now Museum für Naturkunde; ZFMK – Zoologisches Forschungsmuseum Alexander Koenig, Bonn; ZSM – Zoologische Staatssammlung, München. Specimens were assigned to four different phenotype groups according to their coloration pattern, the shape of their nuchal tubercles, and their geographic origin. Subsequently differences in respect to mensurable and meristic characters were assessed using non-parametric statistics (one-way NPMANOVA) and Principal Coordinates Analysis (PCO) using PAST (Hammer et al. 2001).

RESULTS

Phenotypes of *Gekko vittatus* sensu lato

G. vittatus phenotype 1 (Fig. 1).
A distinct light vertebral stripe, several millimetres wide and bordered with dark brown, bifurcating in the neck region and usually reaching the posterior margin of the eyes is present. This stripe can be interrupted, shortened (McCoy 2006: Fig. 14) or even missing (Rösler et al. 2011: Fig. 7A) between neck and eye. The vertebral stripe slightly widens more or less saddle-like in the anterior caudal region. The tail is annulated with sharply defined light and dark rings, the dark rings are usually twice as broad as the light ones. Juveniles are similar to adults, but with more intensive caudal colouration. Roundish to oval pointed tubercles present only within the white rami of the vertebral band, all remaining nuchal tubercles blunt and slightly convex.

Origin of the specimens examined: Wokan (Aru Islands, Indonesia); Asmat, Nabire, (Western New Guinea, Indonesia), Kordo, Mysore (Schouten Group, Western New Guinea, Indonesia), Pulau Ambon (Maluku, Indonesia), Didessa, Airdhills (Papua New Guinea), Ralum, Ratavul (New Britain, Papua New Guinea), Mioko (Duke of York Group, Papua New Guinea).

G. vittatus s.l. phenotype 2 (Fig. 2).
Irregularly flecked pattern on head, body and limbs. Sometimes a light vertebral stripe densely interspersed with darker flecks is discernible. Two dark parallel paravertebral sacral stripes framing a lighter sacral are characteristic. Tail above with short irregular dark stripes and flecks, below monochromatic, whitish, medially with narrow, dark streaks. Subadults with all characters of the adults. All nuchal tubercles round to oval, conical, pointed and irregularly arranged.

Origin of the specimens examined: Palau Islands (Republic of Palau).

G. vittatus s.l. phenotype 3 (Fig. 3).
Colour pattern as in phenotype 1, but nuchal tubercles larger and more distinctly conical, pointed.

Origin of the specimens examined: Kei Islands (Indonesia).

G. vittatus s.l. phenotype 4 (Fig. 4).
Upper side variegated with light and dark. Vertebral stripe entirely lacking or rarely slightly indicated (McCoy 2006: Fig. 115). Two light sacral stripes sometimes present. Tail banding only indicated, predominantly flecked or variegated. All nuchal tubercles conical, pointed, larger than in phenotype 1.

Origin of the specimens examined: Nissan Atoll (Green Islands, Papua New Guinea).

ANALYSIS OF MORPHOLOGICAL CHARACTERS

Besides of the conspicuous differences in colour pattern, the present sample of *G. vittatus* s.l. showed considerable variation in several scalation characters while size and body proportions appeared to be less distinct. Mean values as well as minimal and maximal values are provided in Tables 1 and 2. The four pre-defined groups of phenotypes differ not significantly in the morphometric characters examined ($p < 0.2424$; F: 1.254; one-way NPMANOVA; 50000 permutations; distance measure: Gower), while differences in meristic characters are highly significant ($p < 0.00004$; F: 3.707, one-way NPMANOVA; 50000 permutations; distance measure: Gower). A pairwise comparison of the four groups revealed that only phenotypes 1 and 2 show significant differences in meristic characters, while the other phenotypes differ mainly in respect to colouration pattern (Table 3, Figs 1–4). A Principal Coordinates Analysis (PCO; Fig. 5a) on the morphological

Figs 1–4. 1. *Gekko vittatus* phenotype 1, ZFMK 20612, male, Pulau Ambon, Indonesia; **2.** *Gekko vittatus* s.l. phenotype 2 (sp.n.), ZMB 5698, female, Republic of Palau; **3.** *Gekko vittatus* s.l. phenotype 3, ZMB 48737, male, Kei Islands, Indonesia; **4.** *Gekko vittatus* s.l. phenotype 4, SMF 9159, male, Nissan Atoll, Green Islands, Papua New Guinea.

data obtained from 21 specimens [28 characters; including specimens from all four phenotypes identified in the present study as well as one of the syntypes of *G. bivittatus* (MNHN 6714) and the holotype of *G. trachylaemus* (ZMB 7511)] revealed that the two respective type specimens fall far outside of the remaining clusters. Hence, and supported by the finding that more differences in colouration are present between those two nominal taxa and the four phenotypes of *G. vittatus* s.l. (see next paragraph), we consider the evaluation of the taxonomic status of *G. bivittatus* and *G. trachylaemus* as not within the scope of the present study, because we shall deal with these nominal taxa in detail in a forthcoming paper.

The replication of this PCO excluding *G. bivittatus* and *G. trachylaemus* revealed two major clusters – one encompassing all specimens of phenotype 2 while the second cluster includes roughly all remaining specimens with exception of a single specimen related to phenotype 3 (Fig. 5b). The dataset used in the previous analysis was selected to maximize the number of specimens included in the analysis (because of the preservation state of most specimens, datasets of single specimens are mostly incomplete, missing one or more characters). Therefore the resulting datasets for analysis are either selected to maximize the number of specimens (which means having fewer characters) or to maximize the number of characters (which means encompassing fewer specimens). To check if the use of these two different datasets results in significantly different PCO analyses, a PCO was carried out on a dataset maximizing the number of characters (44 characters; 14 specimens; Fig. 5c). The results of the two PCO analyses are in principal accordance, showing a single cluster for the specimens assigned to phenotype 2. Differences occur in the positions of the specimens assigned to phenotypes 3 and 4, which cluster either together with the phenotype 1 specimens (Fig. 5b) or completely outside of the clusters of phenotype 1 respectively two specimens (Fig. 5c.). On the basis of the PCO results presented here, phenotypes 1 and 2 can be regarded as morphologically different entities, while there is no evidence regarding the morphological affiliation of phenotypes 3 and 4.

Available names in the synonymy of *G. vittatus* s.l.

Gekko vittatus has been described by Houttuyn (1782) from "Zekerlyk uit de Indië" (certainly from India) whereon the type locality was founded. Subsequently, the nomen

Table 1. Mensural data of the *Gekko vittatus* phenotypes 1–4, the syntypes of *Gekko bivittatus* and the holoype of *Gekko trachylaemus* (mean ± SD; max; min; Abbreviations as in material and methods).

	phenotype 1	**phenotype 2**	**phenotype 3**	**phenotype 4**	***G. bivittatus***	***G. trachylaemus***
n	**27**	**12**	**2**	**3**	**2**	**1**
SVL	76.35±25.20 38.2–108.3	81.63±30.56 39.0–117.5	105.3–125.4	110.57±2.25 108.0–112.2	109.0–120.0	103.7
TL	70.47±41.17 39.4–114.5	70.81±23.18 53.0–114.8	116.0–123.0	—	115.0–125.0	106.6
HL	21.04±6.34 11.1–29.1	21.23±7.16 11.1–29.4	30.0–32.5	30.57±1.56 29.1–32.2	28.0–30.0	28.3
HW	14.73±4.71 7.6–20.9	14.88±5.52 7.8–21.6	21.7–22.0	21.53±1.50 19.8–22.5	19.8–18.9	19.6
HH	9.07±2.83 5.0–12.6	10.53±7.25 4.9–31.5	13.1–13.9	12.77±1.06 11.8–13.9	11.4–11.8	10.6
SE	10.91±1.54 5.2–13.9	10.16±3.50 4.9–14.5	15.0–16.6	14.63±0.75 13.9–15.4	11.5–12.8	13.5
EE	8.99±1.54 4.3–11.9	8.48±2.94 3.9–12.6	11.7–12.7	11.83±0.32 11.6–12.2	10.6–12.8	9.9
RW	3.92±0.48 3.20–4.60	4.28±0.47 3.40–4.80	3.90–4.50	4.50±0.34 4.10–4.71	3.9–5.5	4.00
RH	2.06±0.37 1.40–2.50	2.09±0.27 1.7–2.3	2.10–2.90	2.45±0.38 2.14–2.88	1.8–2.3	2.50
MW	2.32±0.52 1.90–3.60	2.02±0.35 1.70–2.30	2.40–2.50	2.58±0.22 2.35–2.78	—	2.60
ML	1.72±0.27 1.10–1.92	1.82±0.32 1.30–2.20	1.90–2.30	2.02±0.27 1.71–2.18	1.53–1.65	1.80
DTL	0.67±0.11 0.49–1.91	0.85±0.16 0.52–0.94	0.72–0.92	0.81±0.08 0.73–0.89	0.63–0.81	1.19
DTW	0.56±0.13 0.43–0.89	0.73±0.20 0.35–0.93	0.56–0.72	0.63±0.09 0.53–0.71	0.75–0.67	0.80
SVL/TL	0.95±0.02 0.89–1.03	0.97±0.03 0.93–1.02	0.91–1.02	—	0.95–0.96	0.97
SVL/HL	3.62±0.18 3.32–3.94	3.80±0.19 3.51–4.14	3.51–3.86	3.62±0.12 3.48–3.71	3.89–4.00	3.66
HL/HW	1.43±0.05 1.34–1.49	1.44±0.07 1.31–1.57	1.38–1.48	1.42±0.05 1.36–1.47	1.48–1.52	1.44
HL/HH	2.32±0.09 2.22–2.46	2.27±0.44 2.18–2.60	2.29–2.34	2.40±0.19 2.19–2.56	2.46–2.54	2.67
SE/EE	1.21±0.07 1.13–1.31	1.20±0.07 1.12–1.34	1.18–1.42	1.24±0.04 1.19–1.26	1.00–1.08	1.36
RW/RH	1.93±0.34 1.68–2.56	2.07±0.29 1.91–2.67	1.34–2.14	1.85±0.19 1.64–2.00	2.17–2.39	1.60
MW/ML	1.34±0.26 1.11–1.89	1.13±0.22 0.86–1.47	1.09–1.26	1.29±0.09 1.20–1.37	—	1.44
RW/MW	1.74±0.25 1.14–2.00	2.16±0.37 1.68–2.53	1.63–1.80	1.74±0.06 1.68–1.80	—	1.54
DTL/DTW	1.24±0.35 0.55–1.82	1.20±0.18 0.97–1.49	1.28–1.29	1.29±0.07 1.24–1.38	—	1.49
DTLx100/SVL	0.71±0.08 0.55–0.86	0.77±0.08 0.62–0.85	0.68–0.73	0.73±0.06 0.68–0.79	—	1.15
DTWx100/SVL	0.62±0.26 0.44–1.26	0.66±0.13 0.42–0.79	0.53–0.57	0.57±0.07 0.49–0.63	—	0.77

Table 2. Meristic data of the *Gekko vittatus* phenotypes 1–4, the syntypes of *Gekko bivittatus* and the holotype of *Gekko trachylaemus* (mean ± SD; max; min; Abbreviations as in material and methods).

n	phenotype 1 27	phenotype 2 12	phenotype 3 2	phenotype 4 3	*G. bivittatus* 2	*G. trachylaemus* 1
SPL	13.45±0.94 12–16	13.00±0.93 11–15	12–13	13.50±0.84 12–14	10–11	12/12
IF	13.51±1.13 11–16	12.38±0.82 10–14	11–14	14.50±0.55 14–15	11–14	10/10
N	3.02±0.15 3–4	3.13±0.45 3–5	3	3	—	3
I	1.15±0.76 0–3	1.17±0.58 1–3	1	0.33±0.58 0–1	2	0
6.SPL	40.55±4.74 32–50	40.55±2.81 36–45	46–49	44.00±1.73 43–46	—	38
IO	27.46±1.76 24–31	27.42±2.15 25–31	24–25	32.50±0.71 32–33	33	24
CS	3.95±1.52 1–6	4.50±1.25 2–7	4–5	5.00±0.71 4–6	5–6	2–4
PM	2	1.92±0.29 1–2	2	2	1–2	2
GP	3.69±0.70 3–5	4.00±1.28 2–6	4–5	4.00±1.41 3–5	2–4	3
ESRM	5.08±0.71 4–6	5.25±0.62 4–6	4–5	6.00±1.00 5–7	5–6	4
DTR	26.27±2.28 22–31	24.75±1.36 22–27	26–27	27.67±0.58 27–28	19–22	24
GSDT	8.74±1.11 6–10	10.67±0.64 10–12	9–10	9.17±0.98 8–11	9–11	10–11
GTL	1.96±0.57 1–3	3.00±0.98 1–5	1–3	1.67±0.82 1–3	2–3	2–3
GTC	1.72±0.57 1–3	2.33±0.70 1–4	1–2	2.00±0.63 1–3	—	1–2
SMC	191.05±20.77 161–222	189.29±10.63 175–205	194–208	193.33±3.51 190–197	197	168
SR	134.89±11.58 115–155	137.29±3.73 131–142	139–142	130.67±3.21 127–133	129	—
V	32.26±2.82 27–39	30.63±2.88 25–34	31–38	34.67±4.73 31–40	—	—
LF1	13.08±1.27 10–15	15.80±0.77 14–17	15–17	16.67±1.21 15–18	15	13–14
LF4	18.08±1.94 13–22	21.50±0.95 20–23	18–22	19.67±0.82 18–20	21	19–21
LZ1	14.28±1.36 12–17	16.89±1.08 15–19	16–17	16.50±0.55 16–17	16	13–16
LZ4	21.22±2.07 17–26	24.15±1.23 22–26	23–25	21.17±0.75 20–22	23	19–20
PP	51.55±7.55 39–65	39.57±5.68 31–45	51–55	33.33±4.73 28–37	53	39
PS	16.20±4.76 11–26	2	—	—	35	—
PCT	2.04±0.74 1–5	1.55±0.51 1–2	1	2	—	1
T1W	3.08±0.74 2–4	3.42±0.51 3–4	3–4	5.33±2.52 3–8	5	3
T3W	3.08±0.00 3–4	3.33±0.65 3–5	3–4	3	5	3
S1W	10.58±1.27 8–12	11.91±0.83 10–13	12–13	12	—	11
S3W	11.25±0.82 10–13	12.40±1.17 1–14	11–13	11	—	11
SC1W	4.42±0.52 4–5	4.17±0.39 4–5	5–6	4	—	4
SC3W	4.08±0.32 4–5	4.00±0.00 4	4–5	4	—	4
SC5W	4.00±0.00 4	4.00±0.00 4	4–5	4	—	3

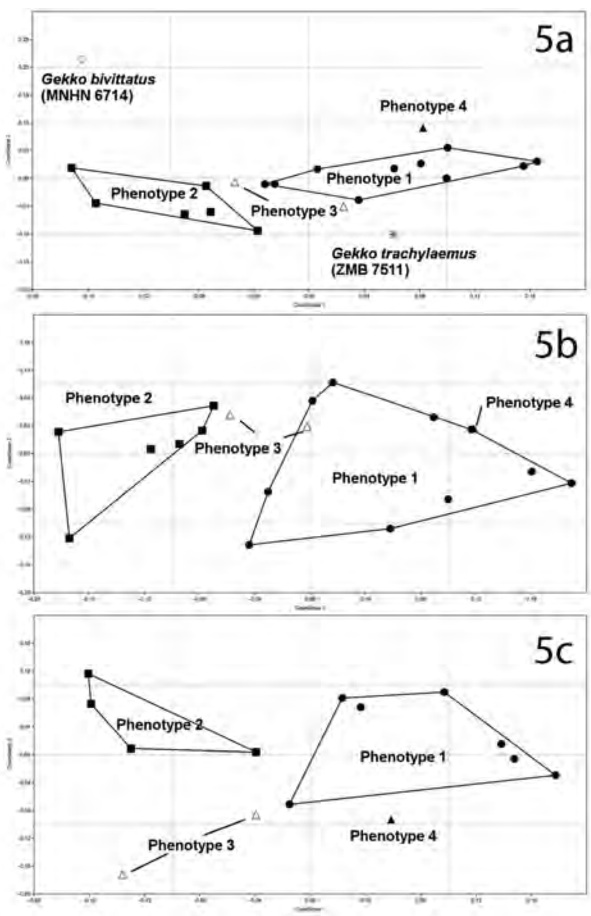

Fig. 5a. Principal Coordinates Analysis (PCO) on 28 morphological characters [8 metric (ratios of original biometric data), 18 meristic and 2 qualitative] of 21 specimens within the *Gekko vittatus* complex (OTUs including the nominal taxa *G. bivittatus* and *G. trachylaemus*). Raw data $\log_{10}$ transformed (after adding x=1 to all values); Similarity Index: Gower.

Axis	**Eigenvalue**	**Percent**
1	0.17682	35.08
2	0.09013	17.88
3	0.05113	10.16
Sum		63.11

Fig. 5b. Principal Coordinates Analysis (PCO) on 28 morphological characters [8 metric (ratios of original biometric data), 18 meristic and 2 qualitative] of 19 specimens within the *Gekko vittatus* – complex (OTUs excluding the nominal taxa *G. bivittatus* and *G. trachylaemus*). Raw data $\log_{10}$ transformed (after adding x=1 to all values); Similarity Index: Gower.

Axis	**Eigenvalue**	**Percent**
1	0.21369	32,68
2	0.08660	13,24
3	0.06508	9,95
Sum		55,87

Fig. 5c. Principal Coordinates Analysis (PCO) on 44 morphological characters [10 metric (ratios of original biometric data), 31 meristic and 3 qualitative] of 14 specimens within the *Gekko vittatus* – complex. Raw data $\log_{10}$ transformed (after adding x=1 to all values); Similarity Index: Gower.

Axis	**Eigenvalue**	**Percent**
1	0.17682	35,08
2	0.09013	17,88
3	0.05113	10,15
Sum		63,11

vittatus was used in combination with various generic names: *Lacerta* (e.g. Gmelin 1789), *Platydactylus* (e.g. Fitzinger 1826) and *Lomatodactylus* (e.g. Van der Hoeven 1833). Currently, four names are considered to be synonymous with *Gekko vittatus* Houttuyn, 1782 (see Wermuth 1965, Bauer 1994, Kluge 2001):

1. *Lacerta unistrigata* Shaw, 1792. Independently from Houttuyn (1782), Shaw (1792) described *G. vittatus* again, as *Lacerta unistrigata*, but without data on any type material. Later, he changed this name into *Lacerta vittata* (see Shaw 1802). Despite the lack of type material, the original description is sufficiently conclusive to place *Lacerta unistrigata* in the synonymy of *G. vittatus* sensu lato.

2. *Stellio bifurcifer* Schneider, 1792. In the same year, Schneider (1792) published a substitute name for *G. vittatus* Houttuyn, 1782, viz. *Stellio bifurcifer*, and commented on it again (Schneider 1812) after having compared it with the description by Daudin (1802). Again, the original description allows synonymization of *Stellio bifurcifer* with *G. vittatus* sensu lato.

3. *Platydactylus bivittatus* Duméril & Bibron, 1836. While Duméril & Bibron (1836) ignored the priority of *Gekko* Laurenti, 1768 over *Platydactylus* Goldfuss, 1820 (Goldfuss 1820, Gray 1825), they generally accepted Cuvier's (1817) classification of geckos who had placed *G. vittatus* as member of *Platydactylus* under the unavailable name "Le Platydactyle à bande". Duméril & Bibron (1836) compared *Platydactylus vittatus* (= *Gekko vittatus*) with their newly described *Platydactylus Bivittatus* (sic) but admitted that both species are hardly distinguished by morphology and might be only colour morphs rather than species; "Il pourrait se faire que ce Platydactyle à deux bandes ne soit qu'une variété du Platydactylus vittatus, dont il ne diffère bien réellement que par la système de coloration". Boulenger (1885) downgraded *Platydactylus bivittatus* Duméril & Bibron, 1836 to a "variety" (currently mostly seen as a subspecies) of *Gekko vittatus* Houttuyn, 1782 (see also Strauch 1887, Boettger 1893, Werner 1900), before Loveridge (1948) finally synonymized this name with the nominotypic form (see also Guibé 1954, Brygoo 1990).

Table 3. Significance levels of morphological differences between four OTU's within the *Gekko vittatus* –complex ($p < 0.00004$; F: 3.707, one–way NPMANOVA; 50000 permutations; distance measure: Gower); pairwise uncorrected significances shown.

	Phenotype 1	**Phenotype 2**	**Phenotype 3**	**Phenotype 4**
Phenotype 1		0.00156**	0.6259	0.5576
Phenotype 2	0.00156**		0.8558	0.8675
Phenotype 3	0.6259	0.8558		1
Phenotype 4	0.5576	0.8675	1	

We re-examined both syntypes of *Platydactylus bivittatus* Duméril & Bibron, 1836 (Tabs 1, 2). MNHN 6714, an adult from "Nouvelle Guinée", has a relatively strong tuberculation and a high number of precloacal and femoral pores (53), and the unforked vertebral stripe is without flecks (Fig. 6). This character combination distinguishes it from both *G.* cf. *vittatus* from the Palau and the Kei Islands. The second syntype, MNHN 2285, an adult female from "Waigiuo" (= Pulau Waigeo) is badly preserved. Neither a vertebral stripe nor a light, dark-bordered sacral stripe is discernible within the variegated dorsal pattern (Fig. 7).

Its dorsal pattern resembles that of *G.* cf. *vittatus* from Nissan Atoll, but further comparisons and a larger sample size are necessary to see whether also the numbers of precloacal and femoral scales fit.

4. *Gekko trachylaemus* Peters, 1872. Described by Peters (1872) from "Nordaustralien" (North Australia) who diagnosed it by larger dorsal tubercles, less supralabials and infralabials, a larger mental and more extended webbing between fingers and toes. Peters & Doria (1878), however, synonymized *G. trachylaemus* with *G. vittatus*, and Cogger et al. (1983) pointed out that the alleged type locality should be wrong, as no Australian records of this gecko exist.

We re-examined the data given by Peters (1872) for *G. trachylaemus* on the basis of its holotype ZMB 7511 (Tab. 1 and 2): the mental relative to the rostral is broader than that of the Palau form and the phenotypes 3 and 4, but is within the range of *G. vittatus* s.str. (see Tab. 1). The scales behind the mental are relatively larger than in all other specimens studied, but the number of rows of these scales is the same (Tab. 2).The flat and smooth to weakly keeled nuchal, dorsal and lateral tubercles of *G. trachylaemus* are distinctly larger than in *G. vittatus* s.str. but less so in the Palau form and the phenotypes 3 and 4. The colour pattern in ZMB 7511 is strongly faded; only the short, sacral streaks as described by Peters (1872) are still a bit better discernible (Fig. 8).

The holotype of *Gekko trachylaemus* is distinguished from the Palau form and from the *G. vittatus* (s.l.) phenotypes 3 and 4 by a different ventral tail scalation: except the first three whorls, there are always three rows of subcaudals present in each whorl of the original, unregenerated tail while there are constantly four to five rows per whorl in *G. vittatus* s.str. as is also the case in the Palau form and in the phenotypes 3 and 4. Moreover, *G. trachylaemus* differs from the Palau form by larger and flatter nuchal and dorsal tubercles, larger tail tubercles and a more banded colour pattern. The assessment the taxonomic status of *Gekko trachylaemus* requires more material and is therefore beyond the scope of the present study.

CONCLUSIONS

Among the four phenotypes of *Gekko vittatus* s.l., only phenotype 1 has rather small, flat tubercles on head, body and limbs, und only the nuchal region bears sparsely distributed conical, pointed tubercles, while all other three phenotypes have larger, relatively high and pointed tubercles, particularly in the nape, so that they have a more spiny appearance. Together with its characteristic colour pattern, phenotype 1 corresponds closely with the original description and can thus be attributed to *Gekko vittatus* sensu stricto. The greatest affinity to this form in dorsal and tail colour pattern as well as regarding their position in the PCO plot is shown by the two Kei Islands males (ZMB 48737–48738; phenotype 3) which are, however, distinguished by their distinctly larger and more pointed nuchal tubercles as well as a possible different tail scalation. Pending further morphological studies and molecular genetic data, this phenotype should be termed *Gekko* cf. *vittatus* ("Kei Islands"). Despite the overall similarity of the specimens assigned to phenotype 4 to phenotype 1 which was shown in the PCO analysis certain differences in morphology and colouration [lower number of precloacal and cloacal pores (28–37) and the overall dark colouration including the lack of a vertebral stripe] suggests, that the three males from Nissan Atoll (SMF 9157–9159; phenotype 4) are also distinguishable from *G. vittatus* s.str. This phenotype should respectively be termed as *Gekko* cf. *vittatus* ("Nissan Atoll"). Based on the considerable genetic distance (see Rösler et al. 2011) and the significant differences in scalation and colour pattern as compared with the other three phenotypes outlined above, and as there is no older available name for the Palau population, we describe phenotype 2 below as a new species.

Figs 6–10. 6. Syntype of *Platydactylus bivittatus*, MNHN 6714, male, New Guinea; **7.** Syntype of *Platydactylus bivittatus*, MNHN 2285, female, Pulau Waigeo, Indonesia; **8.** Holotype of *Gekko trachylaemus*, ZMB 7511, male, Australia; **9.** Holotype of *Gekko remotus* sp.n., ZFMK 20611, male, Republic of Palau; **10.** *Gekko remotus* sp.n., ZMB 76979, juvenile, Republic of Palau.

***Gekko remotus* sp.n.**

Diagnosis. A species of the *Gekko vittatus* s.l. complex with which it is connected by its tubercles on throat and lateral folds as well as by colour pattern. From *Gekko vittatus* s.str. (phenotype 1) it is distinguished by pointed (versus blunt) nuchal tubercles and by the lack of a white, anteriorly forked vertebral stripe and of an annulated tail pattern. From *Gekko* cf. *vittatus* (phenotype 3, "Kei Islands") *Gekko remotus* sp.n. is distinguished by less numerous precloacal and femoral pores (31–45 vs. 51–55) and from *Gekko* cf. *vittatus* (phenotype 4, "Nissan Atoll") by a distinct flecked dorsal (vs. dark and light variegated) colour pattern.

Holotype. ZFMK 20611, male, Palau Islands, coll. by Brock, before 1874, received from Godeffroy Museum, Hamburg (via Zoological Museum, University of Göttingen, 1977).

Description of holotype. Head moderately depressed, distinct from neck. Body not depressed, roundish, belly flat. Tail round, not swollen at base; SVL 117.5 mm, TL 118.5 mm (incomplete); HL 29.4 mm; HW 21.3 mm; HH 13.5 mm; SE 14.2 mm, EE 11.5 mm; ED 5.65 mm; EAD 4.26 mm. Proportions: SVL/HL 4.00; HL/HW 1.38; HL/HH 2.18; SE/EE 1.23; ED/EE 1.33.

Rostral triangular, wider than high (RW 4.39 mm, RH 2.23 mm, RW/RH 1.97), wider than mental (RW/MW 1.82), on the upper margin a converse Y-shape suture; supralabials 14/13, 11/10 to the center of eye; nostril in contact with rostral and 1st supralabial; nasals 3/3, nasorostrals squarish, twice as large as supranasals and postnasals; 1 rectangular internasal, half as big than the nasorostrals. Snout with a longitudinal shallow groove; lateral scales on snout polygonal, smooth, flat to weakly domed, juxtaposed, one and a half times as large as on the mid-snout; 17 scales between postnasals and orbit, 44 scales between the two 6th supralabials; median snout scales polygonal, smooth, flat to weakly domed, juxtaposed; dorsal ciliaries as large as median snout scales, 5/5 spiny tubercles posteriorly. Ear opening vertical, oval; interorbitals 27, polygonal, smooth, flat to weakly domed, juxtaposed; orbital scales weakly conical, and one a half times as large as those in the middle of head. Occipital and nuchal scales polygonal, flat, juxtaposed, half as big as the median interorbitals; temporal, occipital and nuchal tubercles round, conical, five times as big as the surrounding scales. Mental triangular, wider than long (MW 2.41 mm, ML 2.10 mm, MW/ML 1.15); infralabials 12/13, larger than supralabials; posterior of mental five rows of enlarged roundish, oval scales, two of them bordering the mental; no enlarged postmentals; gulars as big as nuchals, round, flat, juxtaposed, interspersed with double-sized conical tubercles. Dorsal and lateral scales similar to nuchals; Dorsal tubercles 2–3 times as big as the bordering dorsal scales (DTL 0.94 mm, DTW 0.79 mm, DTL/DTW 1.19), oval, conical, weakly keeled, surrounded by 10–11 dorsals, in 22 more or less regularly arranged longitudinal rows. Lateral tubercles as large as dorsal tubercles, mostly round, conical to pointed. Tubercles on lateral fold large, blunt, conical. separated by 1–2 small flank scales. Ventrals flat, smooth, imbricate, the median ones being 3–4 times larger than dorsals, 31 between the lateral folds. Midbody scale count 136; 184 scales between mental and cloaca. Scales on upper side of forelegs as large as dorsals, flat, smooth and juxtaposed, passing in small, granular scales below; tubercles on forelegs roundish to oval, blunt, conical, 2–3 times larger than the surrounding scales. Upper and lower thigh scales flat, imbricate passing posteriorly into smaller granules. Tubercles on hind limbs resemble those on forelimbs. Digits connected by narrow webbing, the claws of digits 2–5 encircled by 3 scales each, the median claw of the sheath 2–3 times bigger than the two lateral sheath scales. Subdigital lamellae 16/16 under the 1st finger, 22/23 under the 4th finger, and 17/17 under the 1st toe, and 24/26 under 4th toe, interdigital webbing present but weakly developed. 31 precoacal and femoral pores in one angular, continuous row, 17/17 smooth femoral scales towards the knees behind them small, round tubercles. Original tail distinctly whorled, not thickened at the base. Dorsal tail scales as large as on the back, flat or weakly domed, juxtaposed to weakly subimbricate, arranged in irregular oblique rows. The 1st whorl has 12 scale rows middorsally, the 3rd whorl 13; down to the 11th whorl 3 rows of tubercles per whorl. Tail tubercles similar to dorsal tubercles in size, conical and submucronate, subcaudals not widened, mostly 2, rarely 3 per oblique row, in the 1st whorl 5, in all remaining whorls 4 oblique scale rows per whorl, the last pair of scales a bit enlarged.

The colour in preservative is lilac-grey on head and dorsum, pale grey on tail. Head, dorsum and limbs densely flecked with brown, the flecks being partly confluent. Sacral area with two short blackish brown stripes, bordering a light median zone between them. Tail dorsally variegated with brown. Underside of head, body and limbs greyish brown. Tail medially with a narrow, interrupted dark gray streak (Fig. 9).

Variation. The infraspecific variability of measurements, scalation characters and colour pattern was evaluated in a series of 11 topotypic specimens from the ZMB collection which are, however, regarded as further material rather than paratypes, because neither the holotype nor these specimens have specific data as to their particular island origin within the Palau archipelago. Measurements, proportion indices and scalation values are shown in Tabs 4 and 5.

As compared with the predominantly greyish-coloured holotype, the ground colour of five adult males from Palau varies between pale brown and dark brown. A light vertebral strip, stretching from the nape to the tail base is only shadowy indicated in four males while it is more distinct with a lateral bordering in one.

Four specimens have only a weakly discernible flecked pattern, and only one specimen is comparable to the holotype in this respect (Fig. 2). Of six juveniles of various sizes, only the biggest three (SVL 57–65 mm) have a pattern similar to that of the holotype (Fig. 10), in two smaller ones (SVL 51–54 mm) the light vertebral stripe is forked and reaches the orbital hind margin; the smallest juvenile (SVL 39.0 mm) is uniformly pale brown. The underside of the tail is light in all Palau specimens, with a median, more or less distinct and dark, longitudinal stripe.

Table 4. Mensural data of the holotype and the topotypic specimens of *Gekko remotus* sp.n. (Abbreviations as in material and methods, all measurements in mm).

	ZMB 5698	ZMB 5889	ZMB 6239	ZMB 7922	ZMB 7982	ZMB 76976	ZMB 76977	ZMB 76978	ZMB 76979	ZMB 76980	ZMB 76981	ZFMK 20611	mean±SD min–max
sex	female	male	juvenile	male	male	male	female	juvenile	juvenile	juvenile	juvenil	male	
SVL	111.4	114.6	39.0	117.5	65.5	110.0	83.5	57.2	58.0	54.2	51.1	117.5	81.63±30.56 39.0–117.5
TL	114.8	109.4*	38.0*	104.6*	66.4	83.0*	90.0	57.5	60.5	53.0	53.5	118.5*	70.81±23.18 53.0–114.8
HL	28.7	27.5	11.1	29.4	17.3	29.1	22.0	15.6	15.7	14.7	14.2	29.4	21.23±7.16 11.1–29.4
HW	19.9	21.0	7.8	21.6	12.0	20.0	15.6	10.2	10.0	9.8	9.4	21.3	14.88±5.52 7.8–21.6
HH	11.4	12.5	4.9	13.4	7.6	12.0	8.9	6.0	6.1	6.0	6.0	13.5	9.03±3.31 4.9–13.5
SE	13.4	13.0	4.9	14.1	7.9	14.5	10.6	7.6	7.8	7.1	6.8	14.2	10.16±3.50 4.9–14.5
EE	11.0	11.6	3.9	12.6	7.0	10.8	9.0	6.2	6.6	6.1	5.4	11.5	8.48±2.94 3.9–12.6
RW	4.20	4.50	—	4.80	—	4.40	3.40	—	—	—	—	4.39	4.28±0.47 3.40–4.80
RH	2.20	2.30	—	1.80	—	2.30	1.70	—	—	—	—	2.23	2.09±0.27 1.70–2.30
MW	2.50	1.80	—	1.90	—	1.80	1.70	—	—	—	—	2.41	2.02±2.50 1.70–2.30
ML	1.70	1.80	—	2.20	—	1.80	1.30	—	—	—	—	2.10	1.82±0.32 1.30–2.20
DTL	0.92	0.89	—	0.90	—	0.93	0.5	—	—	—	—	0.94	0.85±0.16 0.52–0.94
DTW	0.81	0.81	—	0.93	—	0.70	0.4	—	—	—	—	0.79	0.73±0.20 0.35–0.93
SVL/TL	0.97	—	—	—	0.97	—	0.93	0.99	0.96	1.02	0.96	—	0.97±0.19 0.93–1.02
SVL/HL	3.88	4.17	3.51	4.00	3.88	3.78	3.80	3.67	3.69	3.69	3.60	4.00	3.80±0.19 3.51–4.17
HL/HW	1.44	1.31	1.42	1.36	1.44	1.46	1.41	1.53	1.57	1.50	1.51	1.38	1.44±0.07 1.31–1.57
HL/HH	2.52	2.20	2.27	2.19	2.52	2.43	2.47	2.60	2.57	2.45	2.37	2.18	2.38±0.15 2.18–2.60
SE/EE	1.22	1.12	1.26	1.12	1.22	1.34	1.18	1.23	1.18	1.16	1.26	1.23	1.20±0.07 1.12–1.34
RW/RH	1.91	1.96	—	2.67	—	1.91	2.00	—	—	—	—	1.97	2.07±0.29 1.91–2.67
MW/ML	1.47	1.00	—	0.86	—	1.00	1.31	—	—	—	—	1.15	1.13±0.22 0.86–1.47
RW/MW	1.68	2.50	—	2.53	—	2.44	2.00	—	—	—	—	1.82	2.16±0.37 1.68–2.53
DTL/DTW	1.14	1.10	—	0.97	—	1.33	1.49	—	—	—	—	1.19	1.20±0.18 0.97–1.49
DTL/SVLx100	0.83	0.78	—	0.77	—	0.85	0.62	—	—	—	—	0.80	0.77±0.08 0.62–0.85
DTW/SVLx100	0.73	0.71	—	0.79	—	0.64	0.42	—	—	—	—	0.67	0.66±0.13 0.42–0.79

* incomplete or regenerates

Table 5. Meristic data of the holotype and the topotypic specimens of *Gekko remotus* sp.n. (Abbreviations as in material and methods).

	ZMB 5698	**ZMB 5889**	**ZMB 6239**	**ZMB 7922**	**ZMB 7982**	**ZMB 76976**	**ZMB 76977**	**ZMB 76978**	**ZMB 76979**	**ZMB 76980**	**ZMB 76981**	**ZFMK 20611**	mean±SD min–max
SPL	13/13	13/12	13/13	12/14	12/11	13/13	13/13	13/13	15/12	14/13	12/15	14/13	13.00±0.93 11–15
IF	13/13	12/12	12/12	13/14	10/12	12/12	12/12	12/12	13/13	12/12	14/13	12/13	12.38±0.82 10–14
NP	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	–
N	3/3	3/3	3/3	5/4	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3/3	3.13±0.45 3–5
I	1	3	1	1	1	1	1	1	1	1	1	1	1.17±0.58 1–3
S6S	38	45	41	41	41	37	43	40	—	36	40	44	40.55±2.81 36–45
IO	26	25	28	30	29	25	30	27	26	25	31	27	27.42±2.15 25–31
PM	2	2	2	1	2	2	2	2	2	2	2	2	1.92±0.29 1–2
GP	2	5	5	3	3	3	3	6	5	5	3	5	4.00±1.28 2–6
ESRM	6	6	5	5	5	4	6	5	5	6	5	5	5.25±0.62 4–6
SC	5/6	7/6	—	5/6	2/3	4/4	4/3	4/4	4/4	—	—	5/5	4.50±1.25 2–7
DTR	26	24	24	24	26	26	24	24	27	25	25	22	24.75±1.36 22–27
GSDT	10–11	11	10	11	10–11	11	10–11	10–12	11–12	10–11	10	10–11	10.67±0.64 10–12
GTL	3	2–4	3–4	3–4	3–4	1–3	3–5	2–3	3–4	1–2	2–3	3–4	3.00±0.98 1–5
GTC	3	2–3	2–3	3	2	2–3	1–2	2–3	1–3	2	2	3–4	2.33±0.70 1–4
SMC	179	175	—	190	195	205	197	—	—	—	—	184	189.25±10.63 175–205
SR	139	131	—	136	141	142	136	—	—	—	—	136	137.29±3.73 131–142
V	28	25	—	32	31	33	34	—	—	—	—	31	30.63±2.88 25–34
TVF	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	–
LF1	16/16	16/16	—	15/16	16/16	15/16	17/17	17/15	—	15/16	14/15	16/16	15.80±0.77 14–17
LF4	22/22	22/21	—	20/21	22/20	22/22	22/22	20/21	—	23/22	20/21	22/23	21.50±0.95 20–23
LZ1	17/16	16/17	—	18/19	18/16	18/15	17/18	—	—	17/17	16/15	17/17	16.89±1.08 15–19
LZ4	24/25	25/24	—	22/25	25/24	25/24	25/26	22/24	—	25/22	23/23	24/26	24.15±1.23 22–26
FTW	weak	weak	weak	weak	weak	weak	weak	weak	weak	weak	weak	weak	
TFL	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	
THL	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	
PP	—	44	—	45	38	33	—	—	—	44	42	31	39.57±5.68 31–45
PS	2	—	—	—	—	—	0	—	—	—	—	—	1.00±1.41 0–2
PCT	2/1	2/2	—	1	1/2	1/2	2/2	1/1	—	2/2	1/1	1/2	1.55±0.51 1–2
T1W	3	3	4	4	3	3	3	3	4	4	4	3	3.42±0.51 3–4
T3W	4	5	3	3	3	3	3	3	4	3	3	3	3.33±0.65 3–5
S1W	10	12	—	12	13	13	11	12	12	12	12	12	11.91±0.83 10–13
S3W	11	13	—	13	11	14	—	12	14	12	11	13	12.40±1.17 11–14
SC1W	4	4	4	4	4	4	5	4	4	4	4	5	4.17±0.39 4–5
SC3W	4	4	4	4	4	4	4	4	4	4	4	4	4.00±0 4
SC5W	4	4	4	4	4	—	4	4	4	4	4	4	4.00±0 4

Again, all specimens from Palau, adult and juvenile, lack the characteristic dark annulated tail pattern typical for *Gekko vittatus* s.str. (see above).

Distribution. Known only from the type locality (i.e. Palau Islands). *Gekko remotus* sp. n. has been recorded from the Palau Islands Babeldaob, Bablomekang, Beliliou, Kmekumer Island, Malakal, Ngeaur, Ngercheu, Ngeruais, Ngerekebesang, Ngerikeuid Island, Oreor, Ulebsechel and Ulong (Crombie & Pregill 1999).

Natural History. *Gekko remotus* sp. n. is active at night and mostly arboricolous, but has occasionally also been found on house walls. It feeds on insects as well as on fruit. Crombie & Pregill (1999) observed not only strong aggressive (territorial) behaviour among single adult males, but also attacks on non-receptive females. Moreover they reported cannibalism.

Comparisons. Like *Gekko vittatus* (s.l.) *Gekko remotus* sp.n. shows tubercles on the throat and lateral folds which makes both species easily distinguishable from all other species of the genus *Gekko* (Rösler et al. 2011). Moreover, *G. remotus* sp.n. differs from *G. albofasciolatus* Günther, 1867, *G. gecko* (Linnaeus, 1758), *G. reevesi* (Gray, 1831), *G. siamensis* Grossmann & Ulber, 1990, *G. smithii* Gray, 1862, and *G. verreauxi* Tytler, 1864 (a species endemic for the Andaman Islands) by its smaller SVL (117.5 mm vs. >150 mm), and also – except *G. verreauxi*, by a contact of nostril and rostral; it differs from *G. verreauxi* by more dorsal tubercle rows (22 vs. 11).

Gekko athymus Brown & Alcala, 1962, *G. melli* Vogt, 1922, *G. scientiadventura* Rösler, Ziegler, Vu, Herrmann & Böhme, 2004, *G. subpalmatus* Günther, 1864, and *G. tawaensis* Okada, 1956 lack the dorsal tubercles present in *G. remotus* sp.n.

The latter differs from *G. auriverrucosus* Zhou & Liu, 1982, *G. badenii* Szczerabk & Nekrasova, 1994, *G. canhi* Rösler, Ngyuyen, Doan, Ho, Nguyen & Ziegler, 2010, *G. grossmanni* Günther, 1994, *G. hokouensis* Pope, 1928, *G. japonicus* (Schlegel, 1836), *G. petricolus* Taylor, 1962, *G. russeltraini* Ngo, Bauer, Wood & Grismer, 2009, *G. scabridus* Liu & Zhou, 1982, *G. sibatai* Toda, Senhoku, Hikida & Ota, 2008, *G. similignum* Smith, 1923, *G. swinhonis* Günther, 1864, *G. taibaiensis* Song, 1985, *G. takouensis* Ngo & Gamble, 2010, *G. vertebralis* Toda, Sengoku, Hikida & Ota, 2008, *G. vietnamensis* Nguyen, 2010, *G. wenxianensis* Zhou & Wang, 2008, and from *G. yakuensis* Matsui & Okada, 1968 by a higher number of cloacal and femoral pores (31 vs. 0–15), and moreover, except from *G. taibaiensis, G. wenxianensis* and *G. yakuensis*, by non-dilated subcaudals.

Gekko remotus sp.n. differs from *G. crombota* Brown, Oliveros, Siler & Diesmos, 2008, *G. gigante* Brown & Alcala, 1978, *G. mindorensis* Taylor, 1919, *G. palawanensis* Taylor, 1925, *G. porosus* Taylor, 1922, *G. romblon* Brown & Alcala, 1978, and *G. rossi* Brown, Oliveros, Siler & Diesmos, 2009 by less numerous precloacal and femoral pores (31 vs. 50–88) and a lower midbody count (136 vs. 145–211).

The new species is distinguished from *G. ernstkelleri* Rösler, Siler, Brown, Demegillo & Gaulke, 2006, *G. liboensis* Zhao & Liu, 1982, *G. palmatus* Boulenger, 1907, and *G. similignum* Smith, 1923 by its numerous, densely placed tubercles on the forelimb, and by a bigger SVL (117.5 vs. 82.5–92.1 mm). *G. canaensis* Ngo & Gamble, 2011 lacks tubercles on the limbs (present in *G. remotus* sp.n.), has fewer precloacal pores (14–18 vs. 31) and widened subcaudals. *G. carusadensis* Linkem, Siler, Diesmos, Sy & Brown, 2010 is smaller than *G. remotus* sp.n. and has a smaller SVL (97.2 versus 117.5 mm), more interorbitals (35–48 vs. 27) and more precoacal and femoral pores (46–50 vs. 31), moreover widened subcaudals.

G. remotus sp. n. differs from *G. chinensis* Gray, 1942 by only weakly developed webbing between fingers and toes (distinct and well developed in *G. chinensis*) and by its larger SVL (117.5 vs. 72 mm), more subdigital lamellae under the 1st and 4th toe (17 vs. 8–10 and 24–26 vs. 12–19 respectively), and non-widened subcaudals.

G. kikuchii Oshima, 1912 has a smaller SVL than *G. remotus* sp.n. (80 vs. 117.5 mm) and has more precloacal and femoral pores (48 vs. 31) and has moreover widened subcaudals. *G. monarchus* (Schlegel, 1836) has more interorbitals than *G. remotus* sp.n. (34–35 vs. 27) a higher midbody count (148–177 vs. 136) and widened subcaudals. Finally, the endemic Thai species *G. nutaphandi* Bauer, Sumontha & Pauwels, 2008 has, in contrast to *G. remotus* sp.n., a nostril without contact to the rostral, and both species are moreover distinguished by different numbers of precloacal and femoral pores, viz. 17–22 vs. 31.

Etymology. The species name is derived from the Latin adjective *remotus, -a, -um*, meaning far away, and refers to the remote, isolated distribution range of the new species.

DISCUSSION

The genus *Gekko* contains several phylogenetic lines or clades with different geographic centres. Molecular divergence within the *Gekko vittatus* group (mitochondrial and nuclear genes: ND2, tRNA, RAG-1, PDC) revealed the distinctness of *G. remotus* sp.n. from all other members of this group (Rösler et al. 2011). In addition to the differences in scalation and colour pattern, *G. remotus* sp.n. differs from *G. vittatus* s.str. in some behavioural traits: *G. remotus* have a strictly solitary lifestyle including aggressive behaviour against conspecifics and even cannibalism, whereas *G. vittatus* live in familial groups and perform brood care (Treu 2001). The herpetofauna of the Palau Islands is dominated by faunal elements of New Guinean, Solomonian or Moluccan origin (Crombie & Pregill 1999). The northernmost representative of the *Gekko vittatus* group so far known is from Pulau Morotai, and also the records from Halmahera and Pulau Waigeo are geographically closer to the Palau islands as for instance New Guinea or the Admiralty Islands (De Rooij 1915). Further studies are, however, necessary to elucidate, from where the ancestors of *Gekko remotus* sp.n. may have reached the Palau Islands.

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APPENDIX

Gekko remotus sp. n.
ZFMK 20611 (holotype) — male, Palau islands (= Republic of Palau); ZMB 5698 — female, Palau islands (= Republic of Palau); ZMB 5889 — male, Palau islands (= Republic of Palau); ZMB 6239 — juvenile, Palau islands (= Republic of Palau); ZMB 7922 — male, Palau islands (= Republic of Palau); ZMB 7982 — male, Palau islands (= Republic of Palau); ZMB 76976–76977 — male, female, Palau islands (= Republic of Palau); ZMB 76978–76981 — 4 juvenile, Palau islands (= Republic of Palau).

Gekko vittatus s. str.
CPHR 393 — female, Dutch New Guinea; ZFMK 20612 — male,, Amboina (= Pulau Ambon), Indonesia; ZMB 7940 — male, Wokan, Aru islands, Indonesia; ZMB 8788 — female, Mysore, Kordo (Schouten Group), Indonesia; ZMB 9457 — male, Ratavul, New Britain, Bismark archipelago ago Papua New Guinea; ZMB 14628–14632 — 1 male, 2 females, 2 juveniles, Ralum, Gazelle peninsula, New Britain, Bismark archipelago ago Papua New Guinea; ZMB 14650 — female, Mioko, Duke or York Group, Papua New Guinea; ZMB 14651–14652 — 2 males, Ralum, Gazelle peninsula, New Britain, Bismark archipelago ago Papua New Guinea; ZMB 76982–76983 — 2 juveniles, Ralum, Gazelle Halbinsel, Neubrittanien, Bismark Archipel, Papua New Guinea; ZSM 285/0/1 — male, Amboina (=Pulau Ambon), Indonesia; ZSM 30/1972/1–30/1972/9 — 4 males, 5 females, Asmat, near Agats, Irian Jaya (Western New Guinea), Indonesia; ZSM 105/1979 — female, Mt. Bosavi, Didessa, southern highland, Papua New Guinea; ZSM 106/1979 — female, Airdhills, Papua New Guinea; ZSM 507/1998 — male, 54 km south from Nabire (800 m a.s.l.), Irian Jaya (= Western New Guinea), Indonesia.

Gecko trachylaemus Peters, 1872
ZMB 7511 (holotype) – male, Northern Australia.

Platydactylus bivittatus (Duméril & Bibron, 1836)
MNHN 6714 (syntype) – male, Nouvelle-Guinée (= New Guinea), Indonesia; MNHN 2285 (syntype) – female, "□le Waigiou" (= Pulau W), Indonesia.

Gekko vittatus- phenotype 3
ZMB 48737–48738 — 2 males, Kei islands, Moluccas, Indonesia.

Gekko vittatus- phenotype 4
SMF 9157–9159 — 3 males, Nissan atoll, Green Islands, Papua New Guinea.

