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Diversification in the mountains: a generic reappraisal of the Western Ghats endemic gecko genus *Dravidogecko* Smith, 1933 (Squamata: Gekkonidae) with descriptions of six new species

R. CHAITANYA[1,7], VARAD B. GIRI[2], V. DEEPAK[3], ANIRUDDHA DATTA-ROY[4], B.H.C.K MURTHY[5] & PRAVEEN KARANTH[6]

[1]*508, 8 B Cross, Asha Township, Doddagubbi Village, Bangalore, 560077, India*
[2]*NIDUS, 1903, Shubh Kalyan, Nanded, Pune, 411041, India*
[3]*Department of Life Sciences, The Natural History Museum, London SW7 5BD, United Kingdom*
[4]*School of Biological Sciences, National Institute of Science Education and Research, Bhubaneswar, Odisha, India Pin - 752050*
[5]*Zoological Survey of India, Western Ghats Regional Station, Kozhikode, 673006, India*
[6]*Centre for Ecological Sciences, Indian Institute of Science, Bangalore, 560012, India*
[7]*Corrersponding author. E-mail: rollingmenhirs@gmail.com*

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Abstract

The monotypic genus *Dravidogecko*, represented by its type-species *D. anamallensis*, is singular amongst peninsular Indian gekkonid lineages in its endemism to the Western Ghats. Molecular species delimitation approaches reveal at least seven species-level lineages within the genus from its distribution range across the mid–high elevations of the southern Western Ghats of India. These lineages, albeit superficially cryptic, are patently diagnosable from each other by employing a limited but precise set of morphological characters. Six of these lineages that were obscured under the nomen *D. anamallensis* are herein recognized as distinct species. A reappraisal of the genus *Dravidogecko* is provided based on external morphology and osteological characters, along with a detailed redescription of the holotype of *D. anamallensis*. A key to the species based on diagnostic characters is presented. Gene-trees based on mitochondrial and nuclear DNA data recovered marginally disparate topologies and were consequently coalesced into a species-tree for phylogenetic inference. Timetree analysis reveals late Miocene cladogenesis in this group and establishes late Palaeocene divergence from its sister genus, *Hemidactylus*, making *Dravidogecko* one of the earliest, extant lizard lineages to have colonized peninsular India.

Key words: biodiversity, divergence dating, Gekkoninae, molecular phylogenetics, species delimitation, taxonomy

Introduction

The portrayal of India's drift into the northern latitudes as an isolated landmass during the late Cretaceous is disputable, with numerous fossil evidence indicating faunal exchange with adjacent lands (Sahni *et al.* 1987; Prasad *et al.* 1994; Briggs 2003). Although the path the Indian plate assumed during its drift remains contentious (see Ali and Aitchison 2008), fossil records of mammals and microvertebrates suggest dispersals across marine barriers at various times facilitated by physiographic features such as elevated ocean floors and oceanic islands that may have acted as causeways (Sahni *et al.* 1987; Thewissen *et al.* 2001). Amongst vagile vertebrate groups that had potential for such transmarine dispersal were squamates that possess hard epidermal scales (Mausfeld *et al.* 2000; Austin *et al.* 2004; Lima *et al.* 2013). The Western Ghats in peninsular India presents evidence of faunal elements that are endemic to this mountain system with origins that predate India's suturing with Eurasia (Pearson & Ghorpade 1989; Bossuyt & Milinkovitch 2001; Biju & Bossuyt 2003; Carpentier 2003; Bossuyt *et al.* 2004; Datta-Roy & Karanth 2009). However, studies dedicated to resolving endemic diversity of these often cryptic groups in the Western Ghats have been focussed on anurans (e.g., Biju *et al.* 2011, 2014).

The Western Ghats endemic genus *Dravidogecko* Smith, 1933 is an exemplar of an ancient (pre-suturing), cryptic, lineage of geckos that purportedly diverged in the Eocene and dispersed into the drifting Indian plate through transmarine colonization (Bansal & Karanth 2013; Agarwal *et al.* 2014). This evolutionary history places *Dravidogecko* amidst some of the earliest, extant lizard lineages to have occupied peninsular India. Past studies on vertebrate lineages of comparable (or older) divergence times that are endemic to the Western Ghats have revealed remarkable diversity, chiefly attributed to the eco-climatic and topological heterogeneity of this landscape (Biju *et al.* 2014; Nair *et al.* 2012; Gower *et al.* 2016). The present distribution range of *Dravidogecko* that encompasses known biogeographic barriers in the Western Ghats, coupled with its ancient origins in the peninsular Indian landscape, provide compelling reasons to question its present monotypy and investigate the diversity it potentially harbours.

The type species *Dravidogecko anamallensis* (Günther, 1875) has endured a tumultuous taxonomic past with various workers questioning, and thereafter emending its generic allocation. Günther (1875) described *Gecko anamallensis* based on a single specimen collected by Colonel R.H. Beddome from the "Anamallay mountains" (now Anaimalai Hills) in Tamil Nadu, which lie immediately south of the Palghat Gap (Fig 1). Subsequently, Boulenger (1885) reassigned this species to the genus *Hoplodactylus* Fitzinger (now in the family Diplodactylidae), based on the presence of transverse, undivided lamellae and a uniformly granular dorsum bereft of larger tubercles. Inadvertently, Boulenger had allied this species with *H. duvaucelli* (Duméril & Bibron, 1836), purportedly from Bengal, and three other *Hoplodactylus* spp. from New Zealand. Smith (1933) recognized the need for a generic reallocation of *Hoplodactylus anamallensis* after he ascertained that *H. duvaucelli* was also in fact, an inhabitant of New Zealand and not Bengal as was the earlier presumption (Smith 1933, 1935). He accordingly restricted the distribution of *Hoplodactylus* to New Zealand and its adjacent islands and established the genus *Dravidogecko* to accommodate the species from the Anaimalai Hills based on differences in subdigital pads and arrangement of precloacofemoral pores (Smith 1933).

Bauer and Russell (1995) argued that the palpably weak diagnostic characters attributed to *Dravidogecko* could easily be ensconced within the wide gamut of shared-derived features imputed to *Hemidactylus* Goldfuss, 1820 across its cosmopolitan range. They considered *Dravidogecko* a primitive, relatively plesiomorphic hemidactyl and in the interest of conserving monophyly of the latter, placed it within its synonymy (Bauer & Russell 1995). Bansal and Karanth (2013) employed molecular methods to determine the phylogenetic placement of *Hemidactylus anamallensis* and ascertained that it was a deeply divergent sister to the global *Hemidactylus* radiation and consequently resurrected the genus *Dravidogecko.*

The monotypic *Dravidogecko*, represented by its type species *D. anamallensis*, is restricted in distribution to the Western Ghats, in Kerala and Tamil Nadu (Boulenger 1885; Smith 1935; Murthy 1993; Johnsingh 2001; Philip *et al.* 2011). A taxonomic reappraisal of the genus using external morphology and osteological characters is presented herein. Further, based on preserved museum specimens and recent material from across the southern Western Ghats, six additional lineages are described as distinct species using an integrative taxonomic approach. Additionally, a molecular phylogeny of this group is presented along with an estimate of their divergence and diversification times based on a broader gekkotan dataset.

Material and methods

Study area, field surveys and sampling. The Western Ghats, sometimes referred to as the Great Escarpment of India, is a mountain range made up of a system of hills that run roughly north-south, parallel to the west coast of peninsular India for a distance of ca. 1600 km. This topographically heterogeneous landscape (mean elevation of 1200 m asl), with steep latitudinal and altitudinal gradients in vegetation, rainfall and seasonality, is dissected by valleys of varying depths that are potential biogeographic barriers for the dispersal of smaller vertebrates such as geckos. The most prominent amongst these valleys in the southern Western Ghats are the Palghat Gap and the Shencottah Pass (Fig 1) (Sekar & Karanth 2013; Robin *et al.* 2015; Vijayakumar *et al.* 2016).

Our field surveys and sampling strategy incorporated this heterogeneity in topography and vegetation while bearing potential dispersal barriers in mind. Certain sampling locations were chosen based on previously published records. The sampled regions are generalized herein as follows: north of the Palghat Gap (NP), south of the Palghat Gap (SP) and south of the Shencottah Pass (SS). Specific hill massifs were identified for sampling in these regions, and forest tracts within them were sampled during 2016–2018. Despite historic occurrence records of *Dravidogecko* indicative of their distribution, fieldwork was conducted further north (Coorg Plateau, Chickmagalur Plateau and Agumbe Ghats), south (Ponmudi Hills) and east (Yercaud, Yelagiri and Sirumalai Hills in the Eastern Ghats) of their confirmed range (Fig 1). Sampling was conducted between 1900– 2200 hrs, predominantly in uninhabited buildings amidst naturally occurring forest patches.

Specimens were hand-collected in accordance with permits granted by the respective state forest departments (see acknowledgements). Individuals were photographed in-situ or in controlled conditions after which they were fixed for two days in a 4% formaldehyde solution. Before fixing, tissue from the liver was removed for DNA extraction from one or two individuals per population and preserved in absolute alcohol. Specimens were washed after fixing and transferred to a 70% alcohol solution for preservation. The type material is deposited in the herpetological collections of the Zoological Survey of India, Kozhikode (ZSIK) and the Bombay Natural History Society (BNHS).

Phylogenetic inference. DNA sequencing and sequence alignment. Genomic DNA was extracted using Qiagen DNeasy™ blood and tissue kits using product specific protocols and stored at -20°C. Partial sequences of the mitochondrial (mtDNA) gene NADH dehydrogenase 2 (ND2, ~822 bp) and two nuclear genes (nDNA)—recombination activating gene (RAG-1, ~1020 bp) and Phosducin (PDC, ~423 bp) were generated. Primers used for amplification and sequencing are listed in Table 1 and PCR conditions follow previously published protocols for these markers (Macey *et al.* 1997; Groth & Barrowclough 1999; Bauer *et al.* 2007). Purification and sequencing of PCR products were carried out at Medauxin India Pvt. Ltd. Complementary strands were sequenced in most cases to ensure sequence accuracy. Published sequences of representatives of each broad *Hemidactylus* clade recovered by Bauer *et al.* (2010) were included based on their established phylogenetic relationship as a sister lineage to *Dravidogecko* (Bansal & Karanth 2013). Based on their sister relationship with the *Hemidactylus+Dravidogecko* clade (Bauer et al. 2010; Bansal & Karanth 2013), two *Cyrtodactylus* exemplars representing the broadest *Cyrtodactylus* clades (Wood *et al.* 2012) were used as the outgroup. Samples used in molecular analyses along with GenBank (ncbi.nlm.nih.gov) accession numbers are listed in Table 2.

TABLE 1. Primers used in this study.

Gene	Primer	Primer sequence	Reference
ND2	L4437B	5'–AAGCAGTTGGGCCCATACC–3'	Macey *et al.* (1997)
ND2	H5540	5'– TTTAGGGCTTTGAAGGC–3'	Macey *et al.* (1997)
RAG-1	R18	5'-GATGCTGCCTCGGTCGGCCACCTTT-3'	Groth & Barrowclough (1999)
RAG-1	R13	5'- TCTGAATGGAAATTCAAGCTGTT-3'	Groth & Barrowclough (1999)
PDC	PHOF2	5'-AGATGAGCATGCAGGAGTATGA-3'	Bauer *et al.*(2007)
PDC	PHOR1	5'-TCCACATCCACAGCAAAAAACTCCT-3'	Bauer *et al.*(2007)

Individual sequences were aligned with the ClustalW algorithm (Thompson *et al.* 1994) implemented in MEGA 6 (Tamura *et al.* 2013) and finally edited by eye. Since all the markers used were protein coding genes, nucleotide sequences were translated into amino acid alignments using MEGA 6 and examined for premature stop codons to rule out the possibility of pseudogenes. Uncorrected *p*-distances were calculated for the ND2 gene sequences using MEGA 6 to assess genetic divergences within the ingroup.

TABLE 2. Gene sequences downloaded from https://www.ncbi.nlm.nih.gov/ and used for phylogenetic analyses in this study. Sequences in bold were generated as part of this study.

Taxon	Voucher no.	Locality	Genbank accession numbers		
			ND2	RAG-1	PDC
Hemidactylus haitianus	AMB 4189	Dominican Republic, Santo Domingo	HM559634	-------------	-------------
Hemidactylus haitianus	CAS 198442	Dominican Republic, Santo Domingo	-------------	EU268311	EU268341
Hemidactylus garnotii	CAS 223286	Myanmar, Rakhine State, Taung Gok Township, Ma Ei Ywa Ma Village	EU268363	EU268302	EU268332
Hemidactylus parvimaculatus	AMB 7475	Sri Lanka, Kandy, 7"15'36"S, 80" 37'11"E	GQ458055	-------------	GQ375302
Hemidactylus parvimaculatus	AMB 7466	Sri Lanka, Mampuri, 7"59'38"S, 79"44'33"E	-------------	GQ375311	-------------
Hemidactylus mabouia	AMB 8301	South Africa, Limpopo Prov., nr. Huntleigh	HM559638	-------------	-------------
Hemidactylus mabouia	MCZ R184446	Limpopo province, South Africa	-------------	EU268300	EU268330
Hemidactylus robustus	MVZ 234374	Iran, Lorestan Province, 99 km SW (by road) of Khorram Abah	HM559644	-------------	-------------
Hemidactylus robustus	MVZ 248437	Pakistan, Thatta District, 40 km S of Mipur Sakro	-------------	EU268315	EU268345
Cyrtodactylus ayeyarwadyensis	CAS 216459	Myanmar, Rakhine State, Than Dawe District, Gwa Township	JX440526	-------------	-------------
Cyrtodactylus ayeyarwadyensis	CAS 216446	Myanmar, Rakhine State, vic. Kanthaya Beach	-------------	EU268287	EU268317
Cyrtodactylus tibetanus	MVZ 233251	China, Tibet Autonomous Region, Lhasa, 3 km WNW of Potala Palace	JX440561	JX440722	-------------
Dravidogecko anamallensis	**ZSIK 2969**	India, Tamil Nadu state, Valparai	**MN520264**	-------------	**MN520286**
Dravidogecko anamallensis	**ZSIK 2970**	India, Tamil Nadu state, Valparai	**MN520265**	-------------	**MN520287**
Dravidogecko septentrionalis sp. nov.	**BNHS 2342**	India, Kerala State, Wayanad district, Lakkidi Village	**MN520267**	**MN520275**	**MN520281**
Dravidogecko septentrionalis sp. nov.	**BNHS 2343**	India, Kerala State, Wayanad district, Lakkidi Village	**MN520273**	-------------	**MN520285**
Dravidogecko meghamalaiensis sp. nov.	**BNHS 2347**	India, Tamil Nadu state, Theni district, Meghamalai	**MN520266**	**MN520274**	**MN520280**
Dravidogecko meghamalaiensis sp. nov.	**ZSIK 2977**	India, Tamil Nadu state, Theni district, Meghamalai	**MN520272**	-------------	-------------
Dravidogecko douglasadamsi sp. nov.	**BNHS 2349**	India, Tamil Nadu state, Tirunelveli district, Manjolai estate	**MN520270**	**MN520278**	-------------
Dravidogecko smithi sp. nov.	**ZSIK 2981**	India, Kerala State, Tiruvananthapuram district, Ponmudi	**MN520262**	**MN520279**	**MN520284**
Dravidogecko smithi sp. nov.	**BNHS 2350**	India, Kerala State, Tiruvananthapuram district, Ponmudi	**MN520263**	-------------	-------------
Dravidogecko tholpalli sp. nov.	**BNHS 2352**	India, Tamil Nadu state, Dindigul district, Kodaikanal	**MN520261**	**MN520277**	**MN520283**
Dravidogecko tholpalli sp. nov.	**ZSIK 2986**	India, Tamil Nadu state, Dindigul district, Kodaikanal	**MN520271**	-------------	-------------
Dravidogecko janakiae sp. nov.	**BNHS 2357**	India, Kerala state, Idukki district, Munnar	**MN520268**	**MN520276**	**MN520282**
Dravidogecko janakiae sp. nov.	**ZSIK 2988**	India, Kerala state, Idukki district, Munnar	**MN520269**	-------------	-------------

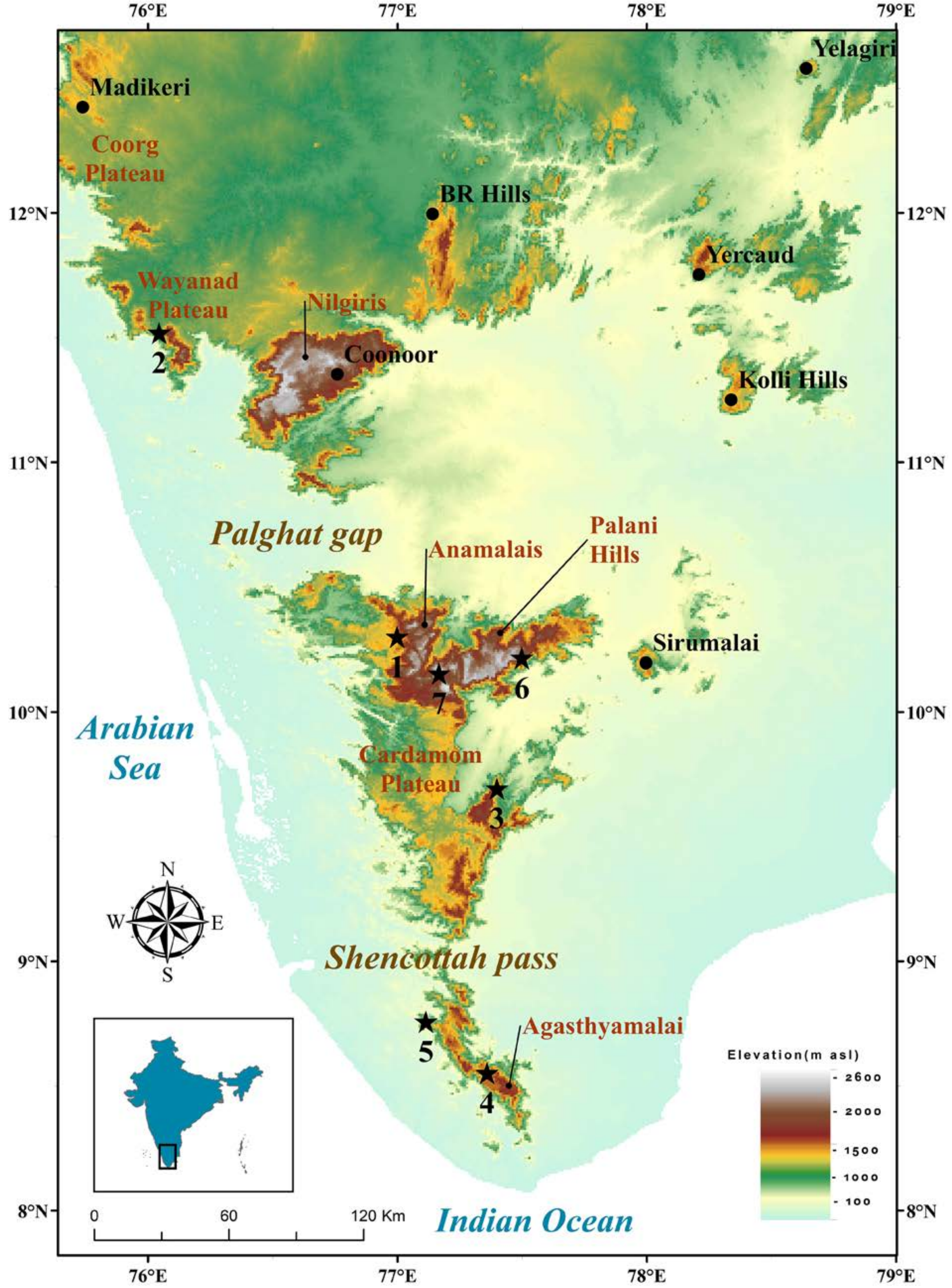

FIGURE 1. Elevation map of peninsular India. Black dots are locations in the Western and Eastern Ghats where fieldwork was conducted. Black stars represent type-localities of *Dravidogecko* spp. 1) *D. anamallensis* (Valparai town) 2) *D. septentrionalis* **sp. nov.** (Lakkidi village, Wayanad) 3) *D. meghamalaiensis* **sp. nov.** (Meghamalai, Theni) 4) *D. douglasadamsi* **sp. nov.** (Manjolai village, Tirunelveli) 5) *D. smithi* **sp. nov.** (Ponmudi Hills, Tiruvananthapuram) 6) *D. tholpalli* **sp. nov.** (Kodaikanal town, Dindigul) 7) *D. janakiae* **sp. nov.** (Munnar town, Idukki).

Divergence dating analyses were undertaken using a concatenated alignment of the ND2 and RAG-1 genes. An extensive Gekkotan dataset was used in order to broadly represent phylogenetic diversity within Gekkota in general and Gekkonidae specifically, and to allow for compatibility with available fossil calibrations (Table 3 & Table S4).

TABLE 3. Fossil calibrations used for divergence dating, their prior distributions and references.

Node	Prior distribution	Reference
Sphaerodactylus dommelli, mrca *Sphaerodactylus* Wagler	Exponential, mean=3, offset=15	Skipwith *et al.* (2016)
Pygopus hortulans, stem calibration for *Pygopus* Merrem	Exponential, mean=10, offset=23	Lee *et al.* (2009)
mrca New Zealand Diplodactylidae	Exponential, mean=17, offset=16	Skipwith *et al.* (2016)
mrca *Gekkota*	Exponential, mean=20, offset=99	Daza *et al.* (2016)

TABLE 4. Partitions and models of sequence evolution for the various genetic analyses carried out as part of the study.

Gene & Codon position	Maximum Likelihood	Bayesian inference	Species tree	Divergence dating
ND2			TrN+Γ	
Position 1	GTR+Γ	GTR+Γ		HKY+Γ
Position 2	GTR+Γ	HKY+Γ		HKY+Γ
Position 3	GTR+Γ	GTR+Γ		
RAG-1			HKY+Γ	
Position 1	GTR+Γ	HKY+Γ		HKY+Γ
Position 2	GTR+Γ	HKY+Γ		HKY+Γ
Position 3	GTR+Γ	K80		
PDC				
Position 1	GTR+Γ	HKY+Γ		
Position 2	GTR+Γ	HKY+Γ		
Position 3	GTR+Γ	K80		

Phylogenetic analyses. Maximum likelihood (ML) and Bayesian inference (BI) analyses were conducted separately for mtDNA (ND2) and nDNA (RAG-1+PDC) to assess possible differences in topology and support parameter values between these unlinked sets of markers. Gene sequences were partitioned by codon position and models of sequence evolution were selected for each partition, independently for the mtDNA and nDNA datasets, based on Schwarz's Bayesian Information Criterion (BIC) using PartitionFinder v.1.1.1 (Lanfear *et al.* 2012). Models of sequence evolution as chosen by PartitionFinder for the different analyses used in this study are listed in Table 4.

Due to restrictions in model choice enforced by the program RaxML, ML trees were estimated under the GTR+ Γ model. Analyses using 10 runs were carried out separately on the mtDNA and nDNA datasets using RAxML HPC v7.2.3 (Stamatakis 2006) implemented in raxmlGUI v1.3 (Silvestro & Michalak 2012). Bootstrap support (bs) for branches was assessed with 10000 thorough bootstrap replicates. Bayesian analyses were conducted in MrBayes 3.2.1 (Ronquist *et al.* 2012) using default priors. The program was executed using two runs with four chains each (three hot chains, one cold chain) for 10 million generations, sampling every 1000 generations. Sampling points of the Markov chains before they attained stationary probability distribution were determined in Tracer 1.6 (Rambaut & Drummond 2014) and about 20% were discarded as burn-in. Convergence of the two runs was ascertained based on the average standard deviation of split frequencies as a proxy (<0.01) and a summarized majority rule consensus tree was constructed using the *sumt* (summarize tree) function implemented in Mr. Bayes 3.2.1.

Due to marginal incongruences in the topologies recovered by the independent mtDNA and nDNA analyses, a coalescent species tree analysis using concatenated mtDNA and nDNA data was carried out in *BEAST (Bouckaert *et al.* 2014). BEAUti 2.4.7 (Bouckaert *et al.* 2014) was used to generate the initial input xml file. Each gene was treated as a separate partition. The mtDNA partition was then unlinked from the two nDNA partitions for the 'model' and 'tree' parameters due to their evolutionary dissimilarities. The models used in the analysis as suggested by Partitionfinder v.1.1.1 are presented in Table 4. A relaxed uncorrelated lognormal clock model for each partition, a Yule speciation tree prior and a linear, constant root model to reflect population sizes were used for the analysis. Specimens were assigned to taxon sets based on geographic proximity of their collection sites. The MCMC implemented in BEAST 2.4.8 (Bouckaert *et al.* 2014) was run for 1000 million generations, storing every 10% of the sampled probability space. Convergence was ascertained after the effective sample size (ESS) for the posterior probabilities of all parameters were observed in Tracer 1.6 to be greater than 200. The first 20% from the sampled tree space was discarded as burn-in and the maximum clade credibility tree with median heights was summarized using TreeAnnotator 2.4.7 (Rambaut & Drummond 2013).

Species delimitation. Discovery and validation approaches to species delimitation require deductive partitioning of samples as a prerequisite. Since *Dravidogecko* lacks predefined taxonomic or morphological partitioning, the ML and ultrametric trees based on ND2 sequence data (using the methods described in the phylogenetic analyses and divergence dating sections respectively) were used to help inform the initial species hypothesis.

In order to detect the number of potential operational taxonomic units (OTUs), species discovery approaches that use single-locus data (but differing paradigms to identifying speciation events) were used in concert with a validation approach to species delimitation (BPP). The generalized mixed Yule-coalescent (GMYC) model (Pons *et al.* 2006) was selected as a discovery approach for its ability to generate stable results despite gaps in intraspecific sampling coverage (Talavera *et al.* 2013). This model uses an ML approach to identify boundaries between Yule speciation and intraspecific coalescence using relative node ages in an ultrametric tree. The ultrametric gene-tree was estimated in BEAST 2.4.8 using the ND2 dataset, partitioned by codon position, a relaxed log normal clock model and a Yule tree prior. The analysis was run for 100 million generations, storing 10% of the sampled tree space. The first 20% of the sampled trees were conservatively discarded as burn-in and a summary tree using maximum clade credibility and median node height, was constructed using TreeAnnotator 2.4.7 after establishing convergence (ESS > 200). An online implementation of GMYC (https://species.h-its.org/gmyc/) was used in single threshold mode with the ultrametric tree in newick format as input. A Bayesian implementation of the Poisson tree process (bPTP) was used as an alternative species discovery method to GMYC (Zhang *et al.* 2013). The PTP model uses the number of nucleotide substitutions as a proxy to determine speciation events versus coalescent events. The bPTP web server (https://species.h-its.org/ptp/) requires a gene-tree as input, which was constructed using the ND2 dataset according to the methods described in the previous section. The bPTP analysis was run for 1 million MCMC generations with 10% of the initial trees discarded as burn-in.

Since both the GMYC and bPTP methods work with a single locus dataset, a multi-locus validation approach was carried out using the Bayesian Phylogenetics & Phylogeography program (Yang 2015). The method uses the multispecies coalescent model to compare different models of species delimitation and species phylogeny in a Bayesian framework, accounting for deep coalescence due to ancestral polymorphism and gene tree-species tree discordance. BPP evaluates speciation models by collapsing or retaining nodes in a 'guide' tree, using reverse jump Markov Chain Monte Carlo (rjMCMC) and calculates the posterior probabilities for each *n-species* model. Posterior probabilities indicate the support or lack of it, for a species-level lineage split event at that point. The ML tree generated using the ND2 dataset was used as the input guide tree topology representing the phylogeny with all putative species. Parameter values for population size (θs) and divergence times (τs) were defaulted. The species delimitation parameter was set to 1, the species tree parameter to 0 and the fine-tune parameter defaulted to 1. Alignments of the ND2, RAG-1 and PDC genes were appended and used as the sequence file input. The MCMC was run for 200,000 generations and rerun for 500,000 generations in order to corroborate results (see Satler *et al.* 2013; Yang 2015). Every 10% of the samples were stored, with the initial 8000 trees being discarded as burn-in.

Once the OTUs were discerned using molecular species-delimitation approaches, an extensive inventory of morphological characters was recorded for all specimens. A limited subset of these characters was then used in delineating species in morpho-space (as described further below).

Divergence dating. BEAST 2.4.8 implemented through the CIPRES portal (www.phylo.org—Miller *et al.* 2010) was used to estimate divergence times within Gekkota for a concatenated ND2+RAG1 dataset. A dataset of 151 gekkotans spanning the diversity of the group was used based on previously published large-scale phylogenies (Gamble *et al.* 2012; Agarwal *et al.* 2017) and appended with one sample per putative species of *Dravidogecko* (Table S4). The dataset was partitioned by codon position based on the partition scheme selected by PartitionFinder v 1.1.1 and the models of sequence evolution were selected using Schwarz's Bayesian Information Criterion (BIC) for BEAST (Table 4). BEAUti 2.4.7 (Bouckaert *et al.* 2014) was used to generate the input xml file with 5 partitions, a relaxed uncorrelated lognormal clock model for each partition and a Yule speciation tree prior. Gekkotan families in the dataset were constrained for monophyly based on published results and relationships recovered from a previously run ML analysis using RAxML HPC v7.2.3 implemented in raxmlGUI v1.3. Four fossil calibrations were used for the divergence dating analysis (Table 3). This includes amber gecko fossils from Burma that date back to 99 Mya and are interpreted to represent a hard minimum for Gekkota (Daza *et al.* 2016). The phylogenetic position of these fossils is still ambiguous but Bauer (2019) argues that that these represent either ancient ancestors of extant families within Gekkota, extinct ancestral lineages of Gekkota *sensu stricto* or they lie just outside Gekkota *sensu stricto*. The usage of these fossils to represent crown Gekkota is in concurrence with more recent studies (Lajmi *et al*. 2018; Agarwal *et al*. 2019). All fossils used were assigned exponential distributions with mean and offset values as listed in Table 3, and default values assigned to all other priors. Analyses were run for 130 million generations, sampling every 10,000 generations, with convergence determined by inspecting log files in Tracer 1.6 (ESS >200 for all parameters).

Repeated runs that used the GTR model failed to reach convergence because of the complexity of its substitution parameters and consequently, a separate analysis that used HKY instead of GTR was run with the same 5-partition scheme and other parameters unaltered to achieve convergence (ESS >200). The first 20% trees in the sample space were discarded as burn-in and the maximum clade credibility tree with median heights was summarized using TreeAnnotator 2.4.7. To correct for possible saturation at the third codon position and rate heterogeneity (Breinholt & Kawahara 2013), an alternate BEAST analysis was carried out without the third codon position in the sequence alignment, using the same parameters and four partitions instead of five. This analysis without the more rapidly evolving third codon position has been conservatively used herein, for any estimates of divergence and inferences on diversification. Age intervals are presented as 95% of the highest posterior densities (HPD) for the corresponding node.

External morphology and osteology. A total of 48 specimens were used for gathering morphological and meristic data. The following measurements were taken using a Mitutoyo™ dial caliper (to the nearest 0.1 mm), except tail length (TL) which was measured using a thread and ruler: snout-vent length (SVL; from tip of snout to vent), trunk length (TRL; distance from axilla to groin measured from posterior edge of forelimb insertion to anterior edge of hindlimb insertion), body width (BW; maximum width of body), crus length (CL; from base of heel to knee); tail length (TL; from vent to tip of tail), tail width (TW; measured at widest point of tail); head length (HL; distance between retroarticular process of jaw and snout-tip), head width (HW; maximum width of head), head height (HH; maximum height of head, from occiput to underside of jaws), forearm length (FL; from base of palm to elbow); orbital diameter (OD; greatest diameter of orbit), naris to eye distance (NE; distance between anterior-most point of eye and nostril), snout to eye distance (SE; distance between anterior-most point of eye and tip of snout), eye to ear distance (EE; distance from anterior edge of ear opening to posterior corner of eye), internarial distance (IN; distance between nares), inter-orbital distance (IO; distance between left and right supraciliary scale rows measured at their midpoint), ear length (EL; maximum length of ear), rostral width (RW; maximum width of rostral scale), rostral length (RL; maximum length of rostral scale), mental length (ML; maximum lenth of mental scale), mental width (MW; maximum width of mental scale), inner postmental length (1PML; maximum length of inner post mental), outer postmental length (2PML; maximum length of outer postmental), contact between inner postmentals (CT; length of contact point between first pair of post mentals). Following scale counts and external observations of morphology were made using a LeicaS6E™ microscope: Lamellae counted from a basal scale at least twice the diameter of surrounding palmar scales to a terminal apical scale on digital pad, not including claw sheath for all digits— (manus (L); lamellae on fingers of left hand, manus (R); lamellae on fingers of right hand, pes (L); lamellae on toes of left foot, pes (R); lamellae on toes of right foot), labials—(SL; supralabials on left and right side respectively—counted to angle of jaw; number in parenthesis indicates mid-orbital position, IL; infralabials on left and right side respectively, counted to angle of jaw); precloacofemoral pores (PcFP; number of precloacofemoral pores); ventral scale row (VS; number of ventral scales across belly counted at midbody, demarcated by last row of granular scales on flanks).

Species were delimited in morphospace using the following limited yet informative subset of characters: 1) number of precloacofemoral pores (PcFP) 2) geometry and size of the mental and post-mental scales (ML, 1PML, 2PML) 3) number of ventral scales 4) number of scales between the inter-nasals. Delineation in morpho-space was established based on consistent population level differences in at least one of these diagnostic characters.

Colour descriptions of holotypes in preservation were made using a digital photograph or by viewing the specimen under a microscope. Photographs of live specimens for each species are provided. Colour, although described for one representative individual per species, is not used for diagnosis, due to high intraspecific variability.

Morphological comparisons were made between older specimens from "Anamallays" (now Anaimalai Hills) and "Tinnevelly" (now Tirunelveli District), preserved in the NHMUK (Natural History Museum, London, United Kingdom, previously BMNH), with freshly collected samples from these localities, to establish conspecificity. Intraspecific morphological variations that are not recorded in Table 5–Table 8, are presented under the variation sections in species accounts, to impute comprehensive circumscriptions to the taxa described. The presentation of synonymies and chresonymies follows Dubois (2000).

One female specimen each from Wayanad District and Idukki District, Kerala, were cleared and stained following protocols from Hanken & Wassersug (1981). Osteological descriptions are made from both specimens. Descriptions of skeletal characters follow Mahendra (1950), Underwood (1954) and Russell (1977).

Results

Species delimitation. Results using single locus ND2 data with both GMYC and bPTP suggest the presence of eight species with high support (Fig S1). These results were likely due to a relatively high degree of variation in the ND2 gene within the *Dravidogecko anamallensis* samples from Valparai (> 2% uncorrected *p*-distance), causing these single-locus tools that are highly sensitive to intra-population variation, to infer a species level split within that lineage.

The eight-species hypothesis as reported by bPTP and GMYC was then used as a guide tree and validated with the BPP program which uses a multi-locus dataset. This hypothesis yielded low support for a seven internal-node (eight species) model (0.39 posterior probability, pp). The BPP program was then re-run with a seven species guide tree, based on the ML phylogeny recovered using the ND2 dataset that treats the two *D. anamallensis* samples as a single taxon. The seven species model (six-node) yielded better support (0.98 pp) suggesting that thresholds for intra-specific divergence in nDNA were relatively lower when compared with mtDNA thresholds, which the single-locus programs were using. The seven species approach recommended by BPP was chosen thereafter, to further delimit these OTUs based on morphological characters (Fig 2B).

Phylogenetic relationships. Analyses employing mtDNA and nDNA recovered marginally different topologies with slight variations in branch support parameters. These sequence alignments were therefore not concatenated and these topologies are presented separately (Fig 2A, Fig S2). The coalescent species tree approach using *BEAST that used concatenated mtDNA and nDNA data yielded a topology similar to what was recovered using only the mtDNA dataset (Fig 2B).

The sister relationship between *Dravidogecko* and *Hemidactylus* received high support from all topologies except from the ML analysis with nDNA, which provided moderate support for their monophyly (66, bs). All topologies retrieve two well-supported clades within *Dravidogecko* with *D. tholpalli* **sp. nov.** + *D. janakiae* **sp. nov.** (Clade A), as sister to the rest of the lineages (Clade B). Clade B comprises of a well-supported sister relationship between the species pair from SS, *D. douglasadamsi* **sp. nov.** + *D. smithi* **sp. nov.** (Clade B1), and a clade comprising *D. septentrionalis* **sp. nov.** + *D. anamallensis* (B2) with moderate support with mtDNA and low support with nDNA for their monophyly. The position of *D. meghamalaiensis* **sp. nov.** within Clade B is not resolved based on the phylogenies presented, and varies between topologies generated using mtDNA/species-tree and nDNA data. In the analyses using mtDNA and the species tree approach, *D. meghamalaiensis* **sp. nov.** is sister to Clade B1 with moderate support, while it is recovered as a sister to Clades B1+ B2 in the topologies retrieved from nDNA. The range of uncorrected *p*-distances for the ND2 gene between Clades A and B is 0.16–0.21 (Table 9).

Divergence dating. The timetree suggests that the ancestral lineage leading to the *Cyrtodactylus* and the *Dravidogecko*+*Hemidactylus* clades split around 60 Mya (70–50 Mya). Further, the *Dravidogecko* and *Hemidactylus* lineages diverged from each other ca. 58 Mya (68–49 Mya) (Fig 3). The first broad split within the *Dravidogecko* radiation occurred around 19.5 Mya (26–13 Mya) recovering *D. tholpalli* **sp. nov.** and *D. janakiae* **sp. nov.** in a clade that is sister to the rest of the lineages. Mean age of diversification amongst species level lineages of *Dravidogecko* is 8.52 Mya ± 2.9. The divergence dates estimated at all other nodes in the Gekkotan timetree were more or less consistent with previous studies (Gamble *et al.* 2012; Agarwal *et al.* 2014, 2017).

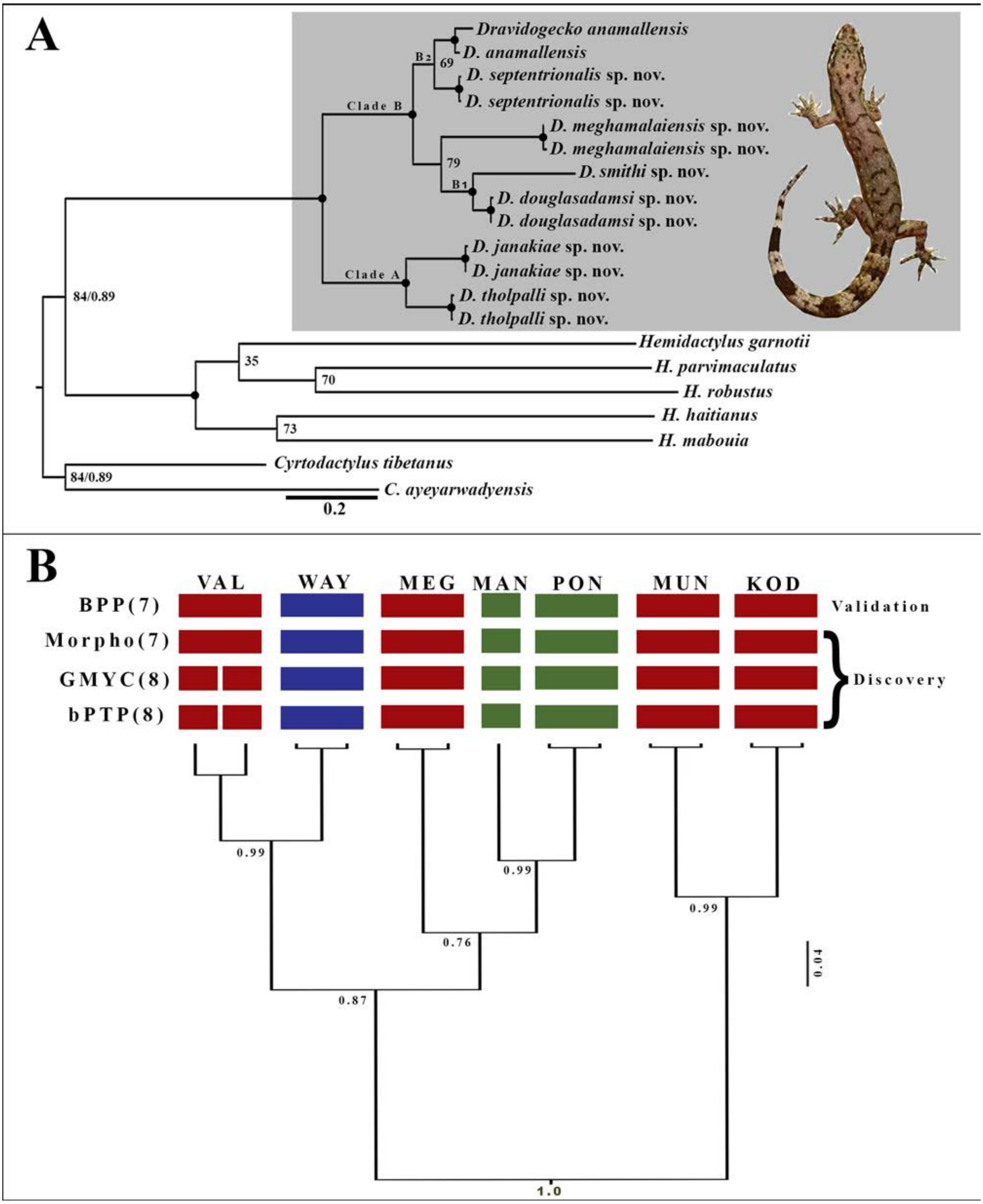

FIGURE 2. A) ML tree based on the ND2 gene. Black circles on nodes represent > 95% bootstrap support and > 0.95 posterior probability (pp) for their corresponding branches. Clades discussed in the text are indicated. B) Species tree topology recovered from mtDNA and nDNA data with pp support against nodes for their corresponding branches. Species recovered using molecular delimitation tools are indicated as boxes below sampling locations, with the number of species in brackets against each tool. Colour bars under locations represent the broad region within the Western Ghats: Blue-NP; Red-SP; Green-SS. Names of collection localities abbreviated to the first three letters.

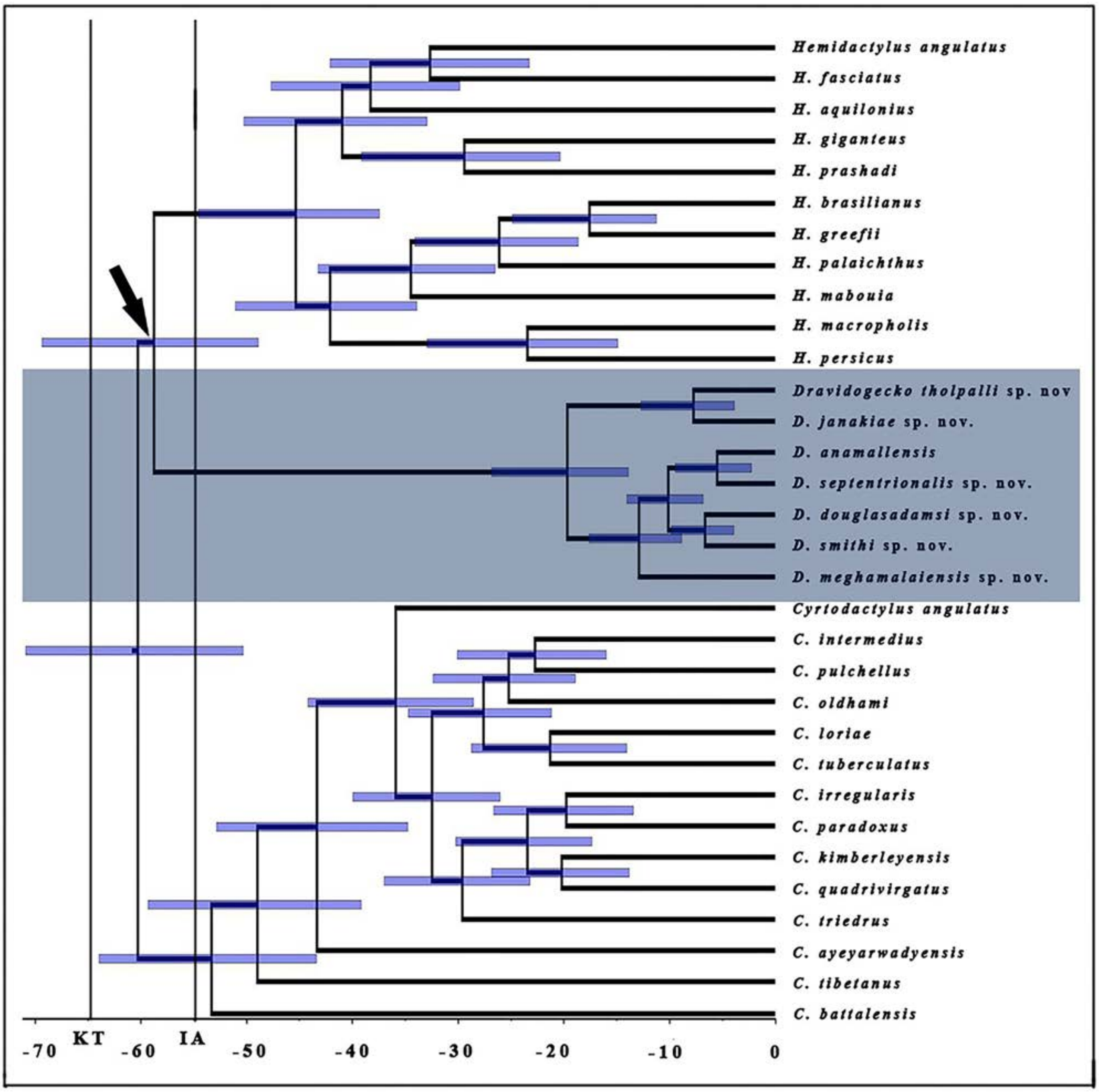

FIGURE 3. Ultrametric tree showing focal groups. Node bars indicate 95% HPD. Slant arrow indicates the point of divergence between *Dravidogecko* and *Hemidactylus*. Key geological events are indicated on the timeline: KT- Cretaceous/Tertiary boundary, IA-India's collision with Laurasia.

Systematics

Genus: *Dravidogecko* Smith, 1933

Type-species. By monotypy—*Gecko anamallensis* Günther, 1875.

Summarized generic description & diagnosis. (N=48). Small sized geckos (average SVL 48.0 mm ± 6.2) that are dorsoventrally compressed (Fig 4A)and elongate (average TRL/SVL 0.47); dorsal pholidosis homogenous and devoid of enlarged tubercles—composed of small, rounded granules throughout; scales on snout and canthus rostralis larger than rest of head; eye with a vertical pupil possessing crenulated margins; ear opening elliptical or sometimes round; internasals divided by one or two smaller scales; two postnasals on either side; rostral wider than deep, usually without a median groove; supralabials 8–12 and infralabials 7–10 on each side, roughly rectangular; ventral scales flat, weakly pointed and sub-imbricate, 24–35 when counted at midbody; mental wider than long, triangular; two pairs of well-developed postmentals, inner pair usually longer than the outer and in strong contact with each other behind the mental; digits moderately short with relatively long, strongly clawed terminal phalanges that are curved and arise angularly from the distal portion of expanded lamellar pad; scansors beneath each digit undivided throughout (Fig 4C), in a straight transverse series, 7–10 under digit IV of manus and 9–13 under digit IV of pes; an uninterrupted series of 35–56 precloacofemoral pores that usually extends up to the knee (Fig 4B); females with enlarged lymphatic sacs.

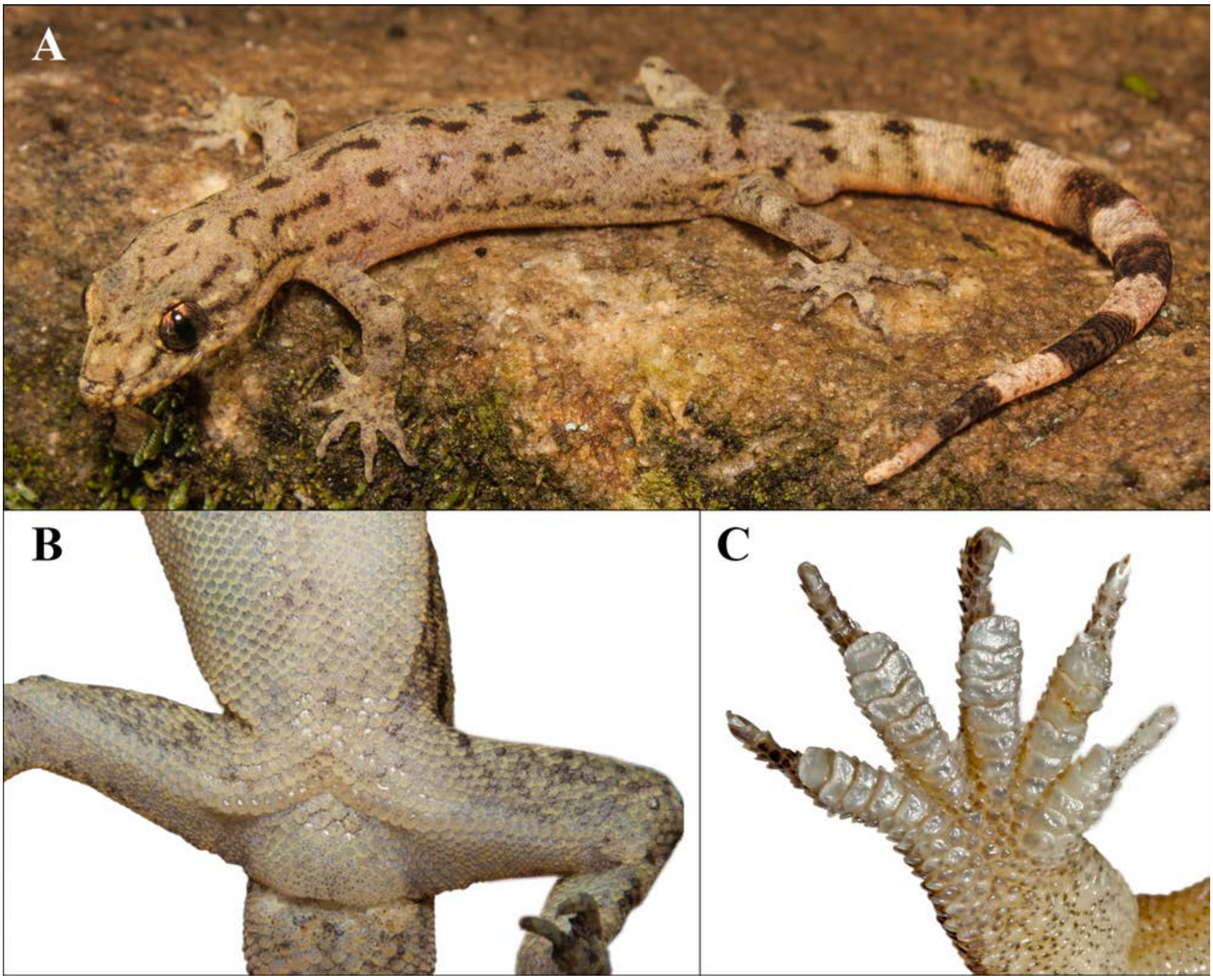

FIGURE 4. A) *In-situ* photograph of an uncollected specimen of *D. anamallensis* B) Cloacal region showing precloacofemoral pores in an uncollected specimen of *D. anamallensis* C) Undivided lamellae on the right manus of *D. septentrionalis* **sp. nov.**

Osteology. Among the median dorsal skull elements, the parietals and nasals are separate. The premaxillae are fused and form a kite shaped pre-nasal process extending between the nasals (Fig 5A). Frontals fused, pineal foramen absent. A boomerang shaped post-frontal on each side, along the suture between the frontals and parietals. Post-frontals distinctly detached from the frontoparietal margins. Orbits bordered anteriorly by crescent shaped pre-frontals. The base of orbit is partially formed by the jugal, palatine, transpalatine and pterygoid bones. Pterygoids widely separated from one another. Each pterygoid is connected to the parietals by an upwardly extending epipterygoid. Endolymphatic sacs in females enlarged extracranially and extend to the level of the sixth vertebra. The hyoid and only the first branchial arch persist (Fig 5B). Anterior end of ceratobranchial I is separated from the basihyal and appears to lie free in the surrounding muscle. There are twenty-six presacral vertebrae, including three anterior cervical vertebrae without associated ribs and one lumbar vertebra. Two sacral, five pygal and 21.5 caudal vertebrae and a slightly curved, elongate precloacal bone on either side that extends up to the first pygal vertebra. Eight premaxillary teeth and approximately 35 teeth on each maxillary bone, 40 on each dentary. Phalangeal formulae 2-3-4-5-3 for manus and 2-3-4-5-4 for pes with the antepenultimate phalanx highly reduced in digits 3, 4 in manus and 3, 4 and 5 in pes (Fig 5C).

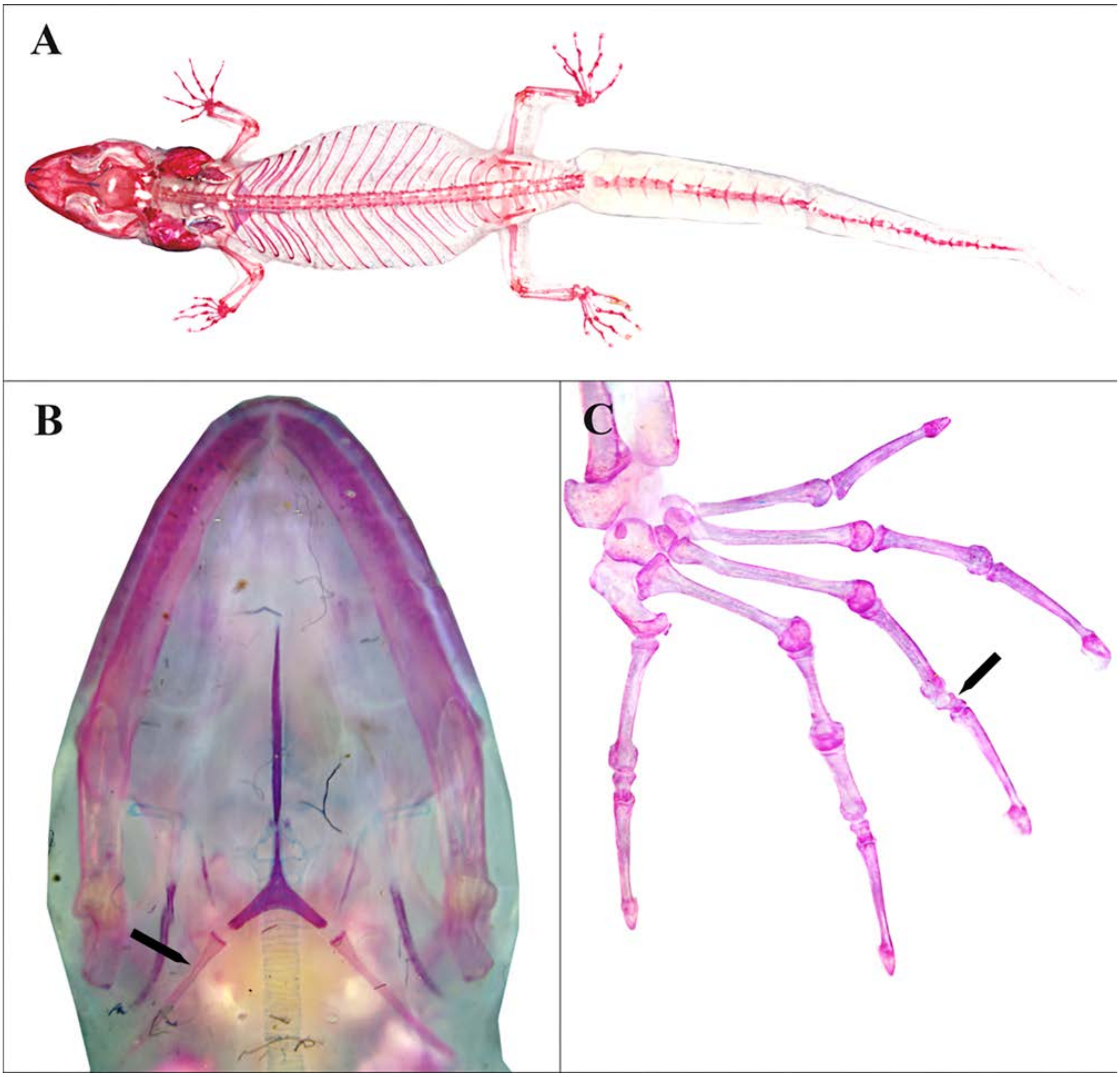

FIGURE 5. Osteological characters in *Dravidogecko* as seen in ***D. septentrionalis* sp. nov.** A) Full body dorsal; B) head ventral showing the hyoid apparatus (arrow points at first ceratobranchial arch); C) Right pes showing phalangeal arrangement (arrow points at the highly diminutive ante-penultimate phalange on digits 3,4 and 5).

Distribution. The genus is endemic to the Western Ghats mountain range in peninsular India. The distribution presently extends from Ponmudi, Tiruvananthapuram district in the south (8.75°N, 77.11°E) to Vythiri, Wayanad district in the north (11.54°N, 76.03°E), both from Kerala. Their eastern-most distribution is up to the Meghamalai Hills (9.69°N, 77.39°E) in Tamil Nadu. These nocturnal, chiefly arboreal geckos are restricted to moist-deciduous and evergreen forests and can be found on trees, under rocks during the day or willingly occupying uninhabited man-made structures in these landscapes. They are restricted to mid–high elevations of the Western Ghats (ca. 850 m–2000 m above mean sea level, m asl) in the southern Indian states of Tamil Nadu and Kerala.

Etymology. Smith (1933) does not explain the etymology of the generic epithet *Dravidogecko* which could be assumed to be composed of two words. The stem word, '*dravido*' is possibly derived from the Sanskrit "*dravid*" (pronounced /ðrävid/) for "land surrounded by water on three sides"—an allusion to peninsular India. The generic nomen therefore, is possibly a reference to the restricted distribution range of these geckos in peninsular India. The gender of the genus is designated as masculine herein (fide ICZN 1999: Article 30.2.1).

Suggested common name. We recommend retention of the generic epithet *Dravidogecko* as the common name for this genus owing to its endemism to the Western Ghats in Peninsular India. The common name "Anaimalai gecko" has been used in the past (Palot 2015) since *D. anamallensis* was the only nominal species in the genus. This name misrepresents the extent of distribution of these geckos and therefore should not be used hereafter.

***Dravidogecko anamallensis* (Günther, 1875)**

(Figs 4A, 4B, 6A–D, 13A; Table 5)

Gecko anamallensis: Günther, 1875.
Hoplodactylus anamallensis: Boulenger, 1885
Hoplodactylus anamallensis—Annandale, 1905; etc.
Hoplodactylus anamallensis [non *Gecko anamallensis* Günther, 1875]—Boulenger, 1885 [partim]; Boulenger, 1890 [partim]; Boettger, 1893.
Dravidogecko anamallensis: Smith, 1933
Dravidogecko anamallensis—Mirza & Sanap, 2014;
Dravidogecko anamallensis [non *Gecko anamallensis* Günther, 1875]—Smith, 1935 [partim]; Kluge, 1991; Murthy, 1993; Radhakrishnan, 1999; Sharma, 2002 [partim]; Palot, 2015; etc.
Hemidactylus anamallensis: Bauer & Russell, 1995
Hemidactylus anamallensis—Giri & Bauer, 2008, Aengals *et al.*, 2010; Venugopal, 2010; Agarwal, Giri & Bauer, 2011; Mahony, 2011; Ganesh & Chandramouli, 2013; Venkatraman, Chattopadhyay & Subramanian, 2013; Srinivasulu & Srinivasulu, 2015; etc.
Hemidactylus anamallensis [non *Gecko anamallensis* Günther, 1875]—Johnsingh, 2001; Ganesh, 2010 [partim]; Chandramouli SR & Ganesh SR, 2010; Philip, Arjun & Joy, 2011; Srinivasulu, Srinivasulu & Molur, 2014 [partim]; etc.

Holotype. By monotypy, BMNH 1946.8.23.61, an adult male collected by Colonel Richard Henry Beddome from the "Anamallay mountains".

Type locality. "*Anamallay*" mountains, restricted to Valparai town in Coimbatore district, Tamil Nadu, herein.

Referred specimens (Topotypes). ZSIK 2969 and ZSIK 2970, adult females, Valparai town (10.3263°N, 76.9551°E; ca. 1100 m asl.), Coimbatore District, Tamil Nadu, collected by R. Venkitesan, RC and ADR on 10th December, 2016.

Summarized description and diagnosis. Snout-vent length up to 54 mm (n=3); rostral groove indistinct; two pairs of well-developed postmentals, inner pair much longer than the mental and outer postmentals, in strong contact behind the mental, bordered by infralabial I, mental, outer postmentals and 2 or 3 gular scales; ventral scales counted at midbody, 25–28; precloacofemoral pores, 45 or 46 (n=2); subdigital lamellae under digit IV of manus, 8–10 and under digit IV of pes, 11 or 12; supralabials, 9–12 and infralabials, 7 or 8 on each side.

Dravidogecko anamallensis can be distinguished easily from other congeners by the presence of 45 or 46 precloacofemoral pores and a pair of distinctly longer postmentals (longer than mentals ML/1PML 0.74–0.81).

Genetic divergence (*p-distance*). *Dravidogecko anamallensis* exhibits 2% intraspecific variation for the mitochondrial ND2 gene (Table 9).

Redescription of holotype. The holotype is curved towards the left when viewed dorsally, first two fingers of each forelimb stretched out from the rest towards the body, a minor laceration at the hindlimb insertion and a transverse laceration at the base of the tail—all possibly artefacts of preservation (Fig 6A). Tail regenerated with a bifid tip, possibly an abnormality. Adult male, SVL 44.8 mm. Head short (HL/SVL 0.27), slightly elongate (HW/HL 0.70), slightly depressed (HH/HW 0.57), distinct from neck. Loreal region slightly inflated, canthus rostralis indistinct (Fig 6C). Snout short (SE/HL 0.41), longer than orbital diameter (OD/SE 0.47); scales on snout, canthus rostralis, inter-orbital region, forehead, occipital and nuchal regions granular and rounded with those on the snout and canthus rostralis being larger (Fig 6B). Eye small (OD/HL 0.19); pupil vertical with crenulated margins; supraciliaries small, rounded, directed outwards, increasing marginally in size anteriorly. Ear opening elliptical (longer diameter 1.7 mm); eye to ear distance longer than diameter of eye (EE/OD 1.54). Rostral wider than deep (RL/RW 0.36), rostral groove indistinct; two large, roughly circular internasals, separated by a smaller scale, all in broad contact with rostral; two postnasals on either side, slightly smaller than the internasals, the lower in contact with supralabial I; rostral in contact with nasal, supralabial I, internasals and the smaller scale separating the internasals; nostrils in nasal, about the size of the lower postnasal, roughly circular with nasal pad visible posteriorly, surrounded by internasal, rostral, two postnasals and supralabial I on either side; 2–4 rows of scales separate orbit from supralabials around mid-orbital position. Supralabials roughly rectangular, increasing in length anteriorly. Supralabials (to midorbital position) 8 (right), 8 (left); supralabials (to angle of jaw) 11 (right), 12 (left); infralabials (to angle of jaw) 8 (right), 8 (left). Mental triangular; two pairs of postmentals, both longer than the mental, the inner pair much longer (1.6 mm) than the mental (1.2 mm), and in strong contact with each other (1.2 mm) behind mental, outer pair marginally longer than mental (1.4 mm), separated from each other by three gular scales that are smaller than postmentals (Fig 6D). Inner postmentals bordered by mental, infralabial I, outer postmentals and three smaller gular scales that separate the outer postmentals; outer postmental on both sides bordered by infralabials I and II, inner postmental, and four smaller gular scales of dissimilar sizes. Outer postmental on right appears to be medially divided.

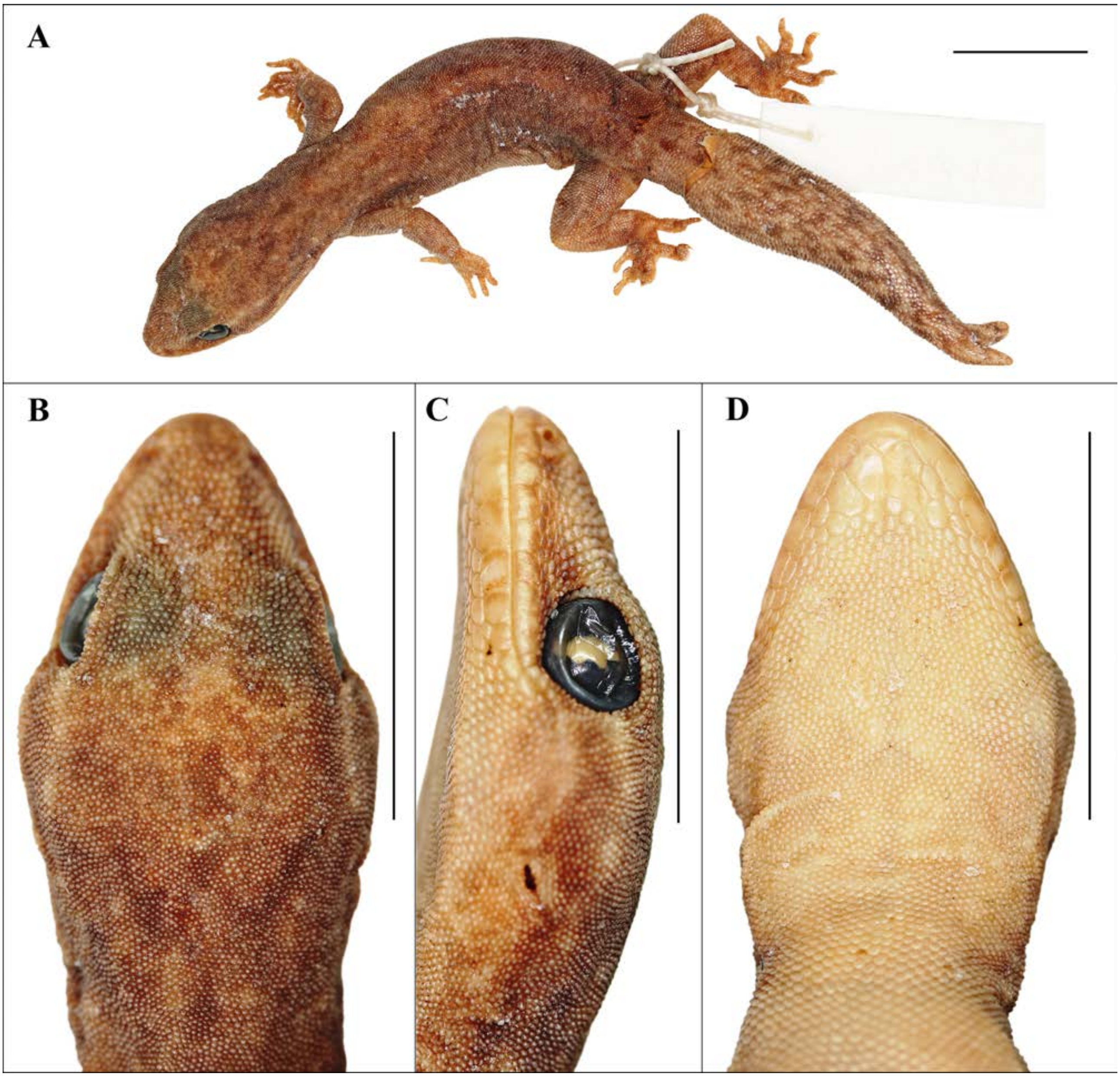

FIGURE 6. Holotype of *D. anamallensis*. A) Full-body dorsal B) Head dorsal C) Head lateral D) Head ventral. Scale bar = 10 mm.

Body dorsoventrally flattened, relatively slender, elongate (TRL/SVL 0.47). Dorsal pholidosis homogenous, composed of small, rounded granules throughout, becoming slightly larger at the lateral aspects; Ventral scales larger than dorsals, largely homogeneous in shape increasing marginally in size posteriorly, smooth, flat, weakly pointed and sub-imbricate; gular region with smaller, granular scales, anterior-most gular scales visibly larger, flatter; scales on sacral and femoral regions larger than those on chest; precloacal scales largest; midbody scale rows across belly 25 or 26; Non-lamellar scales in the palmar and plantar regions heterogeneous in size, flat, rounded, juxtaposed on palm and sub-imbricate on sole; scales on dorsal aspect of upper arm much larger than granules on dorsum, flat, weakly pointed, sub-imbricate and smooth; dorsal aspect of forearm with smaller, sub-imbricate scales intermixed with a few rounded granules around the elbow; scales on dorsal aspect of hand and digits larger than those on forearm, flat, weakly pointed and imbricate; scales on anterior aspect of thigh large, flat, sub-imbricate and weakly pointed; rest of the dorsal scales on hindlimb smaller, granular and rounded. Scales on dorsal aspect of feet and toes larger than those on shank, flat, weakly pointed and imbricate.

Forearm (FL/SVL 0.12) and tibia short (CL/SVL 0.15); digits moderately short with relatively long terminal phalanges, strongly clawed ; terminal phalanx of all digits curved, arising angularly from distal portion of expanded lamellar pad, more than half as long as associated toepad; scansors beneath each toe undivided throughout, in a straight transverse series: 6-7-8-8-7 (left manus), 5-8-8-8-7 (right manus), 6-9-9-12-7 (left pes), 6-9-7-11-7 (right pes).

Tail regenerated, rounded at the base, flat beneath, tapering posteriorly, covered above uniformly with round, smooth, flat, sub-imbricate scales that become slightly larger laterally; Pygal portion of tail with 11 or 12 rows of flat, weakly pointed, sub-imbricate scales; subsequent subcaudal scales larger, with an undivided median series of enlarged scales extending to tail tip. Tail tip bifid. An uninterrupted series of 45 precloacofemoral pores that are indistinct towards the knee (Fig 13A).

Variation in referred specimens (*Topotypes*). The referred specimens ZSIK 2969 and ZSIK 2970 differ from the holotype as follows: Inner postmentals bordered posteriorly by 2 gular scales and outer postmentals bordered by 5 gulars in ZSIK 2969 and 3 gulars in ZSIK 2970 on either side. Other morphological variations are listed in Table 5. An uncollected male topotype was observed to have 46 femoral pores (Fig 4B).

Colour in preservative. Dorsum uniformly brown, darker mottling faintly visible from the snout to the base of tail (Fig 6A). Neck with a dark, discontinuous longitudinal streak, flanked at the break by two dark lines at a 45° angle. A slightly darker discontinuous line emanates from the eye, following the lateral aspect of head and extending just beyond the forearm insertion. Inter-orbital region with a scattering of dark spots, with a distinct dark blotch bordering the supraciliary region on either side. Labials of similar color as the rest of the head with a faint, patternless scattering of darker spots bordering each labial. A dark, roughly rectangular streak emanates from eye up to the nostril. Limbs no different from rest of the dorsum. Tail of similar ground colour to dorsum, the regenerated portion with a scattering of slightly darker streaks throughout. Ventral region creamy with a scattering of dark spots on each ventral scale. Ventral surface of tail uniformly pale.

Colouration (*in life*) (*based on photographs of an uncollected topotype*). Dorsal markings distinct in life (Fig 4A). Dorsum creamish with darker streaks throughout. Head dorsum ground colour, snout with a mottling of dark and yellow spots. A dark streak emanating from above the first supralabial to eye, continues posteriorly up to the forelimb insertion. Yellow blotches on the labials and supraciliaries. Forehead ground colour, with a roughly inverted 'V' shaped pattern emerging from between the eyes which is followed posteriorly by two dark spots. Seven irregular, dark streaks from the forelimb insertion to the sacral region, flanked on either side by dark spots. Limbs of ground colour with dark spots scattered irregularly. Anterior portion of tail ground colour, with three distinct, dark spots in the vertebral region. Posterior portion of tail, distinctly banded with alternating light and dark portions. Iris marbled, golden, suffused with prominent dark-brown venation; pupil black with crenulated margins.

Etymology. The specific epithet is an adjectival toponym referring to the Anaimalai Hills in the southern Western Ghats from which Col. Beddome collected the holotype of this species.

Suggested Common name. Anaimalai Dravidogecko.

Distribution. Previously reported from various localities in Kerala and Tamil Nadu (Boulenger 1885; Smith 1935; Murthy 1993; Johnsingh 2001; Philip *et al.* 2011), *Dravidogecko anamallensis* is restricted in distribution herein, to the Valparai Plateau in Coimbatore District, Tamil Nadu. Its occurrence in other regions of the Anaimalai Hills requires verification.

Habitat and natural history. The Valparai Plateau is dominated by monoculture plantations such as tea, coffee and *Eucalyptus* that are sparsely interspersed with natural evergreen and riparian fragments. The natural vegetation in the region is classified as mid-elevation tropical wet evergreen forest of the *Cullenia-Mesua-Palaquium* type (Pascal 1988). Specimens of *Dravidogecko anamallensis* were chiefly found in abandoned buildings that were amidst natural vegetation. Other geckos in sympatry with them were a species each of the genera *Cnemaspis* and *Hemidactylus*.

Taxonomic notes. Günther (1875) described *Gecko anamallensis* based on a single specimen in the BMNH, collected by Col. Beddome from the "*Anamallay*" mountains. He did not explicitly state the gender of the specimen, but mentioned a lack of femoral or preanal pores, alluding to a female specimen. Boulenger (1885) noted that the type specimen was female and reported many other non-types from "Tinnevelly" while providing a general description of his *Hoplodactylus anamallensis* based on all these specimens. However, the only specimen from "*Anamallay*", BMNH 1946.8.23.61, demarcated as the name bearing type for *Dravidogecko anamallensis* was examined by DV and ascertained to be a male with 45 precloacofemoral pores and distinctly elongate postmentals. Recently observed samples from Valparai in the Anaimalai Hills also conform to these diagnostic characters (Fig 4B, Table 5), eliminating doubt that the specimen BMNH 1946.8.23.61 was indeed from "Anamallay" and therefore must be the original name bearing type. Günther possibly misidentified the gender of the type specimen which then got promulgated and has clearly been accepted unequivocally by later workers. The other specimens (BMNH 82.5.22.79–82) from "Tinnevelly" are herein considered topotypes of *D. douglasadamsi* **sp. nov.** (described below).

***Dravidogecko septentrionalis* sp. nov.**
(Figs 7A–D, 13F, 14A; Table 5)

Hemidactylus anamallensis: Bauer & Russell, 1995
Hemidactylus anamallensis [non *Gecko anamallensis* Günther, 1875]—Philip, Arjun & Joy, 2011; Bansal & Karanth, 2013.

Holotype. BNHS 2340, an adult male, Lakkidi village (11.5184°N, 76.0451°E; ca. 873 m asl.), Wayanad District, Kerala, collected by B.H.C.K Murthy and RC on 27th November, 2016.

Paratypes. Details of collection same as the holotype. BNHS 2341, BNHS 2342, BNHS 2344, ZSIK 2971, ZSIK 2972, ZSIK 2975 adult females; BNHS 2343, ZSIK 2973, ZSIK 2974 adult males.

Type locality. Lakkidi village, Wayanad District, Kerala.

Summarized description and diagnosis. Snout-vent length up to 56.9 mm (n=10); internasals separated by 2 smaller scales; two pairs of well-developed postmentals, inner pair slightly longer than the outer, briefly in contact with each other behind mental, bordered by mental, infralabial I, outer postmentals and 2 or 3 gular scales. ventral scales counted at midbody, 30–35; precloacofemoral pores, 52–56 (n=4); subdigital lamellae under digit IV of manus, 7–10 and under digit IV of pes, 10–13; supralabials, 8–10 and infralabials, 7–10 on each side.

Dravidogecko septentrionalis **sp. nov.**, though closely allied to *D. anamallensis*, can be easily distinguished from the latter by the presence of a greater number of precloacofemoral pores, (PcFP 52–56 versus 45 or 46), a greater number of ventral scales (VS 30–35 versus 25–28) and number of scales between the internasals (two versus one).

Genetic divergence (*p-distance*). *Dravidogecko septentrionalis* **sp. nov.** exhibits 0.3% intraspecific variation, and is 5.0–6.5 % divergent from *D. anamallensis* (Table 9).

Description of holotype. The holotype is in good condition (Fig 7A). Body is dorsoventrally flattened with the second toe and second finger on the right curved upwards, both artefacts of preservation. Distal portion of the tail is regenerated, slightly curved towards the right. Hemipenis everted, exposed and seen on both sides when viewed dorsally. Adult male, SVL 55.9 mm. Head short (HL/SVL 0.28), slightly elongate (HW/HL 0.67), not depressed (HH/HW 0.66), distinct from neck. Loreal region slightly inflated, canthus rostralis indistinct (Fig 7C). Snout short (SE/HL 0.40), longer than orbital diameter (OD/SE 0.67); scales on snout, canthus rostralis, inter-orbital region, forehead, occipital and nuchal regions granular and rounded with those on the snout and canthus rostralis being larger and flat (Fig 7B). Eye small (OD/HL 0.26); pupil vertical with crenulated margins; supraciliaries small, roughly triangular, pointed upwards and gradually increasing in size anteriorly. Ear opening elliptical (longer diameter 0.7 mm); eye to ear distance slightly longer than diameter of eye (EE/OD 1.16). Rostral wider than deep (RL/RW 0.40), without a distinct rostral groove; two large internasals, separated by two smaller scales of similar size, all in broad contact with rostral; two postnasals on either side, slightly smaller than the internasals, the lower in contact with supralabial I; rostral in contact with nasal, supralabial I, internasals and the two small scales separating the internasals; nostrils about the size of the lower postnasal, roughly circular with nasal pad visible posteriorly; nasal surrounded by internasal, rostral, supralabial I and two postnasals on either side; 2–4 rows of scales separate orbit from supralabials at mid-orbital position. Supralabials roughly rectangular, increasing in length anteriorly. Supralabials (to midorbital position) 7 (right), 8 (left); supralabials (to angle of jaw) 9 (right), 10 (left); infralabials (to angle of jaw) 7 (right), 8 (left). Mental triangular; two pairs of well-developed postmentals, the inner pair slightly shorter (1.1

mm) than the mental (1.3 mm), and in contact with each other (0.2 mm) behind mental; outer pair shorter (0.8 mm) than the inner pair, separated from each other by three gular scales that are only slightly smaller than postmentals (Fig 7D). Inner postmentals bordered by mental, infralabial I, outer postmentals and three smaller gular scales; outer postmentals bordered by infralabials I (barely touching on left side) and II, inner postmentals, and four (right) and three (left) smaller gular scales each of dissimilar sizes. Body relatively slender, elongate (TRL/SVL 0.48). Dorsal pholidosis composed of small, flat, rounded scales that are juxtaposed in arrangement, homogeneous in shape, becoming slightly larger laterally; Ventral scales larger than dorsals, largely homogeneous in shape and size, smooth, sub-imbricate; gular region with smaller, granular, juxtaposed scales; anterior gular scales visibly larger, flatter; scales on femoral region larger than those on sacrum and chest with some precloacal scales being largest; midbody scale rows across belly 30–32. Non-lamellar scales in the palmar and plantar regions flat and smooth; ones on palm juxtaposed while those on sole sub-imbricate and weakly pointed; scales on dorsal aspect of upper arm larger than granules on dorsum, sub-imbricate and smooth; dorsal aspect of forearm with smaller, sub-imbricate scales intermixed with a few rounded granules around the elbow; scales on dorsal aspect of hand and digits larger than those on forearm, flat, weakly pointed and imbricate; scales on dorsal part of thigh and shank heterogeneous in size, flat, weakly pointed and sub-imbricate; largest on anterior aspect of thigh. Scales on dorsal aspect of foot larger than those on shank, flat, rounded and imbricate.

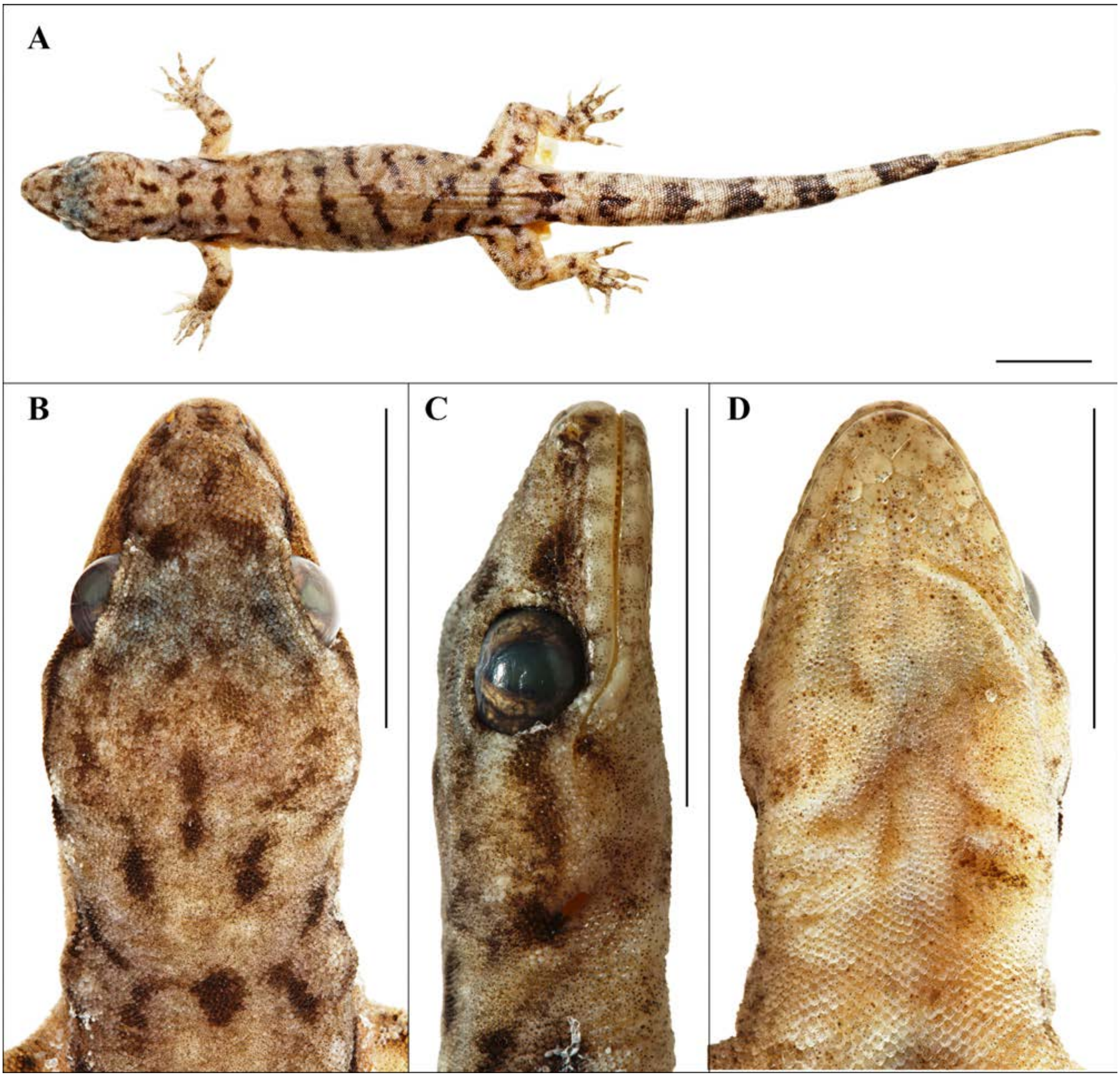

FIGURE 7. Holotype of ***D. septentrionalis* sp. nov.** A) Full-body dorsal B) Head dorsal C) Head lateral D) Head ventral. Scale bar = 10 mm.

TABLE 5. Measurements (in mm) and scale counts for the specimens of *Dravidogecko anamallensis* and ***D. septentrionalis* sp. nov**. Abbreviations as in Materials and Methods. * indicates tail is regenerated, #—broken tail and + indicates a bifid tail tip. Numbers in parentheses indicate the supralabial at midorbital position.

	Dravidogecko anamallensis			***Dravidogecko septentrionalis* sp. nov.**									
Tag	**1946.8.23.61**	**ZSIK 2969**	**ZSIK 2970**	**BNHS 2340**	**BNHS 2341**	**BNHS 2342**	**BNHS 2343**	**BNHS 2344**	**ZSIK 2971**	**ZSIK 2972**	**ZSIK 2973**	**ZSIK 2974**	**ZSIK 2975**
Status	Holotype	Topotype	Topotype	Holotype	Paratype	Paratype	Paratype	Paratype	Paratype	Paratype	Paratype	Paratype	Paratype
Sex	♂	♀	♀	♂	♀	♀	♂	♀	♀	♀	♂	♂	♀
Measurements													
SVL	44.8	54.1	51.5	55.9	56.9	50.6	45.9	56.5	55.6	53.5	52.0	53.1	56.0
TRL	21.2	25.1	24.2	27.0	28.1	24.2	22.0	28.2	28.4	26.6	25.3	26.4	27.9
BW	8.9	12.4	11.0	10.9	11.7	10.1	9.9	11.1	11.1	9.5	10.6	10.6	10.3
CL	6.8	7.1	7.0	6.9	6.7	6.5	6.2	6.8	6.8	7.2	6.8	6.9	6.8
TL	29.6+	-	58.7	66.0	70.6	60.7	19.5#	42.5#	59.7*	66.2	59.1*	51.8#	52.7*
TW	5.1	-	4.7	4.8	5.0	4.6	4.7	4.9	5.0	4.8	4.5	5.0	4.7
HL	12.4	13.0	12.8	13.7	14.0	12.8	12.3	13.7	13.8	13.7	13.6	13.9	13.4
HW	8.7	9.2	8.9	9.0	9.4	8.3	8.2	9.0	9.4	9.2	9.4	9.4	9.0
HH	5.0	5.1	5.2	5.4	5.3	4.7	4.5	5.4	5.5	5.0	5.2	5.5	5.2
FL	5.7	5.8	5.6	6.2	6.3	6.0	5.6	6.3	6.3	6.4	6.1	5.4	6.2
OD	2.5	3.5	3.2	3.6	3.5	3.1	3.1	3.5	3.5	3.3	3.3	3.6	3.3
NE	3.9	4.1	3.6	4.3	4.2	3.9	3.9	4.3	4.3	4.2	4.1	4.2	4.1
SE	5.2	5.3	5.0	5.4	5.3	4.8	4.9	5.5	5.2	5.2	5.2	5.3	5.3
EE	3.8	4.0	3.8	4.2	4.1	3.8	3.6	4.0	3.9	3.6	4.0	3.6	4.0
IN	1.9	2.0	2.1	1.9	2.1	1.8	1.7	2.0	1.8	2.1	2.1	1.9	1.7
IO	5.8	5.9	5.8	5.6	6.1	5.0	5.3	5.7	6.1	5.3	5.9	5.7	5.6
EL	1.7	1.1	0.8	0.7	0.7	0.8	0.7	0.5	1.1	1.0	0.8	0.6	0.9
RW	2.0	2.1	2.0	2.3	2.3	1.9	2.1	2.2	2.5	2.3	2.4	2.2	2.2
RL	0.7	0.8	0.8	0.9	0.9	0.8	1.0	0.8	0.7	0.8	0.9	0.9	0.7
ML	1.2	1.3	1.1	1.3	1.3	1.0	1.2	1.3	1.4	1.0	1.0	1.0	1.3
MW	2.1	2.2	1.8	1.8	2.0	2.0	1.7	1.7	2.0	1.9	1.7	1.9	1.8
CT	1.2	0.8	0.2	0.2	0.8	0.8	0.6	0.4	0.3	0.5	0.4	0.7	0.7
1PML	1.6	1.6	1.5	1.1	1.3	1.4	1.3	1.1	1.3	1.1	1.4	1.2	1.2
2PML	1.4	1.2	0.6	0.8	0.9	1.0	0.9	0.9	0.8	0.9	0.9	0.8	0.8
Meristics													
PcFP	45	NA	NA	54	NA	NA	52	NA	NA	NA	56	55	NA
VS	25-26	27-28	26-27	30-32	34-35	32-33	34-35	34-35	30-31	30-32	30-32	30-32	32-33
Lam (I-V)													
Forelimb (L)	6-7-8-8-7	5-8-8-9-7	6-8-8-9-8	6-7-8-7-7	7-8-8-9-8	7-8-8-9-7	6-8-8-8-7	7-8-9-7-7	7-8-8-8-7	7-8-9-8-8	6-7-7-7-7	7-7-9-10-7	7-8-9-10-8
Forelimb(R)	5-8-8-8-7	6-8-8-10-7	6-8-8-9-8	7-7-8-9-7	7-8-8-9-7	7-8-8-8-7	6-8-9-8-7	7-8-9-7-7	7-7-7-7-7	7-8-9-9-7	7-7-7-7-7	6-7-9-8-7	6-8-8-10-7
Hindlimb (L)	6-9-9-12-7	6-9-9-12-9	5-9-9-12-7	7-8-9-10-8	7-9-10-11-8	7-8-9-10-7	6-8-10-12-7	7-10-10-11-8	7-8-10-10-8	6-9-10-13-8	7-9-9-11-7	7-9-9-10-8	8-10-11-13-8
Hindlimb(R)	6-9-7-11-7	6-9-9-12-8	6-8-9-12-8	6-8-10-10-8	7-9-9-12-8	6-8-10-11-7	6-9-10-11-8	7-9-10-11-8	6-8-9-10-7	8-10-10-12-8	7-9-10-11-8	6-9-10-11-8	7-9-10-11-8
SL(L/R)	12(8)/11(8)	9(8)/10(7)	9(7)/10(8)	10(8)/9(7)	9(7)/10(7)	10(8)/9(7)	10(8)/9(7)	9(7)/10(8)	9(8)/9(7)	10(7)/10(7)	10(8)/10(8)	8(7)/9(7)	10(8)/9(7)
IL(L/R)	8/8	8/8	7/7	8/7	8/9	8/8	7/8	8/10	8/7	8/9	7/8	8/8	8/7

Forearm (FL/SVL 0.11) and tibia (CL/SVL 0.12) short; digits moderately short with relatively long terminal phalanges, strongly clawed; all digits of manus and digits I–IV of pes indistinctly webbed; terminal phalanx of all digits curved, arising angularly from distal portion of expanded lamellar pad, more than half as long as associated toepad; scansors beneath each toe undivided throughout, in a straight transverse series: 6-7-8-7-7 (left manus), 7-7-8-9-7 (right manus), 7-8-9-10-8 (left pes), 6-8-10-10-8 (right pes). Relative length of digits (measurements in mm in parentheses): IV (4.5) > III (4.1) > V (4.0) > II (3.8) > I (2.9) (left manus); III (5.6) > IV (5.2) > II (5.1) > V (4.8) > I (3.3) (left pes).

Tail long (TL/SVL 1.18), rounded at the base, flat beneath, tapering posteriorly with the distal portion regenerated, covered above uniformly with smooth, flat, rounded, sub-imbricate scales, larger than those on dorsum, becoming slightly enlarged laterally; subcaudal scales larger, with an undivided median series of enlarged scales that continue until the regenerated portion. An uninterrupted series of 54 precloacofemoral pores that are indistinct towards the knee (Fig 13F).

Variation in paratypes. Rostral groove distinct and extends halfway through the scale in BNHS 2342, BNHS 2343, ZSIK 2971, ZSIK 2974 and ZSIK 2975. Inner postmentals in BNHS 2341 in contact with infralabial I and II. Two gular scales border the inner postmentals posteriorly in BNHS 2341, BNHS 2342, BNHS 2344, ZSIK 2971, ZSIK 2973, ZSIK 2974 and ZSIK 2975. Outer postmentals bordered by 3 gulars on the right and 4 on the left in ZSIK 2975, 4 gulars on either side in BNHS 2342 and ZSIK 2971, and 3 gulars on either side in ZSIK 2974. Outer postmentals in contact only with infralabial II in ZSIK 2973 (L) and ZSIK 2974 (L). Other morphological variations are listed in Table 5.

Colour in preservative. Dorsum uniformly greyish-brown mottled with darker, discontinuous streaks from the snout to the base of tail (Fig 7A). Similar mottling visible on dorsal aspect of limbs. Occipital region with three distinct longitudinal streaks. Snout slightly darker than rest of the body with scattered, vague, dark-brown markings. Labials paler than rest of the head and similar to the rest of the dorsum. Supralabials bordered by a discontinuous dark brown streak from nostril to eye. Limb colouration no different from rest of the dorsum. The original portion of tail interspersed with alternating light and dark bands while the regenerated portion, mid-brown. Venter predominantly cream with scattered patches of diffusely pigmented scales on head and cloacal regions. Ventral surface of tail pale, with scattered mid-brown speckling throughout until the regenerated portion, which is predominantly mid-brown.

Colouration (*in life*). Dorsal markings distinct in life (Fig 14A). Dorsum mid-brown with darker streaks throughout. Head dorsum ground colour, snout slightly darker and with a pale border. A pale streak in the supraocular region, following the contour of the skull and extending beyond forehead, bordered by a dark streak on each side emanating from just behind the eye and up to the forehead. A dark spot on the head just anterior to the occipital region, followed by another at the occiput, the latter flanked on either side by dark, streaks curved outwards. A dark streak just posterior to the occipital region also flanked by dark, curved, discontinuous lines. Seven irregular, roughly transverse markings follow, until the sacral region. Each marking flanked by dark irregular spots. Limbs of ground colour with irregular dark spots. Tail regenerated; distinctly banded with alternating light and dark portions up to the regenerated portion.

Etymology. The specific epithet is an adjective in the nominative case derived from the Latin for 'northern', referring to the distribution of this species to the north of the Palghat Gap.

Suggested Common name. Wayanad Dravidogecko.

Distribution. *Dravidogecko septentrionalis* **sp. nov.** is presently restricted in distribution to Lakkidi village in Wayanad District, Kerala. Isolated hills in the Wayanad region with a similar altitude (ca. 900 m asl) could potentially harbour other populations. A population from the Nilgiris district of Tamil Nadu is likely to be closely allied with *D. septentrionalis* **sp. nov.** (pers obs).

Habitat and natural history. The type-series of *Dravidogecko septentrionalis* **sp. nov.** was collected from outer compound walls of buildings in Lakkidi village in the western part of the Wayanad plateau. The abutting vegetation is predominantly mid-elevation evergreen forests that get ca. 3500mm–6000mm of annual rainfall (Anu & Sabu 2007). They were found only in areas that were above 850 m asl and seem to be restricted to isolated hillocks with conducive ecological conditions. None of the female specimens encountered during the survey in November 2016 were gravid. A large bodied *Cnemaspis* sp. and *Hemidactylus* cf. *frenatus* were found in sympatry.

***Dravidogecko meghamalaiensis* sp. nov.**
(Figs 8A–D, 13D, 14B; Table 6)

Hemidactylus anamallensis: Bauer & Russell, 1995
Hemidactylus anamallensis [non *Gecko anamallensis* Günther, 1875]—Chandramouli & Ganesh, 2010;

Holotype. BNHS 2345, an adult male, Meghamalai (9.6925 °N, 77.3992 °E; ca. 1480 m asl.), Theni District, Tamil Nadu, collected by RC on 30th May, 2016.

Paratypes. Details of collection same as the holotype. BNHS 2346, BNHS 2347, BNHS 2348, BNHS 2349, ZSIK 2977, ZSIK 2979– adult females; ZSIK 2978 and ZSIK 2980 adult males.

Type locality. Approximately 8 km southwest of Meghamalai village, en route to the Highwavy Mountains in Theni District, Tamil Nadu.

Summarized description and diagnosis. Snout-vent length up to 48.7 mm (n=9); two pairs of well-developed postmentals, inner pair only slightly longer than the outer (2PML/1PML 0.82–0.96), and of comparable length to the mental; ventral scales counted at midbody 28–34; precloacofemoral pores, 36–38 (n=3); subdigital lamellae under digit IV of manus 7–9 and under digit IV of pes, 9 or 10; supralabials, 9–11 and infralabials 8–10 on each side.

Dravidogecko meghamalaiensis **sp. nov.** can be distinguished from other congeners based on the following characters: number of precloacofemoral pores (PcFP 36–38 versus 45 or 46 in *D. anamallensis* & 52–56 in *D. septentrionalis* **sp. nov.**); inner postmentals comparable in length to mental (ML/1PML 0.95–1.23 versus much longer, 0.74–0.81 in *D. annamallensis*); fewer subdigital lamellae under digit IV of pes (9 or 10 versus 11 or 12 in *D. annamallensis*).

Genetic divergence (*p-distance*). *Dravidogecko meghamalaiensis* **sp. nov.** exhibits 0.4% intraspecific variation while it is 13.1% –13.8% divergent from *D. anamallensis* and 13.0%–13.7% divergent from *D. septentrionalis* **sp. nov.** (Table 9).

Description of holotype. The holotype is in good condition (Fig 8A). The head is slightly tilted towards the right, tail curved towards left and two distinct folds of skin just beneath the forearm insertion—all artefacts of preservation. Body is dorsoventrally flattened with the distal half of tail regenerated. Adult male, SVL 45.1 mm. Head short (HL/SVL 0.28), slightly elongate (HW/HL 0.67), not depressed (HH/HW 0.56), distinct from neck. Loreal region slightly inflated, canthus rostralis indistinct (Fig 8C). Snout short (SE/HL 0.39), longer than orbital diameter (OD/SE 0.57); scales on snout, canthus rostralis, inter-orbital region, forehead, occipital and nuchal regions granular and rounded with those on the snout and canthus rostralis being larger (Fig 8B). Eye small (OD/HL 0.22); pupil vertical with crenulated margins; supraciliaries small, roughly triangular, pointed upwards and gradually increasing in size anteriorly. Ear opening elliptical (longer diameter 0.8 mm); eye to ear distance longer than diameter of eye (EE/OD 1.37). Rostral wider than deep (RL/RW 0.30), rostral groove distinct but extending only marginally downwards from the suturing with internasals, medially; two large internasals, separated by two smaller, subequal scales, all in broad contact with rostral; two postnasals on either side, slightly smaller than the internasals, the lower in contact with supralabial I; rostral in contact with nasal, supralabial I, internasals and the two smaller scales separating the internasals; nostrils about the size of the lower postnasal, roughly circular with nasal pad visible posteriorly; nasal surrounded by internasal, rostral, two postnasals and a small scale separating it from supralabial I on either side; 2–4 rows of scales separate orbit from supralabials at mid-orbital position. Supralabials roughly rectangular, increasing in length anteriorly. Supralabials (to midorbital position) 6 (right), 7 (left); supralabials (to angle of jaw) 9 (right), 9 (left); infralabials (to angle of jaw) 8 (right), 8 (left). Mental triangular; two pairs of well-developed postmentals, the inner pair slightly shorter (0.9 mm) than the mental (1.1 mm), and in strong contact with each other (0.5 mm) behind mental; outer pair similar in size to inner pair, separated from each other by two gular scales that are only smaller than postmentals (Fig 8D). Inner postmentals bordered by mental, infralabial I, outer postmentals and two smaller gular scales; outer postmentals bordered by infralabials I (only on the left) and II, inner postmentals, and five smaller gular scales each of dissimilar sizes on either side. Body relatively slender, elongate (TRL/SVL0.49). Dorsal pholidosis homogenous, composed of small, rounded granules, becoming slightly larger, flatter, weakly pointed and sub-imbricate laterally; Ventral scales larger than dorsals, largely homogeneous in shape and size, smooth, flat, sub-imbricate; gular region with smaller, granular, juxtaposed scales; anterior gular scales visibly larger, flatter; scales on femoral region larger than those on sacrum and chest with some precloacal scales being largest; midbody scale rows across belly 28–29. Non-lamellar scales in the palmar and plantar regions heterogeneous in size, rounded and juxtaposed on palm and sole; scales on dorsal aspect of upper arm larger than granules on dorsum, flat, pointed, sub-imbricate and smooth; dorsal aspect of forearm with smaller, sub-imbricate scales intermixed with a few rounded granules around the elbow; scales on dorsal aspect of hand and digits larger than those on forearm, flat, weakly pointed and imbricate; scales on anterior aspect of thigh large, flat, imbricate and weakly pointed; rest of the dorsal scales on hindlimb smaller, granular and rounded. Scales on dorsal aspect of foot larger than those on shank, flat, weakly pointed and imbricate.

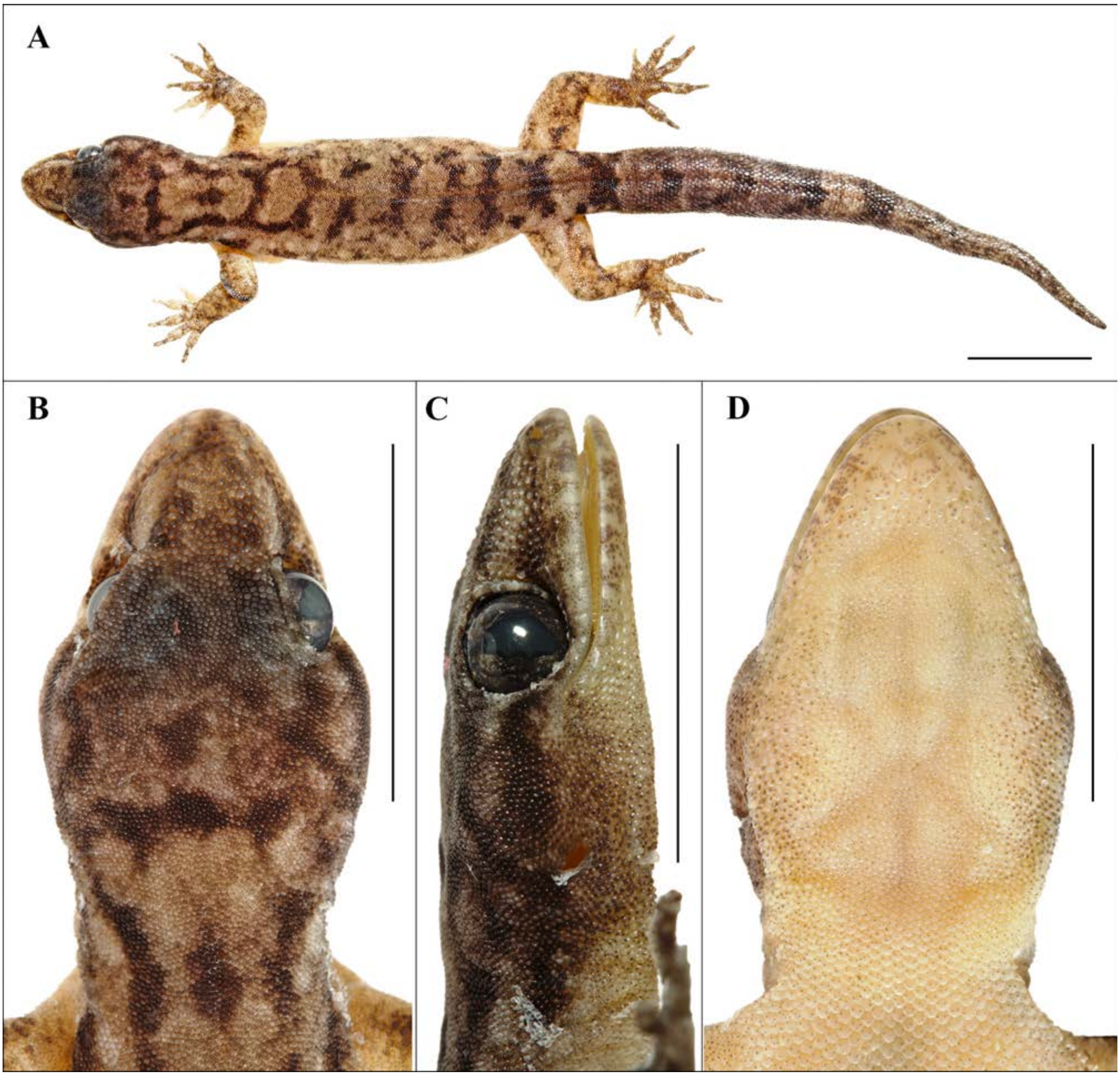

FIGURE 8. Holotype of ***D. meghamalaiensis* sp. nov.** A) Full-body dorsal B) Head dorsal C) Head lateral D) Head ventral. Scale bar = 10 mm.

Forearm (FL/SVL 0.11) and tibia short (CL/SVL 0.14); digits moderately short with relatively long terminal phalanges, strongly clawed; all digits of manus and digits I–IV of pes indistinctly webbed; terminal phalanx of all digits curved, arising angularly from distal portion of expanded lamellar pad, more than half as long as associated toepad; scansors beneath each toe undivided throughout, in a straight transverse series: 6-6-7-7-7 (left manus), 6-7-7-7-6 (right manus), 6-7-8-9-7 (left pes), 6-7-8-9-7 (right pes). Relative length of digits (measurements in mm in parentheses): IV (4.1) > III (3.9) > II (3.6) > V (3.5) > I (2.9, claw broken) (left manus); IV (5.0) > III (4.5) > V (4.3) > II (4.1) > I (3.3) (left pes).

Tail long (TL/SVL 1.06), rounded at the base, flat beneath, tapering posteriorly, covered above uniformly with round, smooth, flat, sub-imbricate scales that become slightly larger laterally; subcaudal scales larger, with an undivided median series of enlarged scales that continue until the regenerated portion. An uninterrupted series of 36 precloacofemoral pores that are only faintly visible towards the knee (Fig 13D).

Variation in paratypes. Rostral groove extends halfway through the scale in BNHS 2346, BNHS 2347, BNHS 2348, ZSIK 2978, ZSIK 2979. Internasals separated by one smaller scale in 2346, BNHS 2347, ZSIK 2976 and ZSIK 2979. Inner postmentals in contact with infralabials I and II in BNHS 2347 (L), BNHS 2348 (L), ZSIK 2978 (R) and ZSIK 2980 (R). Inner postmentals bordered posteriorly by three gular scales in BNHS 2346, BNHS 2348, ZSIK 2978 and ZSIK 2979 and four in ZSIK 2976 and ZSIK 2977. Outer postmentals bordered by 6 gulars in BNHS 2346 (L) and ZSIK 2979 (R) and 4 in ZSIK 2976 (L), ZSIK 2977 (L) and ZSIK 2978 (L,R). Outer postmentals in contact only with infralabial II in ZSIK 2978 (R) and ZSIK 2980 (R) and only with infralabial I in BNHS 2347 (L) and BNHS 2348. Other morphological variations are listed in Table 6.

Colour in preservative. Dorsum predominantly light brown, mottled with darker, discontinuous streaks from the snout to the base of tail (Fig 8A). Similar mottling visible on dorsal aspect of limbs. Neck with a roughly circular, dark blotch flanked by 2 longitudinal streaks on either side. Posterior part of head demarcated by a disctinct horizontal streak. Inter-orbital region slightly darker than rest of the body with scattered vague dark-brown blotches. Labials appear paler than rest of the head with faint spots that are darker. Supralabials bordered by a dark, roughly triangular streak from nostril to eye. Limbs no different from rest of the dorsum. Tail predominantly grey with darker, faint, saddle shaped markings. Venter predominantly cream coloured. Ventral surface of tail pale, with scattered mid-brown speckling throughout until the regenerated portion, which is predominantly mid-grey.

Colouration (*in life*). Dorsum pale with dark-brown streaks throughout that are bordered by one or two rows of yellowish scales (Fig 14B). Head dorsum ground colour, posterior part of snout predominantly with scattered yellow scales. Irregularly arranged dark spots in the inter-orbital region and forehead. A dark streak emanates from loreal region up to the eye and continues posteriorly into the lateral aspect of the neck. A discontinuous, roughly W shaped collar followed by a dark spot in the occipital region. Six dark, transverse streaks across the vertebral region until the sacrum. Limbs of ground colour with irregular dark streaks. Tail lighter than dorsum, with seven irregular, dark streaks. Tip of tail regenerated.

Etymology. The specific epithet is an adjectival toponym referring to the Meghamalai Hills, where the type series was collected.

Suggested Common name. Meghamalai Dravidogecko.

Distribution. *Dravidogecko meghamalaiensis* **sp. nov.** is presently restricted in distribution to the Meghamalai Hills in the southern Western Ghats. Similar habitats are seen in the Vellimalai Range within the Meghamalai Wildlife Sanctuary and in many parts of the Srivilliputtur Grizzled Squirrel Wildlife Sanctuary, where this species could also possibly occur.

Habitat and natural history. The type-series of *Dravidogecko meghamalaiensis* **sp. nov.** was collected en route to the Highwavy Mountains within the Meghamalai Wildlife Sanctuary, where the habitat chiefly constitutes moist mixed deciduous forests (Bhupathy & Babu 2013). Individuals were found on trees and abundantly in unoccupied buildings. Sub-adults (SVL < 42 mm) were encountered during the month of June, and larger individuals during November. These habitats are at an altitude of 1300–1600 m asl and receive an average annual rainfall of 1500 mm (Bhupathy *et al.* 2009).

Dravidogecko douglasadamsi sp. nov.

(Figs 9A–D, 13B, 14C; Table 6)

Hoplodactylus anamallensis: Boulenger, 1885

Hoplodactylus anamallensis [non *Gecko anamallensis* Günther, 1875]—Boulenger, 1885 [partim]; Boulenger, 1890 [partim].

Dravidogecko anamallensis: Smith, 1933

Dravidogecko anamallensis [non *Gecko anamallensis* Günther, 1875]—Smith, 1935 [partim]; Murthy, 1993; Sharma, 2002 [partim].

Hemidactylus anamallensis: Bauer & Russell, 1995

Hemidactylus anamallensis [non *Gecko anamallensis* Günther, 1875]—Johnsingh, 2001; Srinivasulu, Srinivasulu & Molur, 2014 [partim]; etc.

Holotype. BNHS 2349, an adult male, Manjolai (8.5514 °N, 77.3597 °E; ca. 1300 m asl.), Tirunelveli District, Tamil Nadu, collected by R. Venkitesan on 10th June, 2017.

Referred specimens (*Topotypes*). BMNH 82.5.22.79, Adult female, BMNH 82.5.22.81, juvenile male, BMNH

TABLE 6. Measurements (in mm) and scale counts for the holotype and paratypes of ***Dravidogecko meghamalaiensis* sp. nov.** and ***D. douglasadamsi* sp. nov**. Abbreviations as in Materials and Methods. * indicates tail is regenerated and #, a broken tail. Numbers in parentheses indicate the supralabial at midorbital position.

	Dravidogecko meghamalaiensis sp. nov.									*Dravidogecko douglasadamsi* sp. nov.				
Tag	**BNHS 2345**	**BNHS 2346**	**BNHS 2347**	**BNHS 2348**	**ZSIK 2976**	**ZSIK 2977**	**ZSIK 2978**	**ZSIK 2979**	**ZSIK 2980**	**BNHS 2349**	**82.5.22.81**	**82.5.22.79**	**82.5.22.83**	**82.5.22.80**
Status	Holotype	Paratype	Paratype	Paratype	Paratype	Paratype	Paratype	Paratype	Paratype	Holotype	Topotype	Topotype	Topotype	Topotype
Sex	♂	♀	♀	♀	♀	♀	♂	♀	♂	♂	♂	♀	♂	♂
Measurements														
SVL	45.1	45.5	43.3	48.7	47.8	44.1	41.5	42.0	43.8	48.5	25.7	47.1	29.0	34.6
TRL	21.9	21.0	20.1	23.1	24.6	21.0	17.2	17.8	19.2	22.6	10.3	22.7	13.3	16.0
BW	9.4	7.5	7.6	10.1	9.5	8.6	6.8	7.1	8.0	9.0	4.9	8.7	4.9	5.6
CL	6.1	6.2	5.7	6.4	6.4	6.2	5.1	5.4	5.8	6.2	-	6.7	-	-
TL	48.0	37.1*	47.9	52.0	42.8*	48.2	35.3*	3.6#	39.5*	64.1	-	34.5	-	-
TW	4.5	3.9	3.8	4.3	3.8	3.9	4.3	4.0	4.2	4.9	-	4.6	-	-
HL	12.6	12.3	12.1	13.1	12.8	12.0	11.6	11.6	11.9	13.3	7.8	13.9	8.9	9.9
HW	8.4	8.2	7.7	8.7	8.3	7.7	7.5	7.6	8.5	8.6	7.9	7.9	5.1	5.9
HH	4.7	4.4	4.6	4.7	4.6	4.5	4.1	4.5	4.8	5.0	2.5	4.4	3.1	3.3
FL	4.9	5.1	5.1	5.5	5.3	4.9	4.9	4.7	5.2	5.4	-	5.1	-	-
OD	2.8	2.7	2.6	2.8	2.8	2.9	2.7	2.5	2.7	3.2	-	3.3	-	-
NE	3.6	3.7	3.6	3.9	3.8	3.7	3.5	3.5	3.7	4.1	-	4.0	-	-
SE	4.9	4.9	4.7	4.9	4.9	4.8	4.5	4.4	4.7	4.9	-	4.8	-	-
EE	3.8	3.6	3.5	4.1	3.8	3.8	3.6	3.7	3.6	3.9	-	3.4	-	-
IN	1.7	1.7	1.6	1.7	1.7	1.7	1.6	1.5	1.7	1.8	-	1.3	-	-
IO	5.0	5.1	4.9	5.4	5.1	4.4	4.5	4.9	5.2	5.5	-	4.5	-	-
EL	0.8	0.5	0.5	0.5	0.6	0.4	0.4	0.5	0.4	0.8	-	0.4	-	-
RW	2.0	1.8	1.8	1.9	2.0	1.9	1.8	1.7	1.7	2.0	-	1.5	-	-
RL	0.6	0.8	0.6	0.7	0.5	0.7	0.6	0.6	0.7	0.6	-	0.7	-	-
ML	1.1	0.9	1.0	1.1	1.0	1.1	1.1	1.1	1.2	1.2	-	1.0	-	-
MW	1.5	1.6	1.5	1.8	1.6	1.6	1.5	1.6	1.7	1.7	-	1.5	-	-
CT	0.5	0.5	0.6	0.4	0.6	0.7	0.7	0.6	0.7	0.7	-	0.8	-	-
1PML	0.9	0.7	1.0	1.1	1.0	0.9	0.9	0.9	1.1	1.1	-	1.0	-	-
2PML	0.9	0.7	0.9	0.9	0.8	0.9	0.8	0.8	0.9	1.0	-	1.1	-	-
Meristics														
PcFP	36	NA	NA	NA	NA	NA	38	NA	36	43	42	NA	42	42
VS	28-29	33-34	29-31	31-33	30-31	29-30	28-29	31-32	30-31	31-32	-	-	-	-
Lamellae (I-V)														
Forelimb (L)	6-6-7-7-7	5-7-7-7-6	6-7-7-9-7	6-8-8-8-7	5-8-8-7-7	7-7-8-8-6	6-8-8-8-7	6-7-7-7-7	6-7-7-8-7	6-8-9-9-7	-	6-8-8-?-8	6-7-8-9-8	6-8-8-9-7
Forelimb(R)	6-7-7-7-6	5-7-7-7-6	6-7-7-9-7	7-7-8-8-6	6-7-7-7-7	7-7-8-8-7	6-8-8-8-7	6-7-7-7-7	6-8-8-8-6	6-8-9-9-7	-	7-8-8-9-8	6-8-8-9-8	6-8-8-10-7
Hindlimb (L)	6-7-8-9-7	5-7-8-9-8	6-8-9-9-7	5-8-9-9-7	6-7-9-10-8	6-8-8-9-7	6-7-8-10-7	5-7-8-9-7	5-7-8-9-7	7-9-10-12-9	-	6-9-10-12-8	-	6-9-9-10-8
Hindlimb(R)	6-7-8-9-7	6-8-8-9-7	5-8-8-10-7	5-7-8-9-7	6-7-8-9-6	6-7-8-9-7	6-7-8-10-7	5-7-7-9-8	5-7-8-9-6	7-9-10-12-9	-	-	-	6-9-9-10-8
SL(L/R)	9(7)/9(6)	11(9)/9(6)	11(9)/11(8)	11(8)/11(7)	10(8)/10(8)	10(8)/10(8)	9(7)/10(7)	10(8)/10(8)	11(8)/10(7)	12(9)/12(9)	-	11(8)/10(8)	11(9)/10(8)	-
IL(L/R)	8/8	10/9	9/9	9/9	9/10	10/9	8/9	9/9	8/10	10/10	-	8/8	8/8	8/-

82.5.22.80 & BMNH 82.5.22.82, Adult male—collected by Colonel Beddome from "Tinnevely" (now Tirunelveli) and deposited in the NHMUK.

Type locality. Manjolai, Tirunelveli District, Tamil Nadu.

Summarized description and diagnosis. Snout-vent length up to 48.5 mm (n=5); two pairs of well-developed postmentals, inner pair of comparable length to the outer postmentals and mental, bordered posteriorly by 2 or 3 gular scales; ventral scales counted at midbody, 31 or 32; precloacofemoral pores, 42 or 43; subdigital lamellae under digit IV of manus, 9 or 10 and under digit IV of pes, 10–12; supralabials 10–12 and infralabials, 8–10 on each side.

Dravidogecko douglasadamsi **sp. nov.** can be distinguished from other congeners based on the following characters: number of precloacofemoral pores (PcFP 40–43 versus 45 or 46 in *D. anamallensis*, 52–56 in *D. septentrionalis* **sp. nov.** & 36–38 in *D. meghamalaiensis* **sp. nov.**); postmentals of comparable length with mental (ML/1PML 0.98–1.05 versus much longer, 0.74–0.81 in *D. anamallensis*).

Genetic divergence (*p-distance*). *Dravidogecko douglasadamsi* **sp. nov.** is 11.0% –16.5% divergent from other previously described congeners.

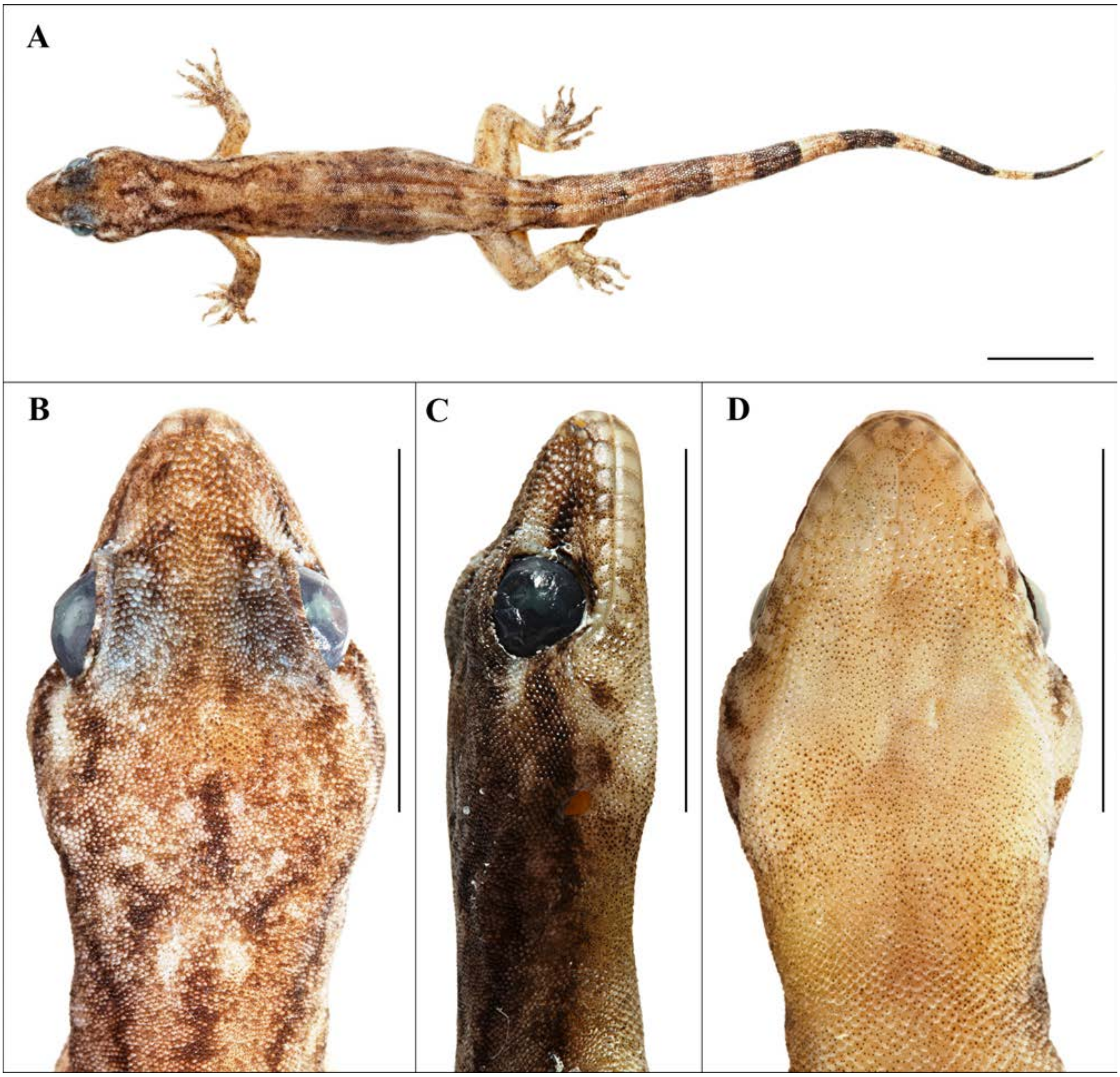

FIGURE 9. Holotype of ***D. douglasadamsi*** **sp. nov.** A) Full-body dorsal B) Head dorsal C) Head lateral D) Head ventral. Scale bar = 10 mm.

Description of holotype. The holotype is in good condition (Fig 9A), except for an incision of about 2.1 mm at mid-trunk region, made to extract liver tissue. Posterior portion of tail curved in a sinusoidal manner, fifth finger on left forelimb curved upwards—both artefacts of preservation. Adult male, SVL 48.5 mm. Head short (HL/SVL 0.27), slightly elongate (HW/HL 0.64), slightly depressed (HH/HW 0.57), distinct from neck. Loreal region slightly inflated, canthus rostralis indistinct (Fig 9C). Snout short (SE/HL 0.36), longer than orbital diameter (OD/SE 0.66); scales on snout, canthus rostralis, inter-orbital region, forehead, occipital and nuchal regions granular and rounded with those on the snout and canthus rostralis being larger (Fig 9B). Eye small (OD/HL 0.24); pupil vertical with crenulated margins; supraciliaries small, rounded, directed outwards, increasing in size anteriorly. Ear opening elliptical (longer diameter 0.8 mm); eye to ear distance longer than diameter of eye (EE/OD 1.19). Rostral wider than deep (RL/RW 0.32), rostral groove absent; two large, roughly circular internasals, separated by two smaller, subequal scales, all in broad contact with rostral; two postnasals on either side, slightly smaller than the internasals, the lower in contact with supralabial I; rostral in contact with nasal, supralabial I, internasals and the two smaller scales separating the internasals; nostrils about the size of the lower postnasal, roughly circular with nasal pad visible posteriorly; nasal surrounded by internasal, rostral, two postnasals and supralabial I on either side; 2–4 rows of scales separate orbit from supralabials around mid-orbital position. Supralabials roughly rectangular, increasing in length anteriorly. Supralabials (to midorbital position) 9 (right), 9 (left); supralabials (to angle of jaw) 12 (right), 12 (left); infralabials (to angle of jaw) 10 (right), 10 (left). Mental triangular; two pairs of postmentals, smaller but roughly the same length as the mental; the inner pair slightly shorter (1.1 mm) than the mental (1.2 mm), and in strong contact with each other (0.7 mm) behind mental; outer pair shorter still (1.0 mm), separated from each other by two gular scales that are smaller than postmentals (Fig 9D). Inner postmentals bordered by mental, infralabial I, infralabials II (barely touching on right), outer postmentals and the two smaller gular scales that separate the outer postmentals; outer postmentals bordered by infralabials I (barely touching only on the left) and II, inner postmentals, and smaller gular scales each of dissimilar sizes, three on the right and four on the left sides. Body dorsoventrally flattened, relatively slender, elongate (TRL/SVL 0.46). Dorsal pholidosis homogenous, composed of small, rounded granules throughout, becoming slightly larger at the lateral aspects; Ventral scales larger than dorsals, largely homogeneous in shape and size, smooth, flat, weakly pointed and sub-imbricate; gular region with smaller, flat, rounded, juxtaposed scales; anteriormost gular scales visibly larger, flatter; scales on sacral and femoral regions larger than those on chest; precloacal scales largest; midbody scale rows across belly 31 or 32; Non-lamellar scales in the palmar and plantar regions heterogeneous in size, flat, rounded, juxtaposed on palm and sub-imbricate on sole; scales on dorsal aspect of upper arm much larger than granules on dorsum, flat, weakly pointed, sub-imbricate and smooth; dorsal aspect of forearm with smaller, sub-imbricate scales intermixed with a few rounded granules around the elbow; scales on dorsal aspect of hand and digits larger than those on forearm, flat, weakly pointed and imbricate; scales on anterior aspect of thigh large, flat, sub-imbricate and weakly pointed; rest of the dorsal scales on hindlimb smaller, granular and rounded; scales on dorsal aspect of feet and toes larger than those on shank, flat, weakly pointed and imbricate.

Forearm (FL/SVL 0.11) and tibia short (CL/SVL 0.12); digits moderately short with relatively long terminal phalanges, strongly clawed; all digits of manus and digits I–IV of pes indistinctly webbed; terminal phalanx of all digits curved, arising angularly from distal portion of expanded lamellar pad, more than half as long as associated toepad; scansors beneath each toe undivided throughout, in a straight transverse series: 6-8-9-9-7 (left manus), 6-8-9-9-7 (right manus), 7-9-10-12-9 (left pes), 7-9-10-12-9 (right pes). Relative length of digits (measurements in mm in parentheses): IV (3.8) > III (3.6) > II (3.2) > V (2.6) > I (2.5) (left manus); IV (4.6) > III (4.5) > II (4.3) > V (3.8) > I (3.3) (left pes).

Tail entire, rounded at the base, flat beneath, tapering posteriorly, covered above uniformly with round, smooth, flat, sub-imbricate scales that become slightly larger laterally; pygal region containing the hemipenal bulge with six or seven rows of flat, weakly pointed, sub-imbricate scales; subsequent subcaudal scales larger, with an undivided median series of enlarged scales extending to tail tip. An uninterrupted series of 43 precloacofemoral pores that are indistinct towards the knee (Fig 13B).

Variation in referred specimens. Internasals separated by one smaller scale in BMNH 82.5.22.83. Inner postmentals bordered posteriorly by three gular scales in BMNH 82.5.22.79 and BMNH 82.5.22.80. Outer postmentals bordered by 4 gulars on right and 5 on left in BMNH 82.5.22.79, BMNH 82.5.22.80, BMNH 82.5.22.83. Outer postmentals not in contact with infralabials in BMNH 82.5.22.80 (L), and in contact with both infralabials I and II in BMNH 82.5.22.79 and BMNH 82.5.22.83. Other morphological variations are listed in Table 6.

Colouration in preservative. Dorsum uniformly brown, mottled with darker, discontinuous streaks from the snout to the base of tail (Fig 9A). Similar mottling faintly visible on dorsal aspect of limbs. Neck with a dark, discontinuous longitudinal streak, flanked at the break by two dark lines at a forty-five degree angle. Two discontinuous lines emanate from the eye, following the contour of the cranium posteriorly and extending beyond the forearm insertion. Inter-orbital region with a scattering of dark spots, witha distinct dark blotch bordering the supraciliary region on either side. Labials paler than the rest of the head with a faint, pattern-less scattering of darker spots bordering each labial. A dark, roughly rectangular streak emanates from eye up to the region above the third supralabial on the right side and the nostril on the left. Limbs no different from rest of the dorsum. Tail of similar ground colour to dorsum with alternating pale-dark longitudinal bands, the first of which is roughly saddle-shaped. Ventral region cream coloured with a scattering of two or three dark spots on each ventral scale. Ventral surface of tail pale, with scattered mid-brown speckling in the hemipenal region followed by alternating pale-dark bands in the distal half.

Colouration (*in life*) (*based on photographs of an uncollected topotype*). Dorsum mid-brown with faint, darker streaks throughout (Fig 14C). Head dorsum ground colour, snout slightly darker with a mottling of yellow scales throughout. A dark streak emanates from above the first supraocular and extends to the eye. Forehead with a scattering of spots that are either paler or darker. A longitudinal streak from the occiput extending into forehead, is flanked by a roughly inverted 'V' shaped marking posteriorly. Two dark spots follow, at and just beyond the forelimb insertion. Six irregular, roughly transverse markings follow, until the sacral region. Trunk with four or five rows of transversely arranged pale spots. Limbs of ground colour with irregular dark spots. Digits interspersed with yellow spots. Tail distinctly banded with alternating light and dark portions, more pronounced posteriorly.

Etymology. The specific epithet is a patronym honouring the English author and satirist, Douglas Noel Adams. Adams was also a renowned environmental activist. His radio documentary on critically endangered animals for the British Broadcasting Corporation (BBC) titled "Last Chance to See" and its accompanying book influenced the thinking of a whole generation of wildlife biologists. The etymology also alludes to the number '*42*'—the number of precloacofemoral pores that most specimens of this species possess. The number 42 incidentally is also the answer to the "*ultimate question of Life, The Universe and Everything*" according to Adams' seminal book "The Hitchhikers Guide to the Galaxy".

Suggested Common name. Adams' Dravidogecko.

Distribution. *Dravidogecko douglasadamsi* **sp. nov.** is presently restricted in distribution to Manjolai and its environs in Tirunelveli district, south of the Shencottah gap in the southern Western Ghats. Similar habitats are seen in various parts of Kalakkad Mundanthurai Tiger Reserve, around which populations of this species might be found.

Habitat and natural history. The habitat in Manjolai and the adjoining Kalakkad- Mundanthurai forests where *Dravidogecko* is found, is chiefly comprised of southern- tropical semi-evergreen (700 m asl) and southern tropical wet evergreen forests (800–1500 m asl). These habitats receive an average annual rainfall of ca. 1600 mm (Ayyanar & Ignacimuthu 2008). This species was seen occupying walls of a tea estate building during the night. There were no other geckos in sympatry, though a species of *Eutropis* was seen in the habitat during the daytime.

Dravidogecko smithi sp. nov.

(Figs 10A–D, 13C, 15A; Table 7)

Holotype. BNHS 2350, an adult male, Ponmudi Hills (8.7570 °N, 77.1145 °E; ca. 920 m asl.), Tiruvananthapuram District, Kerala, collected by Jafer Palot and RC on 25th November, 2017.

Paratypes. Details of collection same as the holotype. ZSIK 2981, adult female.

Type locality. Ponmudi Hills, Tiruvananthapuram District, Kerala.

Summarized description and diagnosis. Snout-vent length up to 49.1 mm (n=2); one scale between internasals; two pairs of well-developed postmentals, inner pair longer than the outer but shorter than mental, bordered posteriorly by 2 or 3 gular scales; ventral scales counted at midbody, 29–32; precloacofemoral pores, 48 (n=1); subdigital lamellae under digit IV of manus, 8 or 9 and under digit IV of pes, 10 or 11; supralabials, 9 or 10 and infralabials, 7 or 8 on each side.

Dravidogecko smithi **sp. nov.** can be distinguished from other congeners based on the following characters: number of precloacofemoral pores (PcFP 48 versus 45 or 46 in *D. anamallensis*, 52–56 in *D. septentrionalis* **sp.**

nov., 36–38 in *D. meghamalaiensis* **sp. nov.** & 42 or 43 in *D. douglasadamsi* **sp. nov.**); postmentals shorter in length than mental (ML/1PML 1.07–1.12 versus longer, 0.74–0.81 in *D. anamallensis*); one scale separating internasals (versus two in *D. septentrionalis* **sp. nov.**).

Genetic divergence (*p-distance*). *Dravidogecko smithi* **sp. nov.** exhibits 0.2% intraspecific variation for the mitochondrial ND2 gene, while it is 10.8% –17.0% divergent from all other congeners. Despite the proximity in range with *D. douglasadamsi* **sp. nov.** (straight line distance of ca. 50 kms), *D. smithi* **sp. nov.** exhibits 11.3% divergence from the former (Table 9).

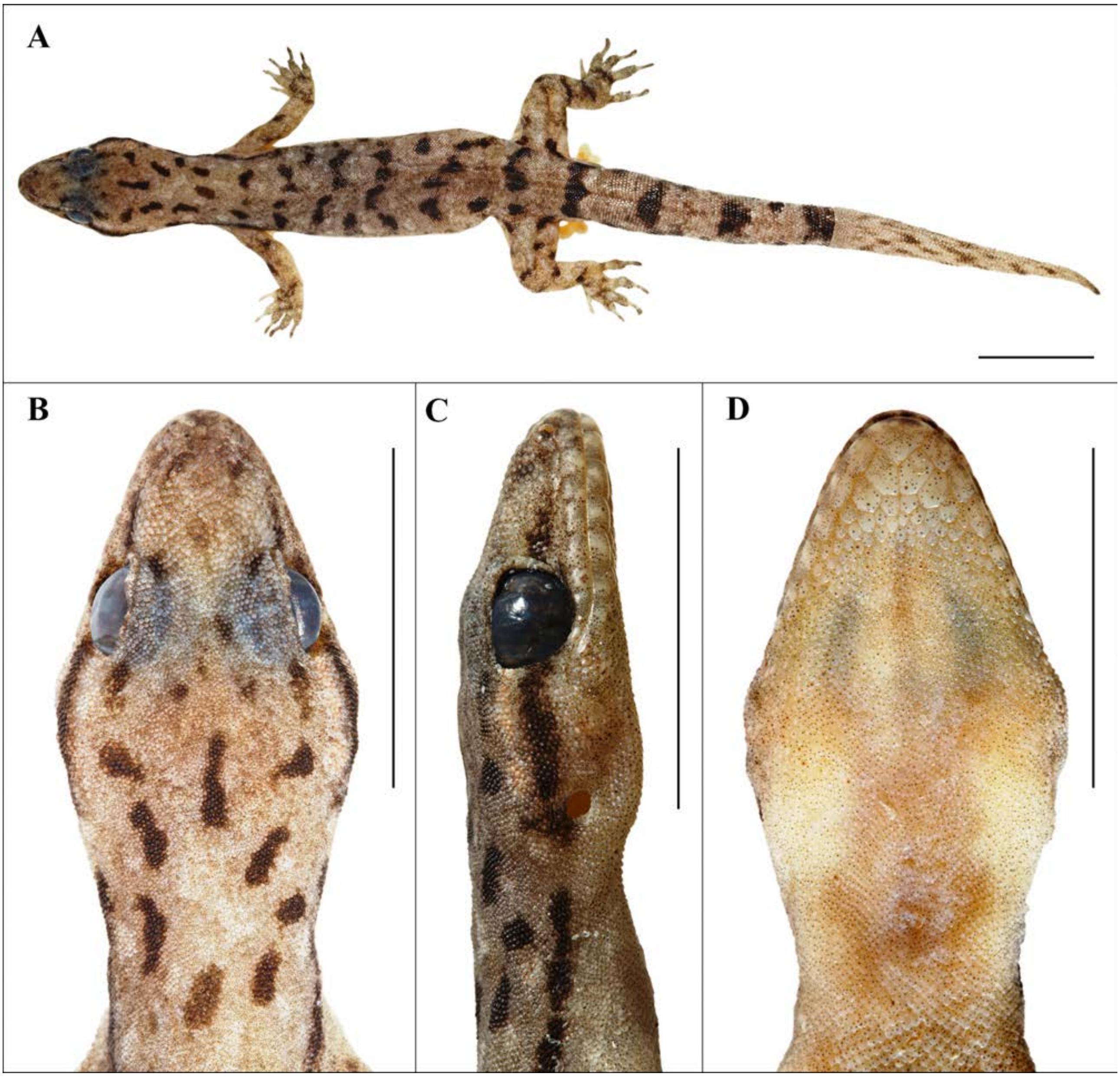

FIGURE 10. Holotype of ***D. smithi*** **sp. nov.** A) Full-body dorsal B) Head dorsal C) Head lateral D) Head ventral. Scale bar = 10 mm.

Description of holotype. The holotype is generally in good condition (Fig 10A). Hemipenes everted, and visible on both sides when viewed dorsally. Posterior half of tail regenerated, tip of which is curved upwards, fourth and fifth fingers on right forelimb curved upwards—both artefacts of preservation (Fig 10A). Adult male, SVL 49.1 mm. Head short (HL/SVL 0.27), slightly elongate (HW/HL 0.61), slightly depressed (HH/HW 0.55), distinct from neck. Loreal region slightly inflated, canthus rostralis indistinct (Fig 10C). Snout short (SE/HL 0.36), longer than orbital diameter (OD/SE 0.64); scales on snout, canthus rostralis, inter-orbital region, forehead, occipital and nuchal regions granular and rounded with those on the snout and canthus rostralis being larger (Fig 10B). Eye small (OD/HL 0.23); pupil vertical with crenulated margins; supraciliaries small, rounded, directed outwards, increasing in size anteriorly. Ear opening roughly elliptical (longer diameter 0.6 mm); eye to ear distance longer than diameter of eye (EE/OD 1.15). Rostral wider than deep (RL/RW 0.33), rostral groove distinct but extending only marginally downwards from the suturing with the internasals, medially; two large, roughly circular internasals, separated by a smaller scale, all in broad contact with rostral; two postnasals on either side, slightly smaller than the internasals, the lower in contact with supralabial I; rostral in contact with nasal, supralabial I, internasals and the smaller scale separating the internasals; nostrils about the size of the lower postnasal, roughly circular with nasal pad visible posteriorly; nasal surrounded by internasal, rostral, two postnasals and supralabial I on either side; 2 or 3 rows of scales separate orbit from supralabials around mid-orbital position. Supralabials roughly rectangular, increasing in length anteriorly. Supralabials (to midorbital position) 7 (right), 7 (left); supralabials (to angle of jaw) 9 (right), 9 (left); infralabials (to angle of jaw) 7 (right), 8 (left). Mental triangular; two pairs of smaller postmentals, the inner pair slightly shorter (1.0 mm) than the mental (1.2 mm), and in strong contact with each other (0.7 mm) behind mental; outer pair shorter still (0.8 mm), separated from each other by two gular scales that are smaller than postmentals (Fig 10D). Inner postmentals bordered by mental, infralabial I, outer postmentals and the two smaller gular scales that separate the outer postmentals; outer postmentals bordered by infralabials I and II, inner postmentals, and four smaller gular scales each of dissimilar sizes. Body dorsoventrally flattened, relatively slender, elongate (TRL/SVL 0.46). Dorsal pholidosis composed of small, rounded granules that are juxtaposed in arrangement throughout, becoming slightly larger at the lateral aspects; Ventral scales larger than dorsals, largely homogeneous in shape and size, smooth, flat, weakly pointed and sub-imbricate; gular region with smaller, granular, juxtaposed scales, anterior-most gular scales visibly larger, flatter; scales on sacral and femoral regions larger than those on chest; precloacal scales larger still; midbody scale rows across belly 31 or 32; Non-lamellar scales in the palmar and plantar regions heterogeneous in size, flat, rounded, sub-imbricate; scales on dorsal aspect of upper arm larger than granules on dorsum, flat, weakly pointed, sub-imbricate and smooth; dorsal aspect of forearm with smaller, sub-imbricate scales intermixed with a few rounded granules around the elbow; scales on dorsal aspect of hand and digits larger than those on forearm, flat, weakly pointed and imbricate; scales on anterior aspect of thigh large, flat, sub-imbricate and weakly pointed; rest of the dorsal scales on hindlimb smaller, granular and rounded. Scales on dorsal aspect of feet and toes larger than those on shank, flat, weakly pointed and imbricate.

Forearm (FL/SVL 0.11) and tibia short (CL/SVL 0.11); digits moderately short with relatively long terminal phalanges, strongly clawed; all digits of manus and digits I–IV of pes indistinctly webbed; terminal phalanx of all digits curved, arising angularly from distal portion of expanded lamellar pad, more than half as long as associated toepad; scansors beneath each toe undivided throughout, in a straight transverse series: 6-6-7-8-7 (left manus), 5-6-7-8-8 (right manus), 6-8-9-10-8 (left pes), 5-9-10-10-8 (right pes). Relative length of digits (measurements in mm in parentheses): IV (3.9) > III (3.8) > II (3.3) > V (3.1) > I (2.7) (left manus); IV (4.7) > III (4.3) > II (4.0) > V (3.8) > I (3.2) (left pes).

Tail rounded at the base with distal half regenerated, flat beneath, tapering posteriorly, covered above uniformly with round, smooth, flat, sub-imbricate scales that become slightly larger laterally; basal portion of tail with six or seven rows of flat, weakly pointed, sub-imbricate scales; subsequent subcaudal scales larger, with an undivided median series of enlarged scales extending to tail tip. An uninterrupted series of 48 precloacofemoral pores, that are only faintly visible towards the knee (Fig 13C).

Variation in paratype. Rostral groove absent in ZSIK 2981. Inner postmentals bordered posteriorly by three gular scales; outer postmentals bordered by 3 gulars on left in ZSIK 2981. Other morphological variations are listed in Table 7.

Colour in preservative. Dorsum uniformly greyish-brown, mottled with darker, discontinuous horizontal streaks in the trunk (Fig 10A). Similar mottling faintly visible on dorsal aspect of limbs. Occipital region with a dark, longitudinal streak, flanked anteriorly by two dark spots. Two discontinuous lines emanate from the eye, breaking posteriolaterally at the head, following the contour of the cranium laterally and extending beyond the forearm insertion. Inter-orbital region with a scattering of dark spots, with a distinct dark blotch bordering the supraciliary region on either side. Labials paler than the rest of the head with a faint, pattern-less scattering of darker spots on each labial. A dark, roughly rectangular streak emanates from eye upto the region above the third supralabial on the right side and the nostril on the left. Limbs no different from rest of the dorsum. Tail of similar ground colour to dorsum with alternating pale-dark longitudinal bands, the first of which is roughly saddle-shaped, up to the regenerated portion. Regenerated portion of tail uniformly greyish throughout with a scattering of darker longitudinal streaks. Ventral region cream coloured with a scattering of three to five dark spots on each ventral scale. Ventral surface of tail pale, with scattered mid-brown speckling in the hemipenial region followed by alternating pale-dark bands up to the regenerated portion.

Colouration (*in life*). Dorsum mid-brown in life (Fig 15A). Distinct yellow blotches visible across dorsal aspect of head, trunk and original portion of tail. Snout predominantly yellow. Lateral aspect with a series of pale yellow spots. Iris dark green with darker venations. Pupil black, with indistinctly crenulated margins. Other patterns and markings in accordance with the description of colour in preservative.

Etymology. The specific epithet is an eponym honouring British herpetologist Malcolm Arthur Smith for establishing the genus *Dravidogecko* in the year 1933. His seminal work on Indian herpetology, resulting in the text "The fauna of British India, including Ceylon and Burma" in three volumes, is still considered the bedrock of reptilian taxonomy in India.

Suggested Common name. Smith's Dravidogecko.

Distribution. *Dravidogecko smithi* **sp. nov.** is currently restricted in distribution to the Ponmudi Hills in Thiruvananthapuram District, Kerala. The habitat chiefly constitutes tropical evergreen rainforests (Champion & Seth 1968). The Agastyamalai Hill Range just south of Ponmudi has similar habitats in which *Dravidogecko* might be found.

Habitat and natural history. The type-series of *Dravidogecko smithi* **sp. nov.** was collected in the Ponmudi Hills at an altitude of ca. 900 m asl. These geckos are found occupying human structures that are scattered along the road to the Ponmudi Hills. Other lizards found in sympatry with *Dravidogecko* in the region were *Hemidactylus* cf. *frenatus*, *Cnemaspis* sp. and *Eutropis* cf. *carinata*, which was also abundant in the adjoining shola grasslands.

***Dravidogecko tholpalli* sp. nov.**

(Figs 11A–D, 13G, 15B; Table 7)

Hoplodactylus anamallensis: Boulenger, 1885

Hoplodactylus anamallensis [non *Gecko anamallensis* Günther, 1875]—Boettger, 1893.

Hemidactylus anamallensis: Bauer & Russell, 1995

Hemidactylus anamallensis [non *Gecko anamallensis* Günther, 1875]—Ganesh, 2010;

Holotype. BNHS 2351, an adult male, Kodaikanal town (10.2334 °N, 77.4910 °E; ca. 2110 m asl.), Dindigul District, Tamil Nadu, collected by R. Venkitesan and RC on 17th December, 2016.

Paratypes. Details of collection same as the holotype. BNHS 2352, BNHS 2353, ZSIK 2982, ZSIK 2984, ZSIK 2985, ZSIK 2986—adult males; BNHS 2354, BNHS 2355 and ZSIK 2983—adult females.

Type locality. Kodaikanal, Dindigul District, Tamil Nadu.

Summarized description and diagnosis. Snout-vent length up to 52.2 mm (n=10); internasals separated by one smaller scale; two pairs of well-developed postmentals, inner pair longer than the outer; ventral scales counted at midbody, 25–31; precloacofemoral pores, 38–40 (n=7); subdigital lamellae under digit IV of manus, 7 or 8 and under digit IV of pes, 9–11; supralabials 8–11 and infralabials, 8–10 on each side.

Dravidogecko tholpalli **sp. nov.** can be distinguished from other congeners based on the following characters: number of precloacofemoral pores (PcFP 38–40 versus 45 or 46 in *D. anamallensis*, 52–56 in *D. septentrionalis* **sp. nov.**, 36–38 in *D. meghamalaiensis* **sp. nov.**, 42 or 43 in *D. douglasadamsi* **sp. nov.** & 48 in *D. smithi* **sp. nov.**); one smaller scale separating the internasals (versus two in *D. septentrionalis* **sp. nov.**); first pair of postmentals much longer than the second (2PML/1PML 0.41–0.67 versus only slightly longer, 0.82–0.96 in *D. meghamalaiensis* **sp. nov.**).

Genetic divergence (*p-distance*). *Dravidogecko tholpalli* **sp. nov.** exhibits 0.3% intraspecific variation, while it is 16.8% –21.4% divergent from all other congeners (Table 9).

Description of holotype. The holotype is in good condition except, head is slightly tilted towards the right—an artefact of preservation (Fig 11A). Body is dorsoventrally flattened with the posterior 3/4th of tail regenerated. Adult male, SVL 50.9 mm. Head short (HL/SVL 0.26), slightly elongate (HW/HL 0.68), not depressed (HH/HW 0.61), distinct from neck. Loreal region slightly inflated, canthus rostralis indistinct (Fig 11C). Snout short (SE/HL 0.40), longer than orbital diameter (OD/SE 0.53); scales on snout, canthus rostralis, inter-orbital region, forehead, occipital and nuchal regions granular and rounded with those on the snout and canthus rostralis being larger (Fig 11B). Eye small (OD/HL 0.21); pupil vertical with crenulated margins; supraciliaries small, rounded, directed outwards and uniform in size. Ear opening elliptical (longer diameter 0.7 mm); eye to ear distance longer than diameter of eye

(EE/OD 1.46). Rostral wider than deep (RL/RW 0.37), with a distinct rostral groove extending halfway through the scale medially; two large internasals, separated by a smaller, subequal scale, all in broad contact with rostral; two postnasals on either side, slightly smaller than the internasals, the lower in contact with supralabial I; rostral in contact with nasal, supralabial I, internasals and the smaller scale separating the internasals; nostrils about the size of the lower postnasal, roughly circular with nasal pad visible posteriorly; nasal surrounded by internasal, rostral, two postnasals and a small scale separating it from supralabial I on either side; 2–4 rows of scales separate orbit from supralabials at mid-orbital position. Supralabials roughly rectangular, increasing in length anteriorly. Supralabials (to midorbital position) 8 (right), 8 (left); supralabials (to angle of jaw) 10 (right), 10 (left); infralabials (to angle of jaw) 8 (right), 8 (left). Mental triangular; two pairs of well-developed postmentals, the inner pair slightly shorter (1.0 mm) than the mental (1.1 mm), and in strong contact with each other (0.5 mm) behind mental; outer pair distinctly shorter (0.6 mm) than the inner pair, separated from each other by five gular scales that are smaller than postmentals (Fig 11D). Inner postmentals bordered by mental, infralabial I & II (barely touching on both sides), outer postmentals and five smaller gular scales; outer postmentals bordered by infralabials I (barely touching on the right) and II, inner postmentals, and smaller gular scales each of dissimilar sizes, four on the right and two on the left sides. Body relatively slender, elongate (TRL/SVL 0.47). Dorsal pholidosis composed of small, rounded granules that are juxtaposed in arrangement, becoming slightly larger, flatter, weakly pointed and sub-imbricate laterally; Ventral scales larger than dorsals, largely homogeneous in shape and size, smooth, flat, sub-imbricate; gular region with smaller, granular, juxtaposed scales; anterior gular scales visibly larger, flatter; scales on femoral region larger than those on chest; precloacal scales larger than scales on femoral region; midbody scale rows across belly 26–28. Non-lamellar scales in the palmar and plantar regions heterogeneous in size, rounded, juxtaposed on palm and sole; scales on dorsal aspect of upper arm larger than granules on dorsum, flat, pointed, sub-imbricate and smooth; dorsal aspect of forearm with smaller, sub-imbricate scales intermixed with a few rounded granules around the elbow; scales on dorsal aspect of hand and digits larger than those on forearm, flat, weakly pointed and imbricate; scales on anterior aspect of thigh large, flat, imbricate and weakly pointed; rest of the dorsal scales on hindlimb smaller, granular and rounded. Scales on dorsal aspect of foot larger than those on shank, flat, weakly pointed and imbricate.

Forearm (FL/SVL 0.10) and tibia short (CL/SVL 0.13); digits moderately short with relatively long terminal phalanges, strongly clawed; all digits of manus and digits I–IV of pes indistinctly webbed; terminal phalanx of all digits curved, arising angularly from distal portion of expanded lamellar pad, more than half as long as associated toepad; scansors beneath each toe undivided throughout, in a straight transverse series: 6-7-8-7-7 (left manus), 6-7-7-8-7 (right manus), 6-8-9-9-7 (left pes), 6-8-9-10-7 (right pes). Relative length of digits (measurements in mm in parentheses): IV (4.0) > III (3.8) > II (3.5) > V (3.0) > I (2.6, claw broken) (left manus); IV (5.2) > III (4.7) > V (4.6) = II (4.6) > I (3.3) (left pes).

Tail partially regenerated, rounded at the base, flat beneath, tapering posteriorly, covered above uniformly with round, smooth, flat, sub-imbricate scales that become slightly larger laterally; subcaudal scales larger, with an undivided median series of enlarged scales. An uninterrupted series of 38 precloacofemoral pores that are only faintly visible towards the knee (Fig 13G).

Variation in paratypes. Inner postmentals in contact with only infralabial I on both sides in all other paratypes. Inner postmentals bordered posteriorly by three gular scales in BNHS 2352, BNHS 2353, ZSIK 2982, ZSIK 2983 and ZSIK 2985, and by five gulars in BNHS 2354. Right inner postmental bordered by a small gular scale laterally in BNHS 2355 and ZSIK 2984. Outer postmentals bordered by 3 gulars in BNHS 2352 (R), 5 in BNHS 2354(R) and ZSIK 2984 (R) and 6 in BNHS 2355 (R) and ZSIK 2983 (R). Outer postmentals not in contact with infralabials BNHS 2355 (R), ZSIK 2983 (R) and ZSIK 2984 (R). Outer postmentals in contact with both infralabial I and II on both sides in BNHS 2352, BNHS 2353, BNHS 2354, ZSIK 2982, ZSIK 2985 and ZSIK 2986. Other morphological variations are listed in Table 7.

Colour in preservative. Dorsum predominantly light brown mottled with darker, discontinuous streaks from the snout to the base of tail (Fig 11A). Similar mottling faintly visible on dorsal aspect of limbs. Neck with a roughly circular, dark blotch flanked by 2 longitudinal streaks on either side. Posterior part of head demarcated by a disctinct saddle-shaped horizontal streak (Fig 11B). Inter-orbital region slightly darker than rest of the body with scattered dark-brown granules. Labials paler than rest of the head with faint, darker spots bordering each labial. Supralabials bordered by a dark, roughly triangular streak from nostril to eye. Limbs no different from rest of the dorsum. Tail predominantly grey with darker, longitudinal markings in the regenerated portion. Ventral region uniformly cream coloured. Ventral surface of tail pale, with scattered mid-brown speckling throughout.

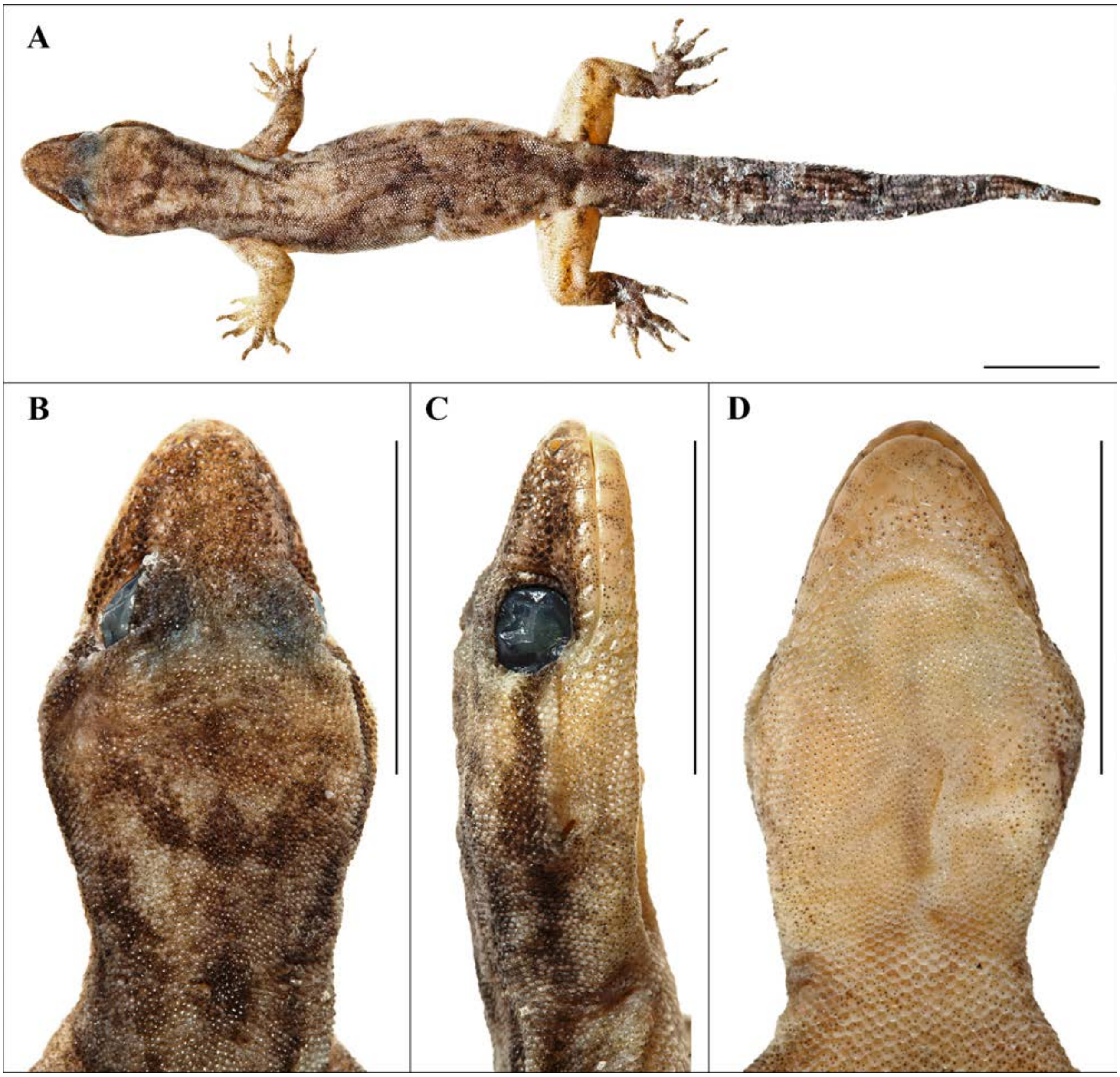

FIGURE 11. Holotype of ***D. tholpalli* sp. nov.** A) Full-body dorsal B) Head dorsal C) Head lateral D) Head ventral. Scale bar = 10 mm.

Colouration (*in life*) (*based on photographs of an uncollected topotype*). Dorsal markings more evident in life (Fig 15B). Dorsum pale-brown with darker streaks throughout. Head dorsum pale-brown, snout darker, with a dark streak emanating from snout to eye. Yellow dots on each labial with a scattering of these in the loreal region. Forehead ground colour, interspersed by darker spots. A dark, discontinuous streak emanates from eye up to the forelimb insertion. A dark saddle shaped collar in the occipital region. Six dark streaks along the vertebral region after the collar, followed posteriorly by two saddle shaped markings in the sacral region. Limbs of ground colour with dark spots sprinkled all over. Tail distinctly banded with alternating light and dark portions. Bands more conspicuous after the first three segments. Iris marbled, golden, suffused with prominent dark-brown venation; pupil black with crenulated margins.

Etymology. The specific epithet is a compound noun formed by the combination of two Tamil words from the Sangam era (3rd century BC—3rd century AD) that alludes to the ancient divergence and colonization of these geckos in peninsular India. The stem word, '*thol*' (pronounced /θɔl/) is an archaic Tamil word for 'ancient' and '*palli*' (pronounced /pəllɪ/) an ancient word still in common parlance, is the Tamil for 'gecko'.

Suggested Common name. Kodaikanal Dravidogecko.

TABLE 7. Measurements (in mm) and scale counts for the specimens of ***Dravidogecko smithi* sp. nov.** and ***D. tholpalli* sp. nov**. Abbreviations as in Materials and Methods. * indicates tail is regenerated and #, a broken tail. Numbers in parentheses indicate the supralabial at midorbital position.

	Dravidogecko smithi sp. nov.		*Dravidogecko tholpalli* sp. nov.									
Tag	**BNHS 2350**	**ZSIK 2981**	**BNHS 2351**	**BNHS 2352**	**BNHS 2353**	**BNHS 2354**	**BNHS 2355**	**ZSIK 2982**	**ZSIK 2983**	**ZSIK 2984**	**ZSIK 2985**	**ZSIK 2986**
Status	Holotype	Paratype	Holotype	Paratype	Paratype	Paratype	Paratype	Paratype	Paratype	Paratype	Paratype	Paratype
Sex	♂	♀	♂	♂	♂	♀	♀	♂	♀	♂	♂	♂
Measurements												
SVL	49.1	48.2	50.9	44.6	47.8	50.4	51.5	49.6	52.2	51.1	48.7	46.2
TRL	22.9	23.2	24.3	21.5	22.6	24.8	25.6	24.4	25.3	24.8	23.5	22.0
BW	8.7	7.9	9.0	7.5	9.7	9.7	11.3	9.9	11.3	10.4	9.0	9.2
CL	5.7	6.2	6.6	6.3	6.3	6.7	6.6	6.7	6.9	6.6	6.0	6.3
TL	53.2*	51.7	44.0*	5.6#	3.4#	3.4#	40.4*	48.6*	43.2*	47.7*	52.6*	51.3*
TW	4.4	4.1	4.6	3.5	4.8	4.5	4.5	5.0	4.4	4.9	4.8	4.4
HL	13.2	12.2	13.4	12.2	12.3	13.6	13.6	13.2	13.5	13.6	13.5	12.4
HW	8.2	7.7	9.2	7.4	8.6	9.2	9.8	8.8	9.3	9.6	9.4	8.5
HH	4.5	5.0	5.6	4.2	4.8	4.6	5.2	5.0	5.3	5.5	5.1	5.0
FL	5.4	5.6	5.3	5.9	6.1	5.6	6.0	5.1	5.7	5.9	5.4	4.8
OD	3.2	3.0	2.9	2.8	2.7	3.1	3.0	3.0	3.0	3.0	2.9	2.5
NE	4.1	3.3	4.1	3.4	3.4	3.9	4.3	3.8	4.3	4.3	4.0	3.8
SE	4.9	4.4	5.4	4.4	4.2	5.0	5.4	5.2	5.6	5.5	4.9	5.0
EE	3.7	3.4	4.2	3.4	3.8	4.0	4.0	3.6	4.1	4.2	3.9	3.8
IN	1.7	1.7	1.9	1.6	1.8	1.7	1.7	1.7	2.1	1.9	1.6	1.7
IO	4.7	4.4	5.2	5.1	5.1	5.8	5.9	5.7	5.0	5.2	5.2	5.3
EL	0.6	0.5	0.7	0.8	0.7	0.7	0.9	0.8	0.7	0.9	0.9	0.8
RW	2.0	2.0	2.2	1.9	1.9	2.1	2.3	2.1	2.3	2.2	2.1	1.9
RL	0.7	0.7	0.8	0.7	0.8	0.8	0.9	0.9	1.0	0.9	0.9	0.9
ML	1.2	1.0	1.1	0.9	1.1	1.1	1.2	1.4	1.0	1.1	1.1	1.2
MW	1.9	1.5	1.9	1.7	1.7	1.9	1.9	1.6	1.8	1.8	1.9	1.8
CT	0.7	0.6	0.5	0.7	0.4	0.5	0.3	0.2	0.6	0.4	0.6	0.4
1PML	1.0	0.9	1.0	1.1	0.9	1.2	1.2	0.9	1.1	0.9	1.1	1.1
2PML	0.8	0.8	0.6	0.6	0.4	0.8	0.6	0.5	0.7	0.6	0.7	0.7
Meristics												
PcFP	48	NA	38	38	39	NA	NA	38	NA	40	38	40
VS	31-32	29-30	26-28	27-29	25-26	29-30	30-31	29-30	30-31	25-26	28-30	26-28
Lamellae (I-V)												
Forelimb (L)	6-6-7-8-7	6-8-8-9-7	6-7-8-7-7	7-6-7-8-7	7-7-7-7-6	6-7-8-8-7	6-7-7-7-7	6-7-7-7-6	6-7-7-8-7	6-7-7-7-7	6-7-7-8-7	6-7-7-7-7
Forelimb (R)	5-6-7-8-8	5-7-8-8-7	6-7-7-8-7	6-8-7-8-6	6-6-8-8-7	6-7-7-7-6	6-7-8-7-6	7-7-7-7-6	6-8-8-8-7	6-7-8-7-7	6-7-7-8-7	6-7-8-8-6
Hindlimb (L)	6-8-9-10-8	6-9-10-10-8	6-8-9-9-7	6-8-9-10-7	7-7-8-9-7	6-7-8-9-7	6-8-9-10-7	6-8-8-9-7	6-8-9-11-8	6-7-9-10-7	6-8-9-10-7	6-7-8-10-8
Hindlimb(R)	5-9-10-10-8	6-9-10-11-8	6-8-9-10-7	6-7-8-10-7	7-8-9-9-7	6-7-9-9-8	6-7-8-10-7	7-9-9-10-7	7-8-9-11-7	6-7-9-10-7	6-8-9-10-7	6-7-8-11-8
SL(L/R)	9(7)/9(7)	9(7)/10(8)	10(8)/10(8)	8(6)/10(7)	10(7)/9(7)	9(7)/10(8)	9(7)/10(7)	8(6)/9(7)	9(7)/11(8)	9(7)/10(8)	9(7)/10(7)	10(8)/11(8)
IL(L/R)	8/7	7/8	8/8	8/9	9/8	10/8	9/9	9/8	10/8	8/9	8/8	9/9

Distribution. *Dravidogecko tholpalli* **sp. nov.** is presently restricted in distribution to Kodaikanal town and its outskirts in the Palani Hills of the southern Western Ghats. They are found in large numbers around the Kodaikanal Lake in the centre of the town, which is surrounded by disturbed evergreen forests. The habitat in the Palani Hills chiefly constitutes moist deciduous and southern tropical wet evergreen forests (B. Balaguru *et al.* 2016). These habitats are at an altitude of 1600–2000 m asl and receive an average annual rainfall of 1500 mm (Bhupathy *et al.* 2009). Other areas in the Palani Hills such as Perumalmalai and Vattakanal are likely to harbour populations of *D. tholpalli* **sp. nov.**

Habitat and natural history. The type-series of *Dravidogecko tholpalli* **sp. nov.** was collected in Kodaikanal town from abandoned buildings and stone walls near forested areas. Kodaikanal falls under a special case of the Madurai-Pollachi rainfall regime with 0–4 dry months and slightly more (~92) rainy days annually (Pascal 1982). Other lizards found in sympatry were *Cnemaspis* sp., *Kaestlea* cf. *palnica* and *Salea anamallayana*.

Dravidogecko janakiae sp. nov.

(Figs 12A–D, 13E, 15C; Table 8)

Hemidactylus anamallensis: Bauer & Russell, 1995

Hemidactylus anamallensis [non *Gecko anamallensis* Günther, 1875]—Bansal & Karanth, 2013

Dravidogecko anamallensis: Smith, 1933

Dravidogecko anamallensis [non *Gecko anamallensis* Günther, 1875]—Radhakrishnan, 1999.

Holotyp*e*. BNHS 2356, an adult male, Munnar town (10.1436 °N, 77.0927 °E; ca. 1900 m asl.), Idukki District, Kerala, collected by Jafer Palot and RC on 28th May, 2016.

Paratypes. Details of collection same as the holotype. BNHS 2358, BNHS 2359 and ZSIK 2989—adult males; BNHS 2357, BNHS 2360 and ZSIK 2988—adult females.

Type locality. Munnar town, Idukki District, Tamil Nadu.

Summarized description and diagnosis. Snout-vent length up to 52.0 mm (n=8); two pairs of well-developed postmentals, inner pair longer than the outer and never in contact with infralabial II; ventral scales counted at mid-body, 24–30; precloacofemoral pores, 35 or 36 (n=4); subdigital lamellae under digit IV of manus, 7–9 and under digit IV of pes, 9–11; supralabials 8–11 and infralabials, 8–10 on each side.

Dravidogecko janakiae **sp. nov.** can be distinguished from other congeners based on the following characters: Number of precloacofemoral pores (PcFP 35 or 36 versus 45 or 46 in *D. anamallensis*, 52–56 in *D. septentrionalis* **sp. nov.**, 36–38 in *D. meghamalaiensis* **sp. nov.**, 42 or 43 in *D. douglasadamsi* **sp. nov.**, 48 in *D. smithi* **sp. nov.** & 38–40 in *D. tholpalli* **sp. nov.**); first pair of postmentals much longer than the second (2PML/1PML 0.47–0.70 versus only slightly longer, 0.82–0.96 in *D. meghamalaiensis* **sp. nov.**).

Genetic divergence (*p-distance*). *Dravidogecko janakiae* **sp. nov.** exhibits 0.2% intraspecific variation, while it is 10.1% –21.5% divergent from all other congeners (Table 9).

Description of holotype. The holotype is in good condition (Fig 12A). The hemipenis is partially everted and is visible on both sides when viewed dorsally. Body dorsoventrally flattened, tail entire. Second and fifth toes on each hindlimb curved upwards, an artefact of preservation. Adult male, SVL 48.4 mm. Head short (HL/SVL 0.26), slightly elongate (HW/HL0.68), slightly depressed (HH/HW 0.55), distinct from neck. Loreal region slightly inflated, canthus rostralis indistinct (Fig 12C). Snout short (SE/HL 0.37), longer than orbital diameter (OD/SE 0.61); scales on snout, canthus rostralis, inter-orbital region, forehead, occipital and nuchal regions granular and rounded with those on the snout and canthus rostralis being larger (Fig 12B). Eye small (OD/HL 0.22); pupil vertical with crenulated margins; supraciliaries small, rounded, directed outwards, increasing in size anteriorly. Ear opening elliptical (longer diameter 0.6 mm); eye to ear distance longer than diameter of eye (EE/OD 1.26). Rostral wider than deep (RL/RW 0.42), with a distinct rostral groove extending halfway through the scale medially; two large internasals, separated by a smaller, subequal scale, all in broad contact with rostral; two postnasals on either side, slightly smaller than the internasals, the lower in contact with supralabial I; rostral in contact with nasal, supralabial I, internasals and the smaller scale separating the internasals; nostrils smaller than lower postnasal, roughly circular with nasal pad visible posteriorly; nasal surrounded by internasal, rostral, two postnasals and supralabial I (barely touching) on either side; 2 or 3 rows of scales separate orbit from supralabials at mid-orbital position. Supralabials roughly rectangular, increasing in length anteriorly. Supralabials (to midorbital position) 8 (right), 7 (left); supralabials (to angle of jaw) 10 (right), 9 (left); infralabials (to angle of jaw) 9 (right), 9 (left). Mental triangular; two pairs of smaller postmentals, the inner pair shorter (0.7 mm) than the mental (1.1 mm), and barely in contact with each other (0.2 mm) behind mental; outer pair distinctly shorter (0.4 mm) than the inner pair, separated from each other by four gular scales that are smaller than postmentals (Fig 12D). Inner postmentals bordered by mental, infralabial I, outer postmentals and three smaller gular scales; outer postmentals bordered by infralabials I and II, inner postmentals, and smaller gular scales of dissimilar sizes, four on the right and five on the left sides. Body relatively slender, elongate (TRL/SVL 0.46). Dorsal pholidosis composed of small, rounded granules that are juxtaposed in arrangement throughout; Ventral scales larger than dorsals, largely homogeneous in shape and size, smooth, flat, weakly pointed and sub-imbricate; gular region with smaller, granular, juxtaposed scales, anteriormost gular scales visibly larger, flatter; scales on sacral and femoral regions larger than those on chest; precloacal scales larger than scales on femoral region; midbody scale rows across belly 24 or 25; Non-lamellar scales in the palmar and plantar regions heterogeneous in size, flat, rounded and juxtaposed on palm and sole; scales on dorsal aspect of upper arm larger than granules on dorsum, flat, weakly pointed, sub-imbricate and smooth; dorsal aspect of forearm with smaller, sub-imbricate scales intermixed with a few rounded granules around the elbow; scales on dorsal aspect of hand and digits larger than those on forearm, flat, weakly pointed and imbricate; scales on anterior aspect of thigh large, flat, imbricate and weakly pointed; rest of the dorsal scales on hindlimb smaller, granular and rounded. Scales on dorsal aspect of foot larger than those on shank, flat, weakly pointed and imbricate.

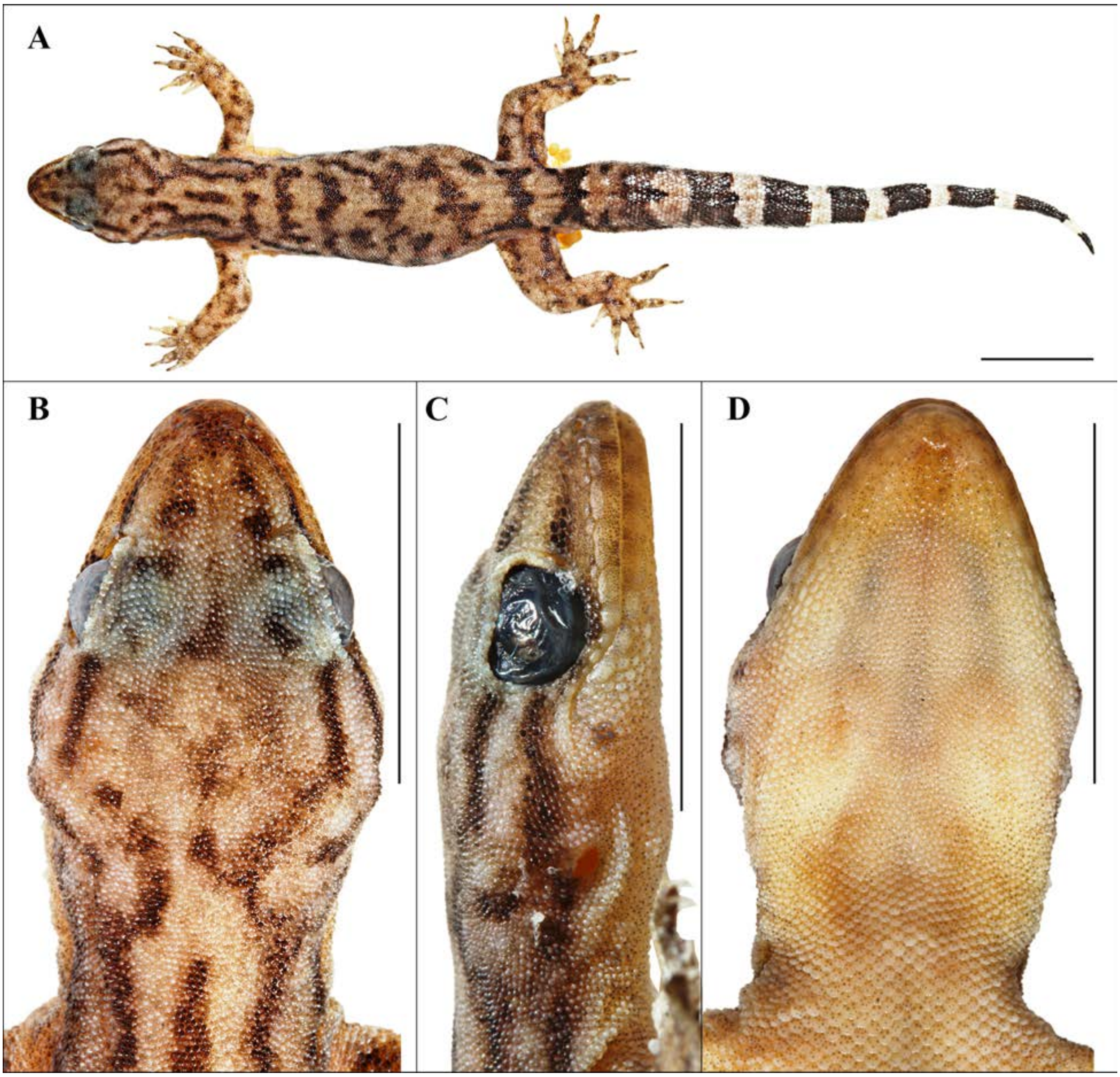

FIGURE 12. Holotype of ***D. janakiae* sp. nov.** A) Full-body dorsal B) Head dorsal C) Head lateral D) Head ventral. Scale bar = 10 mm.

TABLE 8. Measurements (in mm) and scale counts for the holotype and paratypes of ***Dravidogecko janakiae* sp. nov**. Abbreviations as in Materials and Methods. * indicates tail is regenerated and #, a broken tail. Numbers in parentheses indicate the supralabial at midorbital position.

	***Dravidogecko janakiae* sp.nov.**							
Tag	BNHS 2356	BNHS 2357	BNHS 2358	BNHS 2359	BNHS 2360	ZSIK 2987	ZSIK 2988	**ZSIK 2989**
Status	Holotype	Paratype	Paratype	Paratype	Paratype	Topotype	Paratype	Paratype
Sex	♂	♀	♂	♂	♀	♀	♀	♂
Measurements								
SVL	48.4	48.4	52.0	45.2	50.6	53.9	50.1	46.2
TRL	22.7	24.4	26.6	20.9	24.5	26.6	23.8	21.6
BW	9.6	11.0	10.6	9.1	10.8	12.3	9.7	10.5
CL	7.0	6.7	7.3	6.2	6.6	6.7	6.3	5.7
TL	53.0	51.8	25.1#	20.5#	38.8*	56.2	44.3	34.1*
TW	4.9	4.3	5.5	4.1	4.3	5.0	3.6	3.9
HL	13.9	13.0	14.0	12.5	12.9	13.0	12.5	12.8
HW	9.4	8.9	9.7	8.1	9.1	10.0	9.1	9.2
HH	5.2	5.3	5.6	5.1	5.0	5.6	4.9	5.3
FL	6.0	6.0	6.1	5.5	5.6	6.0	5.7	5.2
OD	3.2	3.1	3.1	2.9	3.0	3.2	3.2	3.1
NE	3.6	3.8	3.9	3.7	3.6	3.9	4.2	3.7
SE	5.1	5.0	5.3	4.7	4.7	5.7	5.2	4.7
EE	4.0	4.0	4.3	3.6	4.0	4.5	4.1	3.8
IN	1.8	1.9	1.8	1.7	1.8	2.0	1.9	1.8
IO	6.1	5.0	5.9	4.2	5.1	5.9	5.1	5.4
EL	0.6	0.9	0.6	0.6	0.9	0.7	0.8	0.5
RW	1.9	2.1	2.2	1.9	2.1	2.1	2.2	2.1
RL	0.8	0.8	1.0	0.7	0.8	0.9	0.9	0.7
ML	1.1	1.1	1.1	0.9	1.2	1.2	1.2	1.4
MW	2.0	2.0	2.0	1.9	2.0	2.1	2.1	2.2
CT	0.2	0.3	0.5	0.6	0.2	0.7	0.2	0.1
1PML	0.7	1.1	0.9	1.0	0.9	1.1	0.9	1.0
2PML	0.4	0.5	0.6	0.6	0.7	0.8	0.5	0.7
Meristics								
PcFP	35	NA	36	35	NA	NA	NA	36
VS	24-25	24-26	27-29	26-28	27-28	29-30	28-29	28-29
Lamellae (I-V)								
Forelimb (L)	6-7-8-9-7	6-7-8-7-7	6-6-7-8-6	7-7-8-8-7	6-8-8-9-6	6-7-7-8-7	7-8-8-9-7	6-7-7-7-7
Forelimb(R)	5-7-8-9-6	5-7-8-9-8	5-6-7-7-5	6-7-7-8-7	6-7-9-9-6	6-7-7-8-6	6-7-7-9-7	6-7-7-8-7
Hindlimb (L)	6-9-8-11-7	6-7-9-11-8	5-7-8-9-6	6-8-9-11-8	5-8-8-11-7	6-8-8-11-6	6-8-10-10-8	6-8-8-10-8
Hindlimb(R)	5-7-8-9-6	6-8-9-11-8	5-7-8-10-7	6-8-9-11-7	5-8-10-10-7	5-9-8-9-6	6-8-9-11-9	6-8-9-9-8
SL(L/R)	10(8)/9(7)	10(8)/10(7)	8(7)/8(7)	10(7)/10(8)	10(7)/10(8)	10(7)/11(8)	10(8)/11(8)	8(7)/10(8)
IL(L/R)	9/9	9/9	9/8	8/8	9/9	10/10	8/9	8/8

Forearm (FL/SVL 0.12) and tibia short (CL/SVL 0.14); digits moderately short with relatively long terminal phalanges, strongly clawed; all digits of manus and digits I–IV of pes indistinctly webbed; terminal phalanx of all digits curved, arising angularly from distal portion of expanded lamellar pad, more than half as long as associated toepad; scansors beneath each toe undivided throughout, in a straight transverse series: 6-7-8-9-7 (left manus), 5-7-8-9-6 (right manus), 6-9-8-11-7 (left pes), 5-7-8-9-6 (right pes). Relative length of digits (measurements in mm in parentheses): IV (4.5) > III (4.3) > II (4.0) > V (3.4) > I (2.9) (left manus); IV (5.0) > III (4.7) > V (4.2) > II (3.8) > I (2.8) (left pes).

Hemipenes partially everted, followed by six or seven rows of flat, weakly pointed, imbricate scales in the pygal region. Tail entire, rounded at the base, flat beneath, tapering posteriorly, covered above uniformly with round, smooth, flat, sub-imbricate scales that become slightly larger laterally; subcaudal scales larger, with an undivided median series of enlarged scales. An uninterrupted series of 35 precloacofemoral pores that are only faintly visible towards the knee (Fig 13E).

Variation in paratypes. Internasals separated by two smaller scales in BNHS 2357, BNHS 2359, BNHS 2360 and ZSIK 2989. Inner postmentals bordered posteriorly by two gular scales in BNHS 2357 and ZSIK 2989, by four gulars in BNHS 2358, BNHS 2359, BNHS 2360 and ZSIK 2988. Inner postmentals bordered laterally by a smaller, flat scale in BNHS 2357, BNHS 2359 and ZSIK 2989. Outer postmentals bordered by three gulars in BNHS 2359 (L) and ZSIK 2988 (R) and five in BNHS 2357 (L), BNHS 2359 (R), BNHS 2360 (R) and ZSIK 2989 (R,L). Outer postmentals not in contact with infralabials in BNHS 2357 and BNHS 2359 and in contact only with infralabial I in ZSIK 2988 (R) and ZSIK 2989 (R,L). Other morphological variations are listed in Table 8.

Colour in preservative. Dorsum predominantly dull brown mottled with darker, discontinuous streaks from the snout to the base of tail (Fig 12A). Similar mottling faintly visible on dorsal aspect of limbs. Neck with a dark, longitudinal streak, flanked on either side by 2 discontinuous lines emanating from the eye upto the forearm insertion. Inter-orbital region with a single, dark boomerang shaped blotch. Labials as dark as rest of the head with a faint, pattern-less scattering of darker spots on each one. Supralabials bordered by a dark, roughly triangular streak from nostril to eye. Limbs no different from rest of the dorsum. Tail of similar ground colour to dorsum with alternating pale-dark longitudinal bands, the first pair of which is roughly saddle-shaped. Ventral region uniformly cream coloured. Ventral surface of tail pale, with scattered mid-brown speckling in the anterior half and alternating pale-dark bands in the distal half.

Colouration (*in life*) *(based on photographs of an uncollected topotype)*. Dorsal markings distinct in life (Fig 15C). Dorsum creamish with darker mottling and streaks throughout. Head dorsum ground colour, with three distinctly paler patches anterior and posterior to the eye and just above the ear opening. Labials with dark yellow spots. Snout with a mottling of dark and yellow spots. A dark streak emanating from above the third supralabial to eye, continues posteriorly up to posterior-lateral part of head. A dark discontinuous streak originating at the ear opening, continues beyond the forelimb insertion. A dark longitudinal streak at the mid-occipital region, that is flanked by two dark curves. Eight dark blotches along the vertebral region from the neck to the sacrum. Limbs of ground colour with dark blotches scattered irregularly. Anterior portion of tail ground colour, with three distinct dark spots in the vertebral region. Tail regenerated, distinctly banded with alternating light and dark portions. Iris marbled, golden, suffused with prominent dark-brown venation; pupil black with crenulated margins.

Etymology. The specific epithet is an eponym honouring Kerala-born Janaki Ammal, the first Indian woman to obtain a doctorate in Botany in 1931. She obtained a PhD degree in an age when most Indian women were barely allowed a high school education because of prevailing social mores, and made seminal contributions to her fields of cytogenetics and phytogeography.

Suggested Common name. Janaki's Dravidogecko.

Distribution. *Dravidogecko janakiae* **sp. nov.** is presently restricted in distribution to the northern outskirts of Munnar town in Idukki District, Kerala. The habitat is composed of southern west-coast evergreen forests and southern tropical moist deciduous forests (Champion & Seth 1968). These habitats are at an altitude of 2000–2200 m asl and receive an average annual rainfall of ~3600 mm.

Habitat and natural history. The type-series was collected from tree trunks and buildings surrounded by mixed forests composed of evergreen and deciduous trees in the outskirts of Munnar town. Munnar falls under the Alleppey-Mangalore rainfall regime and receives upto 5000 mm of rainfall annually, spread over 144 days (Pascal 1982). Two species of *Cnemaspis* and one species of *Hemidactylus* were found in sympatry with *Dravidogecko* in the region.

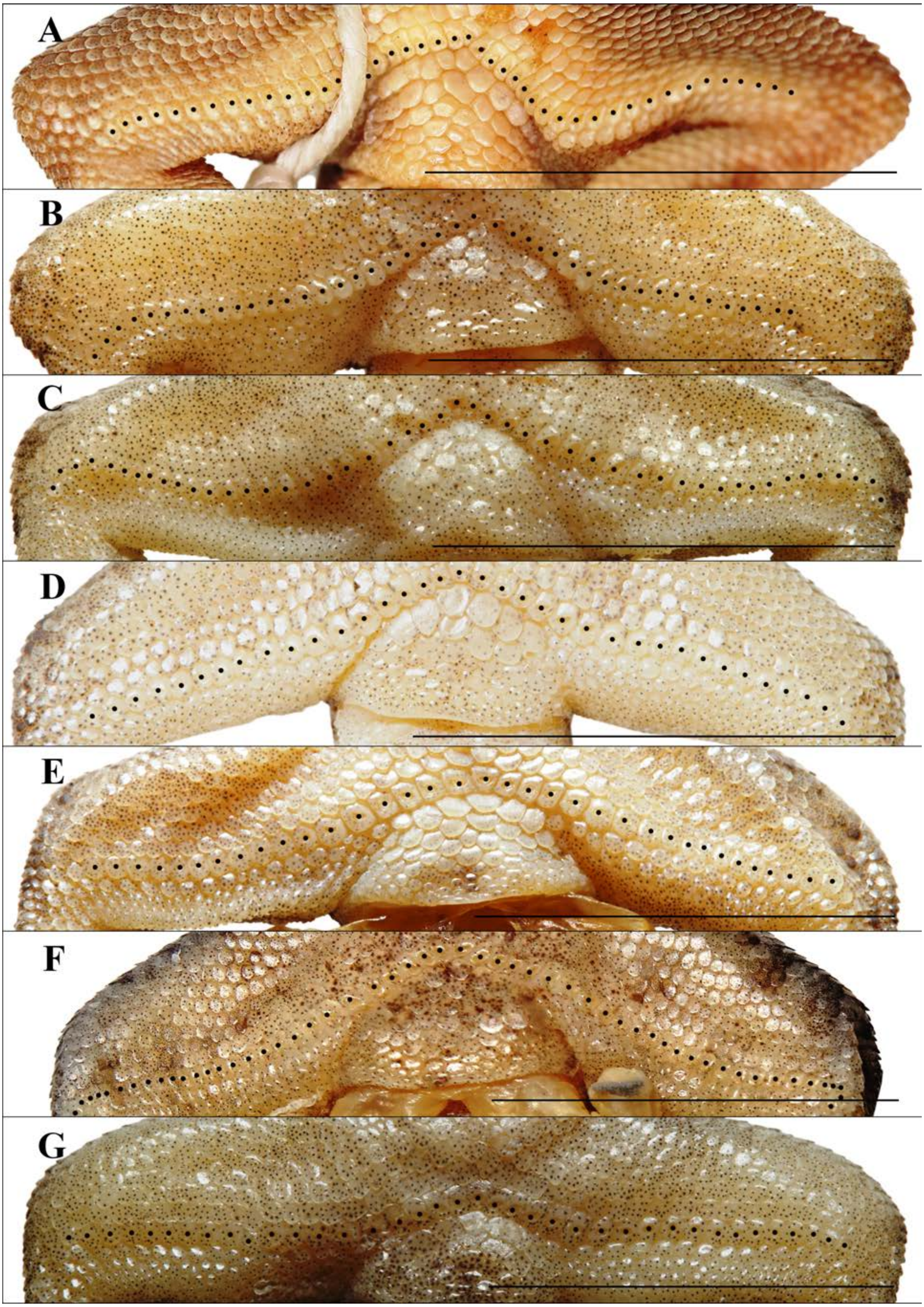

FIGURE 13. Cloacal region showing precloacofemoral pores (indicated by black dots) in the congeners of *Dravidogecko*. A) *D. anamallensis* B) *D. douglasadamsi* **sp. nov.** C) *D. smithi* **sp. nov.** D) *D. meghamalaiensis* **sp. nov.** E) *D. janakiae* **sp. nov.** F) *D. septentrionalis* **sp. nov.** G) *D. tholpalli* **sp. nov.** Scale bar = 10 mm

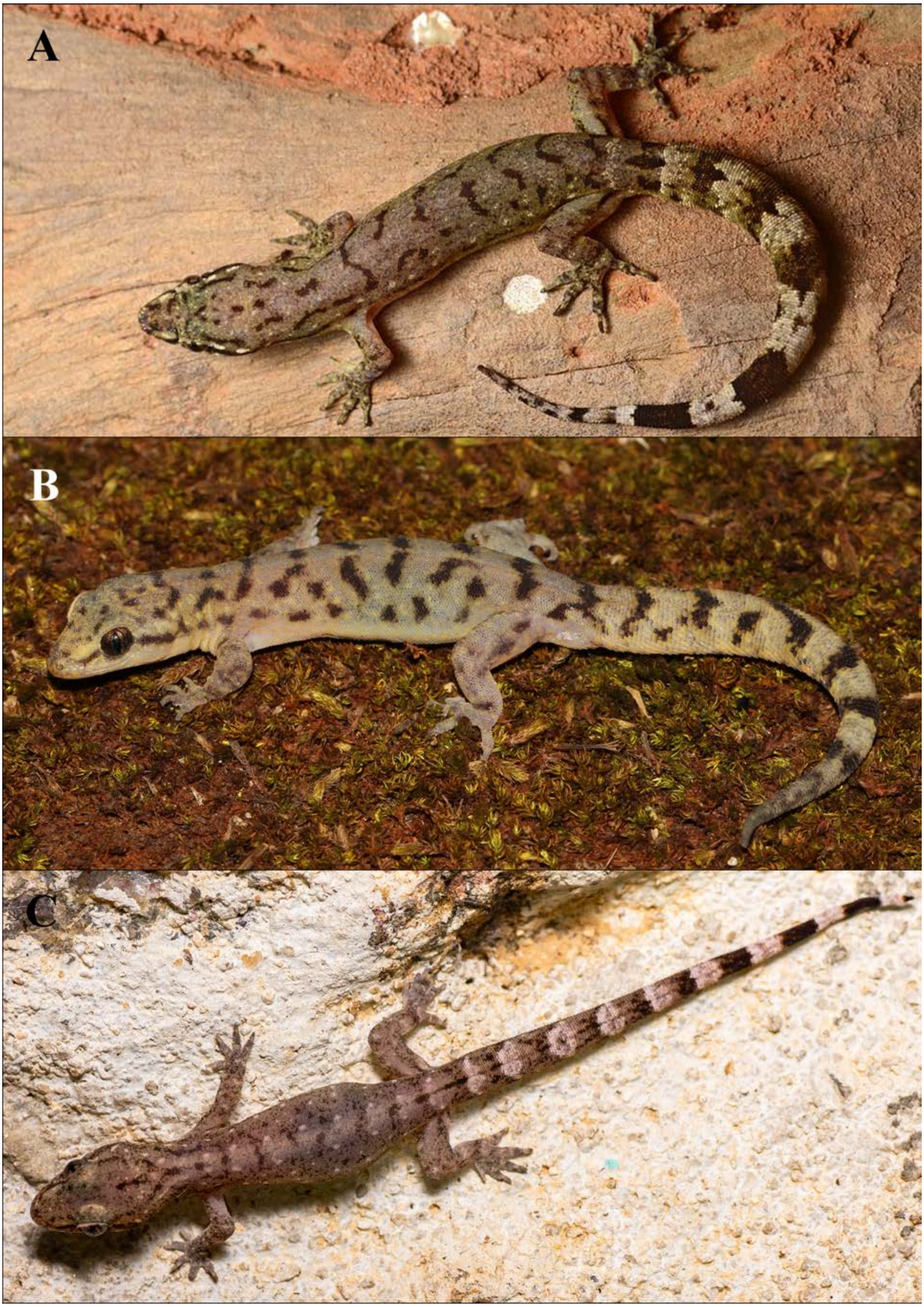

FIGURE 14. A) *Dravidogecko septentrionalis* **sp. nov.** (BNHS 2344) in life, from Lakkidi village, Wayanad, Kerala B) *Dravidogecko meghamalaiensis* **sp. nov.** (BNHS 2347) in life from Meghamalai, Theni, Tamil Nadu C) *Dravidogecko douglasadamsi* **sp. nov.** (uncollected specimen) from Manjolai estate, Tirunelveli, Tamil Nadu

FIGURE 15. A) *Dravidogecko smithi* **sp. nov.** (BNHS 2350) from Ponmudi, Tiruvananthapuram, Kerala B) *Dravidogecko tholpalli* **sp. nov.** (uncollected specimen) from Kodaikanal town, Dindigul, Tamil Nadu C) *Dravidogecko janakiae* **sp. nov.** (uncollected specimen) from Munnar, Idukki, Tamil Nadu.

TABLE 9. Uncorrected p-distance matrix based on the ND2 gene for all the species of *Dravidogecko* described herein. Numbers in the diagonal indicate intraspecific divergence. X indicates absence of information.

	D. anamallensis	*D. septentrionalis* **sp. nov.**	*D. meghamalaiensis* **sp. nov.**	*D. douglasadamsi* **sp. nov.**	*D. smithi* **sp. nov.**	*D. tholpalli* **sp. nov.**	*D. janakiae* **sp. nov.**
D. anamallensis	0.024						
D. septentrionalis **sp. nov.**	0.050–0.065	0.003					
D. meghamalaiensis **sp. nov.**	0.131–0.138	0.130–0.137	0.004				
D. douglasadamsi **sp. nov.**	0.110–0.115	0.151–0.152	0.162–0.165	X			
D. smithi **sp. nov.**	0.154–0.170	0.108–0.113	0.128–0.131	0.113	0.002		
D. tholpalli **sp. nov.**	0.168–0.175	0.169–0.180	0.204–0.212	0.212–0.214	0.180–0.184	0.003	
D. janakiae **sp. nov.**	0.160–0.168	0.163–0.168	0.204–0.210	0.213–0.215	0.182–0.185	0.101–0.105	0.002

Discussion

Phylogenetic relationships, diversity and distribution. Amongst the two broad clades consistently recovered using various phylogenetic analyses, clade A, comprising *D. tholpalli* **sp. nov.** and *D. janakiae* **sp. nov.** is restricted to the SP region (Fig 2A) while clade B is seemingly more widespread and distributed across NP, SP and SS. Further, there seems to be separation across an elevation gradient between the two broad clades with clade A being restricted to the higher elevations (~1900–2100 masl) while clade B inhabits the mid elevation regions (~850–1500 masl) of the Western Ghats. Given the limited distribution range for *Dravidogecko* across the southern Western Ghats, there exist ostensible sampling gaps in the Cardamom Plateau, Tenmala Hills (SP) and the Nilgiris Biosphere Reserve (NP). Sampling in these areas could perhaps better resolve relationships, especially for the taxa within Clade B from either side of the Palghat Gap. The genetic proximity between *D. anamallensis* (SP) and *D. septentrionalis* **sp. nov.** (NP) that diversified during the late Miocene, is intriguing given the large distance and the presence of the Palghat gap, a significant biogeographic barrier, between them (Fig 1). A similar relationship has been established between frogs of the genus *Raorchestes* Biju, Shouche, Dubois, Dutta & Bossuyt, 2010 that also underwent late Miocene diversification (Vijaykumar *et al.* 2014). They argue that the Palghat Gap intermittently acted as a permeable barrier, given the undeniable evidence of exchange and diversification of bush-frog lineages on both sides of the gap. The exchange of high-elevation lineages during the Miocene suggests that the gap was maybe not as impermeable, and constituted a contiguity of favourable ecological conditions for dispersal during the time.

On the contrary, the lineages of *Dravidogecko* from Kodaikanal (*D. tholpalli* **sp. nov.**) and Munnar (*D. janakiae* **sp. nov.**) exhibit relatively higher genetic divergence, despite their geographic proximity (~ 40–50 km straight line distance) and the lack of a perceivable barrier between them. This genetic structure between populations from Munnar and Kodaikanal has been observed in other smaller animals (Sekar & Karanth 2013; Robin *et al.* 2015). Sekar & Karanth (2013) speculated that the differences in rainfall regimes between these two localities (Fig S3B) are a causal factor that limits dispersal (and therefore gene flow) abilities in butterflies of the genus *Heteropsis* Westwood, 1850. The high genetic variation exhibited by *D. tholpalli* **sp. nov.** and *D. janakiae* **sp. nov.** could therefore well be a biproduct of adaptation to diverse rainfall regimes combined with the inability of *Dravidogecko* from the high altitudes (Clade A) to disperse across the intervening regions (Fig S3).

Investigating the spaces between sampling locations for *Dravidogecko* should likely yield more lineages and help establish more accurate genetic, morphological and spatial conscriptions for species. Sispara Ghat (NP) and the Cardamom Plateau (SP) harbour populations of *Dravidogecko* that were not sampled as part of this study. Fine-scaled sampling across the Nilgiris (NP), Cardamom Plateau (SP) and the Agathyamalai Hills (SS) would certainly enhance our present understanding of the biodiversity in this group. The reason for the absence of *Dravidogecko* from north of the Wayanad Plateau or even in the Eastern Ghats is presently a matter of conjecture and should make for an interesting follow up study.

Divergence dating. A previous study (Bansal & Karanth 2013) that included *Dravidogecko* in a divergence dating analysis used a concatenated nuclear dataset comprising of RAG-1 and Phosducin (PDC) genes and a mutually exclusive set of calibrations from the present one (Table 3). The estimates presented herein reveal younger divergence times for *Dravidogecko* from the results obtained by Bansal & Karanth (2013). These results support a late Palaeocene (ca. 58 Mya) as opposed to a late Cretaceous (68.9 Mya) origin for this lineage which was proposed by Bansal and Karanth (2013). However, the biogeographic hypothesis of its transmarine dispersal into peninsular India remains unaltered. The crown gekkotan fossils including *Cretaceogecko burmae* dated with reasonable accuracy to ca. 99 Mya (Daza *et al.* 2016) and used herein, most likely resulted in the disparity in dates between the two studies. The divergence dates for all gekkotan groups presented here are more or less consistent with a previous study that used *Cretaceogecko* as calibration (see Agarwal *et al.* 2017). Fossil evidence from the late Cretaceous–early Palaeocene strata of India indicate a migration of many microvertebrate forms with Eurasian relationships, suggesting a change in faunal affinities from Gondwanic to Holarctic (Sahni *et al.* 1987; Briggs 2003). However, it is also argued that the southern tip of India underwent faunal exchange with Madagascar through the Seychelles-Mascarene plateau until the early Cenozoic (65 Mya), while the northern tip made glancing contact with Sumatra and later, Burma at ca. 57 Mya (Ali & Aitchison 2008). Given this complexity in India's geological past combined with the ambiguity in the origins of its sister genus *Hemidactylus*, the origins of the ancestral stock of *Dravidogecko* are presently a matter of conjecture and cannot be propounded with much confidence.

Mean diversification estimates within lineages of *Dravidogecko* (8.52 Mya ± 2.9) indicate late-Miocene cladogenesis. Tropical evergreen broadleaved forests prevailed across peninsular India between the mid-Miocene climatic optimum (17–15 Mya) until the beginning of the Tortonian (11.6 Mya) (Pound *et al.* 2012). Subsequent global cooling and warming events including severe aridification during the late-Miocene resulted in the fragmentation of these wet forests. These dynamics in vegetation and temperature were possibly a causal factor leading to climate-induced vicariance (fragmentation) within *Dravidogecko*. A similar pattern has been proposed for the increase in diversification rates of the terrestrial, forest dwelling subgenus *Geckoella* (Genus: *Cyrtodactylus*) during the late-Miocene (Agarwal & Karanth, 2015).

Niche conservatism, morphology and osteology. *Dravidogecko* spp. across their geographic range, exhibit a high degree of niche conservatism—the tendency to retain ancestral ecological characteristics. They are adapted to a mountainous, wet-deciduous–evergreen vegetation gradient and are exclusively scansorial. The ecological compulsions that arise due to niche conservatism in *Dravidogecko* have led to geographical isolation and consequently to allopatric speciation, akin to observations in other squamate and anuran lineages (Wiens & Graham 2005).

Another implication of niche conservatism is a lack in morphological variability amongst species owing to similar ecologies (Roughgarden 1972; Stanley 1989; Travis 1989; Johnson & Barton, 2005). All congeners of *Dravidogecko* seem highly conserved morphologically, barring the number of precloacofemoral pores in males that exhibit inter-specific variation. The dimensions of ventral head shields (mental, inner and outer post-mentals) vary and are distinctly diagnosable in certain species (*D. anamallensis & D. tholpalli* **sp. nov.**). The geometry and number of enlarged tubercles on the dorsal aspect (including tail) has been used historically as a significant inter-specific diagnostic character in many groups of geckos (Bauer & Giri 2004; Manamendra-Arachchi *et al.* 2007; Chaitanya *et al.* 2018 etc.). The lack of dorsal tubercles in *Dravidogecko*, a significant inter-specific diagnostic character in many other gecko groups, further limits taxonomic conscription in this genus.

Amongst significant skeletal features which have been used to classify gekkotans in the past, the second ceratobranchial arch is absent in *Dravidogecko* (Fig 5B)—a character which was proposed to be a synapomorphy for the tribe Gekkonini (Kluge 1987). However, Gamble *et al.* (2008) showed that this character is highly homoplasious as the second ceratobranchial has been lost independently, several times within Gekkota. *Dravidogecko* retain the primitive reptilian phalangeal formula of 2-3-4-5-3 for manus and 2-3-4-5-4 for pes (Fig 5C). The reduction in size of the antepenultimate phalanx in digits 3,4 in manus and 3,4 and 5 in pes as seen in the gekkonine clade comprising *Cyrtodactylus*+[*Hemidactylus*+*Dravidogecko*], could represent a synapomorphic state (Russell 1977, Gamble *et al.* 2012). While the antepenultimate phalanges in these digits are merely reduced in *Cyrtodactylus*, they are remarkably diminutive in *Hemidactylus* and *Dravidogecko* (see Russell 1977 and Fig 5C) and possibly represent a synapomorphy shared between these two sister genera.

Conservation implications. Increased anthropogenic activity in the Western Ghats, labelled one of the eight "hottest hotspots" in biological diversity (https://whc.unesco.org/), has led to large-scale deforestation in this landscape. An estimated 25% reduction of forest cover has been reported from the southern Western Ghats between the years 1979 and 1995 (Jha *et al.* 2000). The conservation of wet-adapted, endemic fauna like *Dravidogecko* is unequivocally correlated to the protection of these forests from anthropogenic pressure. Moreover, the Western Ghats harbours biodiversity with lineages represented by both the "Out of India" and "Out of Asia" biogeographic hypotheses (Datta-Roy & Karanth 2009). A holistic approach to conservation should lay equitable emphasis on the diversity in evolutionary/biogeographic histories of the biota in a landscape. Consequently, lineages with ancient origins in India, including exemplar herpetofaunal genera such as *Nasikabatrachus* Biju & Bossuyt, 2003, *Indirana* Laurent, 1986, *Micrixalus* Boulenger, 1888, *Dravidogecko*, *Indotyphlus* Taylor 1960, *Ichthyophis* Fitzinger, 1826 etc., implore concerted attention. Present-day conservation strategies lay inordinate emphasis on "charismatic species", especially large mammals, often ignoring lineages with diverse evolutionary histories. Innovative measures that look outside these conventional mores are exigent and must be devised and implemented to holistically conserve the biodiversity India harbours.

A key to the species of *Dravidogecko*

1a.	Number of precloacofemoral pores > 40	2
1b.	Number of precloacofemoral pores <= 40	5
2a.	Number of precloacofemoral pores < 50	3
2b.	Number of precloacofemoral pores 52–56	*D. septentrionalis* **sp. nov.**
3a.	Postmentals comparable in size with mental or shorter	4
3b.	Postmentals distinctly longer than mental; number of precloacofemoral pores 45 or 46	*D. anamallensis*
4a.	Number of precloacofemoral pores 40–43	*D. douglasadamsi* **sp. nov.**
4b,	Number of precloacofemoral pores 48	*D. smithi* **sp. nov.**
5a.	First pair of postmentals distinctly longer than the second	6
5b.	First pair of postmentals only marginally longer than the second; number of precloacofemoral pores 36–38	*D. meghamalaiensis* **sp. nov.**
6a.	Number of femoral pores 38–40	*D. tholpalli* **sp. nov.**
6b.	Number of femoral pores 35 or 36	*D. janakiae* **sp. nov.**

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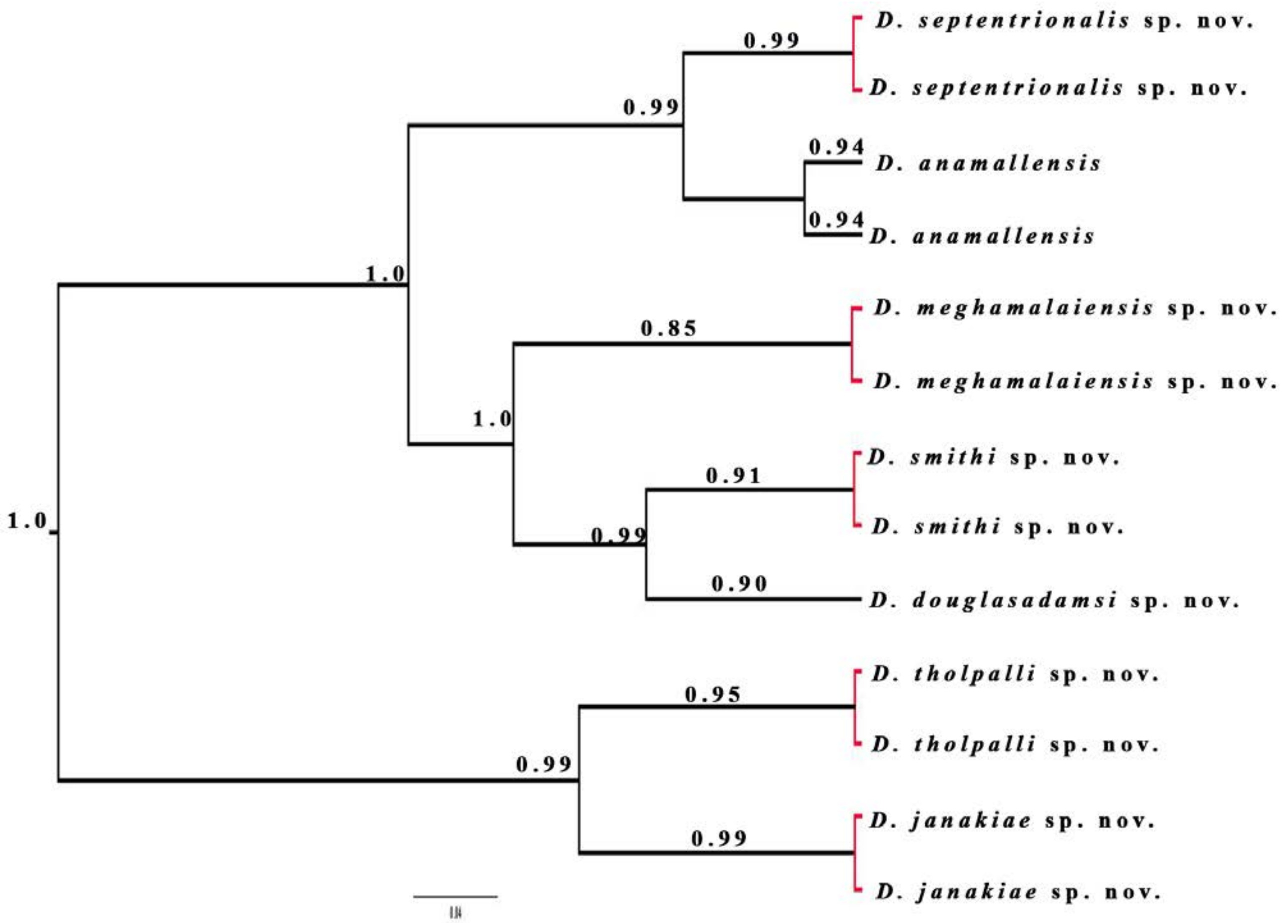

FIGURE S1. Species delimitation results as depicted on an ultrametric tree based on the ND2 dataset. Terminal branches in red indicate clusters within species, in black indicate distinct species as estimated by GMYC. Posterior probability on branches indicate support for delimitation of those terminal nodes as distinct species using the bPTP tool. Posterior probabilities against internal nodes indicate support for a species-level lineage split as estimated by the BPP tool.

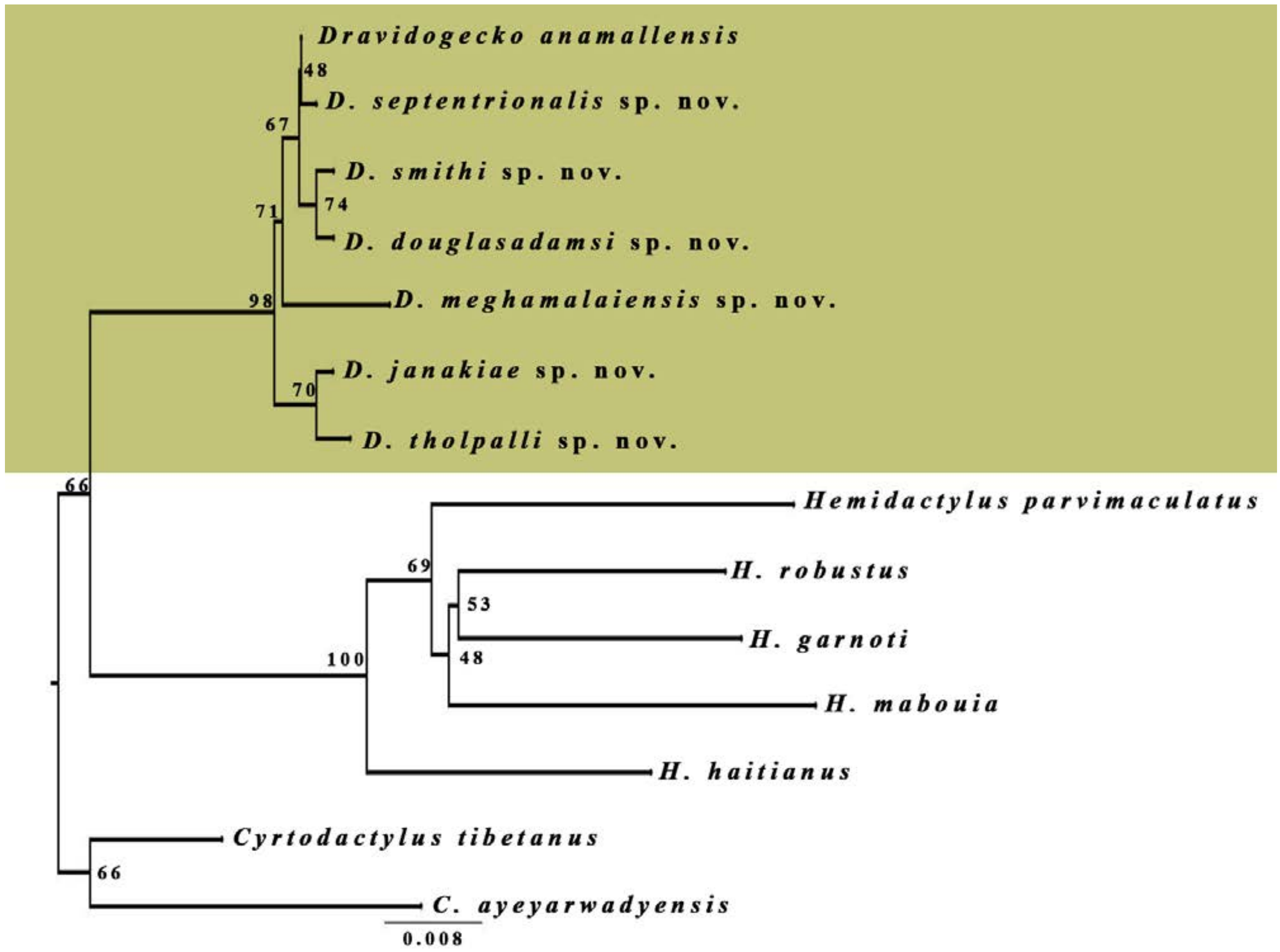

FIGURE S2. ML phylogeny of *Dravidogecko* based on the RAG-1 and PDC genes.

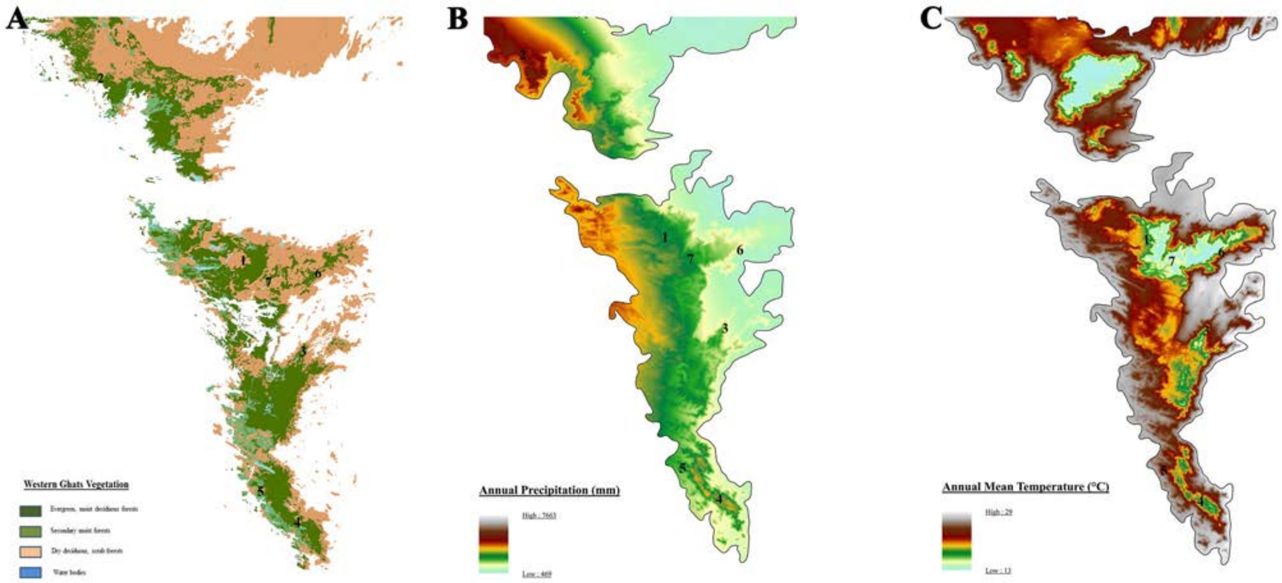

FIGURE S3. Eco-climatic maps of the southern Western Ghats. A) Vegetation B) Mean annual rainfall C) Mean annual temperatures.

TABLE S4. The list of gekkotan exemplars and their sequence numbers for the ND2 and RAG-1 genes used to estimate divergence dates in *Dravidogecko*. Families within Gekkota are abbreviated as follows: Cp-Carphodactylidae, Dp-Diplodactylidae, Py-Pygopodidae, Sp-Sphaerodactylidae, Eu-Eublepharidae, Gk-Gekkonidae, Ph-Phyllodactilydiae.

Family	Species	ID	Location	Genbank accession numbers	
				ND2	RAG1
Cp	*Carphodactylus laevis*	AMS 143258	Lamb Range, Queensland, Australia	GU459943	EF534781
Cp	*Nephrurus levis*	AMS140561	Western Australia, Australia	AY369018	GU459544
Cp	*Saltuarius swaini*	AMS143262	Lamb Range, Queensland, Australia	JX024356	JQ945338
Dp	*Crenadactylus ocellatus*	AMS R162089	Trephina Gorge, Northern Territory, Australia	JX024364	AY662627
Dp	*Lucasium stenodactylum*	AMS 139897	Western Australia, Australia	JQ173630	JQ173724
Dp	*Diplodactylus tesselatus*	AMS 143855	Stonehenge area, Queensland, Australia	JQ173631	JQ173725
Dp	*Naultinus elegans*	-	Whangarei, New Zealand	GU459757	GU459354
Dp	*Oedodera marmorata*	CAS 230936	Paagoumène, New Caledonia	GU459947	JQ945318
Dp	*Oedura marmorata*	AMS 143861	Australia, Queensland	GU459951	EF534779
Dp	*Pseudothecadactylus lindneri*	MVZ 99544	Kakadu Natl. Park, NT, Australia	GU459946	HQ426318
Dp	*Woodworthia maculata*	RAH 292	New Zealand, Titahi Bay	GU459852	GU459449
Py	*Pygopus lepidopodus*	WBJ 1206	Western Australia, Australia	AY134603	HQ426319
Py	*Lialis burtonis*	JFBM 8	Australia (captive)	-	GU459540
Py	*Paradelma orientalis*	QM J56089	20 km N Capella, Queensland, Australia	AY134605	HQ426304
Py	*Pygopus nigriceps*	MVZ 197233	Australia, Northern Territory	JX440518	EF534783
Sp	*Sphaerodactylus elegans*	YPM 14795	Monroe County, Florida, USA	JN393942	EF534787
Sp	*Sphaerodactylus roosevelti*	CAS 198428	USA, Puerto Rico	JN393943	EF534785
Eu	*Eublepharis fuscus*	-	India, Himachal Pradesh, Shimla	KU549142	KU549109
Eu	*Eublepharis fuscus*	-	India, Gujarat	KU549151	KU549118
Eu	*Eublepharis satpuraensis*	-	India, Maharashtra, Satpura	KU549149	KU549116
Eu	*Eublepharis fuscus*	-	India	KU549151	KU549118
Eu	*Eublepharis hardwickii*	-	India, Andhra Pradesh, Vishakapatnam	KU549155	KU549123
Eu	*Coleonyx brevis*	TG 00194	Hudspeth County, Texas, USA	JX041333	HQ426271
Eu	*Coleonyx elegans*	-	Central America, Mexico	AB308465	-
Eu	*Coleonyx mitratus*	TG 00075	unknown	JX041334	HQ426272

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TABLE S1. (Continued)

Family	Species	ID	Location	Genbank accession numbers	
				ND2	RAG1
Eu	*Coleonyx variegatus*	CAS 205334	Imperial Co.,California, USA	JX041335	EF534777
Eu	*Holodactylus africanus*	CAS 198845	Kajiado District, Kenya	JX041372	HQ426296
Eu	*Aeluroscalabotes felinus*	JB16	Cameron Highlands, Malaysia	JX041301	HQ426259
Eu	*Goniurosaurus araneus*	JFBM15830	Vietnam	JX041364	HQ426287
Eu	*Goniurosaurus kuroiwae*	-	Japan	AB308469	-
Eu	*Goniurosaurus lichtenfelderi*	-	Southeast China	AB308470	-
Eu	*Goniurosaurus luii*	TG00795	China	JX041365	HQ426287
Gk	*Hemitheconyx caudicinctus*	TG00180	-	JX041370	HQ426294
Gk	*Hemitheconyx caudicinctus*	-	West Africa	AB308472	-
Gk	*Hemitheconyx taylori*	JB 12	Somalia	JX041371	HQ426295
Eu	*Holodactylus africanus*	-	East Africa	AB308474	-
Ph	*Asaccus platyrhynchus*	CAS 227605	Wilayat Nazwa, Oman	JX041313	EU293625
Ph	*Garthia gaudichaudii*	SC 1	Chile	JX041351	HQ426281
Ph	*Homonota darwinii*	LJAMM 4601	Puerto Deseado, Santa Cruz, Argentina	JX041373	EU293628
Ph	*Phyllodactylus xanti*	ROM 38490	Mexico, Baja California Sur	JN393940	EF534807
Ph	*Phyllopezus pollicaris*	MZUSP 92491	das Confusões, Piauí, Brazil	JX041417	EU293635
Ph	*Ptyodactylus guttatus*	TG 00072	Egypt (captive)	JX041426	EU293636
Ph	*Tarentola deserti*	JB 44	unknown	JX041445	HQ426333
Ph	*Thecadactylus rapicauda*	USNM 561446	St. Croix, U.S. Virgin Islands	JX041456	EU293643
Py	*Aprasia parapulchella*	MVD66569	Bendigo Whipstick, Victoria, Australia	GU459941	HQ426260
Py	*Delma butleri*	SAM R36144	Coonbah, New South Wales, Australia	AY134584	HQ426276
Sp	*Aristelliger praesignis*	USNM 337563	Kingston, St. Andrew Parish, Jamaica	JX041312	HQ426262
Sp	*Coleodactylus cf. brachystoma*	CHUNB 43901	São Domingos, Goiás, Brazil	JX041331	HQ426270
Sp	*Euleptes europaea*	-	Liguria, Italy	JN393941	EF534806
Sp	*Sphaerodactylus grandisquamis*	TG0099	Puerto Rico	KP640637	HQ426326
Sp	*Sphaerodactylus nigropunctatus*	FLMNH 144010	Long Island, Bahamas	JX041439	HQ426329
Sp	*Pseudogonatodes guianensis*	KU 222142	Loreto, Peru	JX041421	EF534784
Sp	*Quedenfeldtia trachyblepharus*	MVZ 178121	Oukaimeden, Morocco	JX041428	EF534804

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TABLE S1. (Continued)

Family	Species	ID	Location	Genbank accession numbers	
				ND2	RAG1
Sp	*Saurodactylus fasciatus*	DJH M616	*Zumi, Morocco*	JX041434	HQ426322
Sp	*Saurodactylus mauritanicus*	DJH Sm61	NW of Ain Benimather,Morocco	JX041435	HQ426323
Gk	*Microgecko persicus*	CES09/1115	India, Rajasthan, Jaisalmer District, Nabh Dongar	KJ794409	KJ794388
Gk	*Altiphylax stolickzai*	CES09/1237	India, Jammu and Kashmir, Ladakh, Leh	KJ794404	KJ794394
Gk	*Ramigekko swartbergensis*	JB 47	Swartberg Mts., Western Cape Prov., South Africa	JX041305	JQ945280
Gk	*Afroedura loveridgei*	GVH 3969	Mozambique	JX041303	JQ945278
Gk	*Alsophylax pipiens*	CAS 238804	Mongolia, Khovd, 1km N of Bulgam	KC151973	KC152020
Gk	*Cyrtodactylus angularis*	FMNH 265815	Thailand, Sa Kaeo, Muang Sa Kaeo	JX440523	JQ945301
Gk	*Cyrtodactylus ayeyarwadyensis*	CAS 216459	Myanmar, Rakhine State, Than Dawe District	JX440526	JX440634
Gk	*Cyrtodactylus battalensis*	PMNH 2301	Pakistan, NWFP, Battagram City	KC151983	KC152035
Gk	*Cyrtodactylus intermedius*	FMNH 265812	Thailand, Sa Kaeo, Muang Sa Kaeo	JQ889182	JX440701
Gk	*Cyrtodactylus irregularis*	FMNH 258697	Pakxong District, Champasak Province, Lao PDR	JX440540	JQ945302
Gk	*Cyrtodactylus kimberleyensis*	WAM R164144	Australia, Western Australia, East Montalivet Island	JX440544	JX440703
Gk	*Cyrtodactylus loriae*	FK 7709	Papua New Guinea, Milne Bay Prov., Bunisi, N slope Mt. Simpson	EU268350	EU268289
Gk	*Cyrtodactylus oldhami*	JB 126	captive	JX440548	JX440707
Gk	*Cyrtodactylus paradoxus*	LSUHC 8672	Vietnam, Hon Nghe Island	JX440549	JX440709
Gk	*Cyrtodactylus pulchellus*	LSUHC 6637	West Malaysia, Selangor, Genting Highlands	-	JX440711
Gk	*Cyrtodactylus pulchellus*	LSUHC 6729	West Malaysia, Penang, Pulau Penang, Moongate Trail	JX440552	-
Gk	*Cyrtodactylus quadrivirgatus*	LSUHC 4813	West Malaysia, Pahang, Pulau Tioman, Tekek-Juara Trail	JX440553	JX440712
Gk	*Cyrtodactylus tibetanus*	MVZ 233251	Tibet, Lhasa, 3 km WNW of Potala Palace	JX440561	JX440722
Gk	*Cyrtodactylus triedra*	AdS 35	Sri Lanka, Yakkunehela	JX440522	JX440682
Gk	*Cyrtodactylus tuberculatus*	CJS 833	Northeast Queensland, Australia	JX440564	JX440725
Gk	*Calodactylodes illingworthorum*	AMB7415	Sri Lanka,Pitakumbura	JX041318	JQ945288
Gk	*Chondrodactylus fitzsimonsi*	CAS 193884	Namibia, 30 km N Swakopmund	-	EU293645
Gk	*Chondrodactylus fitzsimonsi*	MCZ R185712	Namibia, Gai-as spring	JN393945	-
Gk	*Christinus marmoratus*	AMS 135338	Wirralie, Ladysmith, New South Wales, Australia	JX041322	JQ945290
Gk	*Cnemaspis africana*	CAS 168872	Amani, Tanga, Tanzania	JX041323	JQ945359

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TABLE S1. (Continued)

Family	Species	ID	Location	Genbank accession numbers	
				ND2	RAG1
Gk	*Cnemaspis dickersonae*	MTSN 8604	Uzungwa Scarp, Tanzania	JX041324	JQ945292
Gk	*Cnemaspis kendalii*	LSHUC6562		JX041326	JQ945294
Gk	*Cnemaspis limi*	LSHUC 6267	Pulau Tioman, Malaysia	JX041327	EF534809
Gk	*Cnemaspis alwisi AA60*	WHT 5918	Sri Lanka, Moneragala district	KY038012	KY037921
Gk	*Cnemaspis gemunu*	AMB7495	Sri Lanka, Nuwara Eliya District, Hakgala	KY037998	KM878597
Gk	*Cnemaspis kallima*	AA82	Sri Lanka, Matale District, Rattota, Gammaduwa	KY037970	KY037895
Gk	*Cnemaspis kandiana*	AA57	Sri Lanka, Kandy District, Gannnoruwa	KY037971	KY037896
Gk	*Cnemaspis kumarasinghei*	AA7431	Sri Lanka, Moneragala District, Rathataakanda (Buttala)	KY037974	-
Gk	*Cnemaspis latha*		Sri Lanka, Nuwara Eliya District, Bandarawela	KY037976	KY037900
Gk	*Cnemaspis modigliani*	MVZ 239314	Sumatra, Kecematan Enggano, Pulau Enggano, near Malakoni	KY037977	KM878601
Gk	*Cnemaspis phillipsi*	AA 81	Sri Lanka, Matale District, Rattota, Gammaduwa	KY038001	KY037914
Gk	*Cnemaspis podihuna 58A*	58 A	Sri Lanka, Moneragala District, Kukulagoda	KY038005	KM878603
Gk	*Cnemaspis punctata*	AA 80	Sri Lanka, Matale District, Rattota, Gammaduwa	KY038007	KY037918
Gk	*Cnemaspis sp.*	SB 048	India, Karnataka, Kodagu District, Kumarahalli	KY037995	-
Gk	*Cnemaspis sp.*	SB 151	India, Kerala, Thrissur District, Athirappilly Falls	KY038013	-
Gk	*Cnemaspis scalpensis*	WHT 7268	Sri Lanka, Kandy District, Gannnoruwa	KY038008	KY037919
Gk	*Cnemaspis silvula*	AA 88	Sri Lanka, Galle District, Hiyare forest reserve	KY037984	KY037904
Gk	*Cnemaspis samanalensis*	AMB7505	-	KY037983	KY037903
Gk	*Cnemaspis upendrai AA83*	AA 83	-	KY037986	KY037894
Gk	*Colopus wahlbergii*	NMZ16974	Kalamba Station, Kazungula Dist., Zambia	JX041337	JQ945298
Gk	*Dixonius vietnamensis*	FMNH 263003	Cambodia, Mondolkiri Province, Keo Seima district	EU054297	EU054281
Gk	*Ebenavia inunguis*	ZCMV 2099	Cambonia Marojejy, Madagascar	JX041348	HQ426280
Gk	*Elasmodactylus tetensis*	PEM 5551	Niassa Game Reserve, Mozambique	JX041349	JQ945307
Gk	*Gekko monarchus*	LLG 4824	West Malaysia, Selangor, Kepong, FRIM	JN019078	JN019142
Gk	*Gekko smithi*	LLG 7648	West Malaysia, Johor, Endau-Rompin, Peta	JN019056	JN019121
Gk	*Gekko vittatus*	AMS 138865	Vanuatu, Gaua Island	JN019072	JN019137

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TABLE S1. (Continued)

Family	Species	ID	Location	Genbank accession numbers	
				ND2	RAG1
	Geckolepis maculata	FGZC 463	Montagne d'Ambre, Madagascar	EU054235	EU054211
Gk	*Gehyra australis*	AMS 139934	Australia, Western Australia, El Questro	JN019081	JN019145
Gk	*Gekko gecko*	MVZ 215314	Thailand, Phuket Island	AF114249	-
Gk	*Gekko badenii*	JB 13	Vietnam	JN019065	JN019130
Gk	*Gekko chinensis*	LSHUC 4209	Wuzhi Shan, Hainan Id., China	JN019058	JN019123
Gk	*Goggia lineata*	AMB4762	Park, Northern Cape Prov., South Africa	JX041353	JQ945310
Gk	*Hemidactylus angulatus*	EBG 746	Guinea, Daniah village at Koulete River	HM559620	HM559686
Gk	*Hemidactylus aquilonius*	CAS 206649	Myanmar, Sagaing Division, Alaungdau Kathapa Natl. Park	EU268373	EU268312
Gk	*Hemidactylus brasilianus*	MZUSP 92493	Brazil, Piauí, Parque Nacional Serra das Confusões	EU268351	EU268290
Gk	*Hemidactylus fasciatus*	CAS 207777	Equatorial Guinea, Bioko Sur Prov., Near Luba	EU268371	EU268310
Gk	*Hemidactylus giganteus*	JB 03	India (captive specimen)	HM559632	HM559698
Gk	*Hemidactylus greefii*	CAS 219044	São Tome and Principe, São Tome Island, Praia da Mutamba	EU268369	EU268308
Gk	*Hemidactylus mabouia*	AMB 8301	South Africa, Limpopo Prov., nr. Huntleigh	HM559638	HM559704
Gk	*Hemidactylus macropholis*	CAS 227520	Bari Region, Puntland State, Somalia	JX041369	HQ426292
Gk	*Hemidactylus palaichthus*	LSUMZ 12421	Brazil, Roraima State	EU268368	EU268307
Gk	*Hemidactylus persicus*	CAS 227612	Oman, Wilayat Nazwa, 4.5 km N. of Tanuf, Wadi Tanuf	EU268316	EU268346
Gk	*Hemidactylus prashadi*	JB 30	India (captive specimen)	HM559644	HM559709
Gk	*Hemiphyllodactylus typus*	LSUHC 8751	Tasik Chini, Phanag, Malaysia	KF219797	-
Gk	*Homopholis walbergii*	AMB 8410	n/a	EU054244	EU054220
Gk	*Hemiphyllodactylus aurantiacus*	AMB (no number)	India, Tamil Nadu, Yercaud	JN393933	JN393977
Gk	*Hemiphyllodactylus* sp.	LSHC 5797	Malaysia, Johor, Pulau Sibu	JN393936	JN393980
Gk	***Dravidogecko douglasadamsi*** sp. nov.	**BNHS 2349**	Manjolai, Tirunelveli district, India	**MN520270**	**MN520278**
Gk	***Dravidogecko tholpalli*** sp. nov.	**BNHS 2352**	Kodaikanal, Dindigul district, India	**MN520261**	**MN520277**
Gk	*Kolekanos plumicaudus*	WDH 1	Parque Nacional do Iona, Cunene Prov., Angola	JX041304	JQ945279
Gk	*Lepidodactylus orientalis*	BPBM 19794	Papua New Guinea: Sudest Island	JN019080	JN019144
Gk	*Lepidodactylus lugubris*	ZRC 24847	Singapore	JN393944	JX515629

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TABLE S1. (Continued)

Family	Species	ID	Location	Genbank accession numbers	
				ND2	RAG1
Gk	*Luperosaurus cumingii*	RMB 3546	Philippines, Cumiagi	JX515623	JX515637
Gk	*Lygodactylus miops*	ZSM 116/2004	Andohahela, Madagascar	KM034118	HQ426299
Gk	*Mediodactylus brachykolon*	PMNH 2165	Pakistan, NWFP, Battagram City	KC151981	KC152029
Gk	*Matoatoa brevipes*	FG/MV 2002.2237	Tulear area, Madagascar	EF490777	EF490724
Gk	*Mediodactylus russowii*	JEM 863	Kazakhstan, Ili River	JX440517	JX440678
Gk	***Dravidogecko meghamalaiensis* sp. nov.**	**BNHS 2347**	Meghamalai, Theni district, India	**MN520266**	**MN520274**
Gk	***Dravidogecko janakiae* sp. nov.**	**BNHS 2357**	Munnar, Idukki district, India	**MN520268**	**MN520276**
Gk	*Nactus vankampeni*	BPBM 23365	Papua New Guinea, East Sepik Province, Wewak	EU054295	EU054279
Gk	*Paroedura picta*	FG/MV 2002.B1	Berenty, Madagascar	EF536197	EF536149
Gk	*Pachydactylus gaiasensis*	AMB 7596	Gai-As, Namibia	JX041391	JQ945322
Gk	*Cyrtopodion' aravallensis*	CES09/1102	India, New Delhi	KJ794406	KJ794385
Gk	*Cyrtopodion mansurulum*	CES09/1332	Mansar, Samba District, Jammu and Kashmir, India	KJ794415	KJ794397
Gk	*Agamura persica*	FMNH 247474	Gwadar Division, Balochistan, Pakistan	JX440515	JX440675
Gk	*Tropiocolotes nubicus*	JB 123	Egypt	KC151991	KC152042
Gk	*Paragehyra gabriellae*	FGZC 2366	Grotte Ampasy, Madagascar	JX041399	JQ945328
Gk	*Perochirus ateles*	-	Dehpelhi Id., Pohnpei, Federated States of Micronesia	JN393938	JN393984
Gk	*Phelsuma inexpectata*	JB 56	Réunion (captive)	JN393939	JN393983
Gk	*Phelsuma rosagularis*	JB 109	Mauritius (captive)	-	HQ426306
Gk	***Dravidogecko smithi* sp. nov.**		Ponmudi, Tiruvananthapuram district, India	**MN520262**	**MN520279**
Gk	*Pseudogekko smaragdina*	KU 303995	Philippines: Quezon	JX515626	JQ945332
Gk	*Rhoptropella ocellata*	CAS 186351	Richtersveld National Park, Northern Cape, South Africa	JX041429	HQ426308
Gk	*Rhoptropus diporus*	MCZ R183737	Brandberg Wes Myn, Namibia	JX041432	JQ945337
Gk	*Uroplatus phantasticus*	ZMA 19620	Madagascar: Vohidrazana	EF490800	EF490747
Gk	*Uroplatus henkeli*	FG/MV 2000.C1	Nosy Be, Madagascar	EF490796	EF490743
Gk	***Dravidogecko anamallensis***	**ZSIK 2969**	Valparai, India	**MN520264**	------------
Gk	***Dravidogecko septentrionalis* sp. nov.**	**BNHS 2342**	Lakkidi village, Wayanad district, India	**MN520267**	**MN520275**