Changes in the Distribution Ranges of the Sri Lankan *Hemidactylus* Species

Fig. 1. *Hemidactylus leschenaultii* juveniles. Photo by Mendis Wickramasinghe.

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Abstract: The current distribution of Sri Lanka's *Hemidactylus* gecko fauna is assessed, based on 2000–2005 field work by the authors, supported by historical data and museum records of the National Museum of Sri Lanka (NMSL). A total of eight taxa are recorded from the island, four of them (one species and three subspecies) endemic. Our results conclude that most taxa have been subject to changes in their distribution ranges when compared to records previous to the 1960s. Causes for changes in distribution are attributed to habitat loss by deforestation and agricultural practices etc. for reductions; transportation along with timber, coconut husks, woven coconut leaves, bricks and bananas, extension of anthropogenic habitats etc. for increases and floods for both increases and reductions. Thus, conservation status assessments of some species will differ in the future from those mentioned in earlier conservation reports.

Introduction

The genus *Hemidactylus* Gray, 1825 holds a special place among the gekkotan genera as it includes over eighty species, making it one of the largest gekkonid genera in the world (Kluge, 2001; Carranza & Arnold, 2006). Several species of the genus *Hemidactylus* are almost cosmopolitan lizards, with distributions that have probably been shaped by natural transoceanic dispersal as well as by more recent human introductions. In his book 'Reptile Fauna of Ceylon', which is the first comprehensive and fully annotated list of the Sri Lankan herpetofauna, Ferguson (1877) recorded six species of *Hemidactylus*. Subsequently, Deraniyagala (1932) and Taylor (1953) recognised five taxa and six taxa, respectively. Also writing in 1953, Deraniyagala described the number of species and subspecies of Sri Lankan *Hemidactylus* as six in his volume II of "A Colored Atlas of Some Vertebrates From Ceylon". *H. scabriceps* was also included in the volume but was under the genus *Lophopholis* at this time. Recently,

Manamendra-Arachchi (1997) and De Silva (2001) considered the *Hemidactylus* wealth of Sri Lanka to comprise seven taxa. In their recent paper, Carranza and Arnold (2006) assigned *Cosymbotus platyurus* into the *Hemidactylus* genus, and redefined it as *Hemidactylus platyurus*, thus increasing the number of *Hemidactylus* taxa in the island to eight. The eight taxa of *Hemidactylus* in Sri Lanka are (those marked with an asterisk are endemic): *H. brookii parvimaculatus** Deraniyagala, 1953, *H. depressus** Gray, 1842, *H. frenatus* Schlegel, 1836, *H. leschenaultii* Dumeril and Bibron, 1836, *H. maculatus hunae** Deraniyagala, 1937, *H. platyurus* (Schneider, 1792), *H. scabriceps* (Annandale, 1906) and *H. triedrus lankae** Deraniyagala, 1953. Separate studies by these authors have so far revealed the potential existence of two new *Hemidactylus* species in the island. Further work is being undertaken to confirm these findings.

The geographical distributions of *Hemidactylus* species in the country was last described by Deraniyagala (1953) and Taylor (1953) after which only Manamendra-Arachchi (1995, 1997) and Das & De Silva (2005) have briefly given their distribution ranges, mostly referring to earlier records. Thus the current distribution patterns of the *Hemidactylus* species are only poorly known. Increased concern for issues such as possible distributional changes of reptile faunas in relation to climate change or conservation of peripheral populations of reptiles suggests a need for accurate knowledge of their distributions. The quest for such knowledge is often hampered, not only by the remoteness of the areas, but also by poor criteria for field identification of closely related species (especially by non-experts), by failure of field workers to recognize the significance of specific geographical occurrences and by the taxonomic complexity and problems pervasive in some species of *Hemidactylus*.

The objectives of this work are twofold: 1) to clarify the current geographical distributions of *Hemidactylus* geckos; and, 2) to find out the possible reasons for range changes.

Materials and Methods

1) To clarify the current geographical distributions of *Hemidactylus* geckos

Data on distribution of geckos in the country were collected during ongoing herpetofaunal studies conducted by the authors since 2000. The study sites included locations in all four climatic zones—semi-arid zone (MAR <1200 mm/y), dry zone (MAR <1750 mm/y), intermediate zone (MAR 1750–2400 mm/y), wet zone (MAR >2400 mm/y) and in all three peneplains—coastal lowlands/first peneplain (0-270m a.s.l.), uplands/second peneplain (270–900m a.s.l.) and highlands/third peneplain (>900m a.s.l.)] of the country. Special attention was paid to studying anthropogenic habitats as they are the preferred habitats of most *Hemidactylus* species.

Abbreviations:

MAR	Mean Annual Rainfall
m a.s.l.	meters above sea level
mm/y	millimeters per year

2) To find out the possible reasons for range changes

The current status of the habitat was recorded for most of the recorded specimens. Any significant changes or alterations in the habitats were noted. Information from published work (Deraniyagala, 1932; Smith, 1935; Deraniyagala, 1953; Taylor, 1953; Manamendra-Arachchi, 1995, 1997; Wickramasinghe & Somaweera, 2003; Das & De Silva, 2005), mass media, reliable records from herpetologists and villagers were used in confirming the presence of geckos and distribution changes etc. The major vegetable markets in some urban areas and the economic zones (a form of commercial center) of Dambulla and Ambilipitiya were asked to collect any animals which arrived with their wares, and these were collected by us upon notification. Additionally we also checked trucks transporting vegetable and fruit loads whenever possible for any stranded animals. The passenger trawlers operating from Kalpitiya to Baththalankunduwa

(Puttalam district) and from Trincomalee to Kinya (Trincomalee district) and migratory fishing trawlers functioning at Bundala, Yala, Kirinda, Panama, Wilpattu, Negambo, Beruwala, Baththalankunduwa and surrounding areas were informed to hand over any reptiles seen on the boats. Large objects such as logs, planks, boxes etc. that were floating or stranded ashore in several coastal areas were examined for any 'passenger' herps. Some of the regularly flooding areas in Ratnapura, Kalawana and Hiniduma were sampled twice in May of 2001 and 2003, prior and subsequent to floods.

Representative specimens from captured species were photographed alive, in the respective natural habitats whenever possible, without using any chemical restraints. Museum specimens in the National Museum of Sri Lanka (NMSL) were examined and photographed. No *Hemidactylus* gecko specimens were removed or preserved by the authors during the study.

Results

We recorded six of the eight taxa of *Hemidactylus* geckos from Sri Lanka during the five years of this study, the exceptions being *H. platyurus* and *H. scabriceps*. Changes from the distribution ranges given by Deraniyagala (1932 and 1953) and Taylor (1953) were observed in some species of *Hemidactylus* geckos in the island. The recorded locations of the species from this study are given in Appendix I. The red spots in the distribution maps show the locations where the particular species was recorded during the current study while the green and the blue spots show the locations given by Deraniyagala (1932 and 1953) and Taylor (1953), respectively.

Hemidactylus brookii parvimaculatus Deraniyagala, 1953— Spotted house-gecko

This gecko is usually found in pairs or in small groups comprising 3–15 individuals but in some dry zone areas, groups comprising over

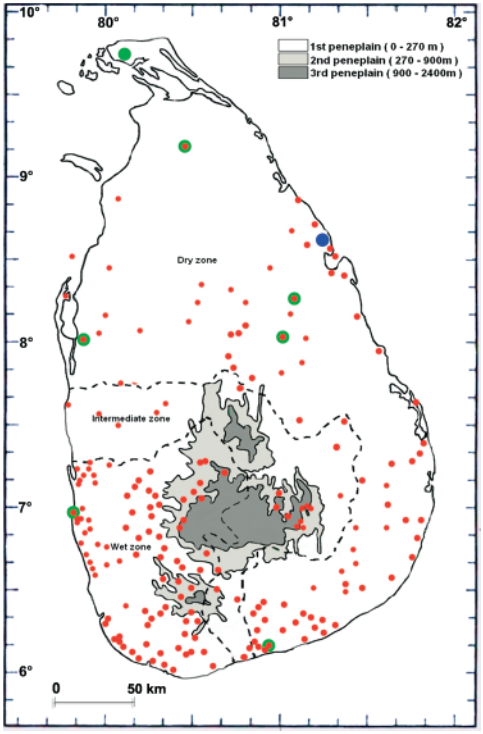
Fig. 2. *H. brookii parvimaculatus*. Photo by Ruchira Somaweera.

50 individuals can be observed feeding in continuously illuminated places (shops, lampposts etc.). Territorial fighting is commonly observed in males and so is cannibalism. *H. brookii parvimaculatus* mainly prey on insects by ambushing, but it is also known to feed on rice and other man-made food and hence has become a 'pest'. It is largely a house gecko and is present even in highly disturbed habitats. This subspecies is endemic to Sri Lanka.

Current distribution: Almost throughout the country except at altitudes above NuwaraEliya (ca. 1700 m a.s.l.). De Silva (1957) records it from Analativu island, Deraniyagala (1932) from Jaffna and Mankulum in the north. Refer map No. 1 and Appendix 1.

Net change in range: A probable extension in the range has taken place due to human activities.

Major causes of changes in distribution: ***Anthropogenic***—expansion of anthropogenic habitats due to resettlements; formation of new villages; transportation of timber, fruits and vegetables (especially bananas), coconut husks and woven coconut leaves and bricks. Transportation is mainly of the gecko eggs rather than live animals. Several live specimens were obtained from passenger and fishing trawlers in Hikkaduwa, Negambo and Galle. ***Natural***—several specimens were also collected from floating logs in the floods of the Gin ganga at Hiniduma and Kukule ganga at Kalawana.



Map1. Distribution of *H. brookii parvimaculatus*

Hemidactylus depressus Gray, 1842—Kandyan gecko

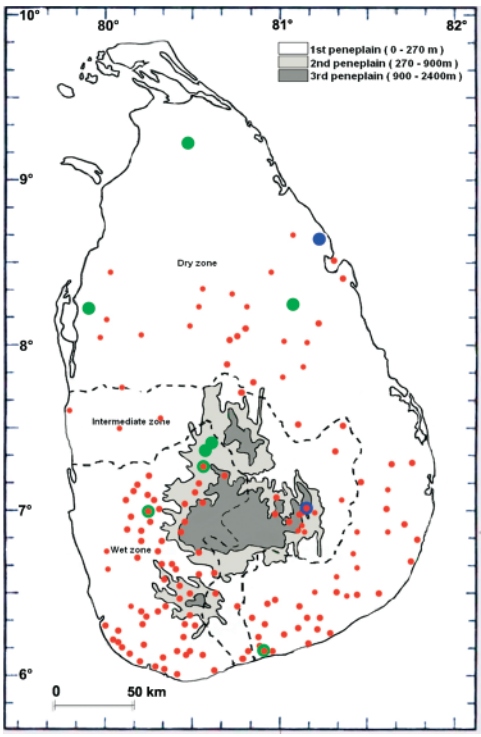
This is the only endemic *Hemidactylus* species in the country and it inhabits a very wide range of habitats in all climatic zones and all three peneplains. It can also be considered a 'house gecko', due to its presence in highly urbanized areas. Normally found in pairs. It is an aggressive species and may attack other smaller geckos.

Current distribution: Shows a very wide distribution in the country and extends to the Haputale range in altitude but is absent above NuwaraEliya (ca. 1700 m a.s.l.). It has been recorded from some islands in the Trincomalee area, but no records are available from the small northern islands. Deraniyagala (1932) records it from Mankulum in the north. Refer map No. 2 and Appendix 1.

Net change in range: A possible extension in the distribution range has taken place mainly due to anthropogenic habitat expansion.

Major causes of changes in distribution: ***Anthropogenic***—several eggs were obtained from tree trunks cut for the Kukuleganga hydropower project that were subsequently transported to Moratuwa and surrounding areas. It is possible that this species spreads with the transportation of furniture and other household materials as it is common inside houses.

Fig. 3. Subadult *H. depressus*. Photo by Ruchira Somaweera.

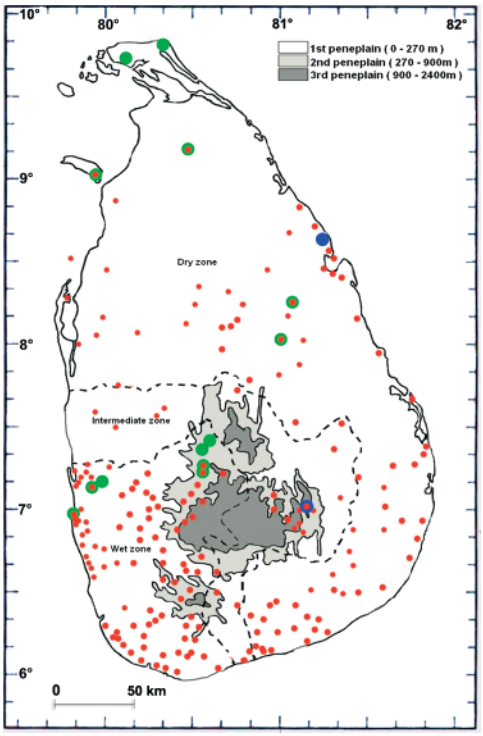


Map 2. Distribution of *H. depressus*.

Hemidactylus frenatus Schlegel, 1836—Common house-gecko

This species is usually found in pairs and is largely a 'house gecko'. It rarely inhabits undisturbed forests in the wet zone though it is comparatively common in some dry, intermediate and semi-arid forests. In the wild they occur in caves, under the bark of trees and among boulders. This nocturnal species spends daytime in crevices and the like, but feeding during daytime can be observed. Although it is not highly territorial, most individuals seem to occupy the same place for a long time though group behavior can also be observed, especially within human habitations in the dry zone. This species can commonly be seen on lampposts. It commonly feeds on rice, bread and other man-made food and hence has become a 'pest' in most houses. Habitual cannibalism is shown by some adults as they feed on juveniles.

Fig. 4. *Hemidactylus frenatus*. Photo by Ruchira Somaweera.



Map 3. Distribution of *H. frenatus*.

Current distribution: Found almost throughout the country except at altitudes above NuwaraEliya (ca. 1700 m a.s.l.). Specimens were even collected from crevices in rocks that directly contact the sea at Pathirajapitiya in Bundala National Park. De Silva (1957) records it from all northern islands while Deraniyagala (1932) records it from Jaffna, Mankulum and Pt. Pedro in the north. Refer map No. 3 and Appendix 1.

Net change in range: As it is a widely distributed species, no prominent change in the distribution range has taken place, although the species seems to have increased in abundance.

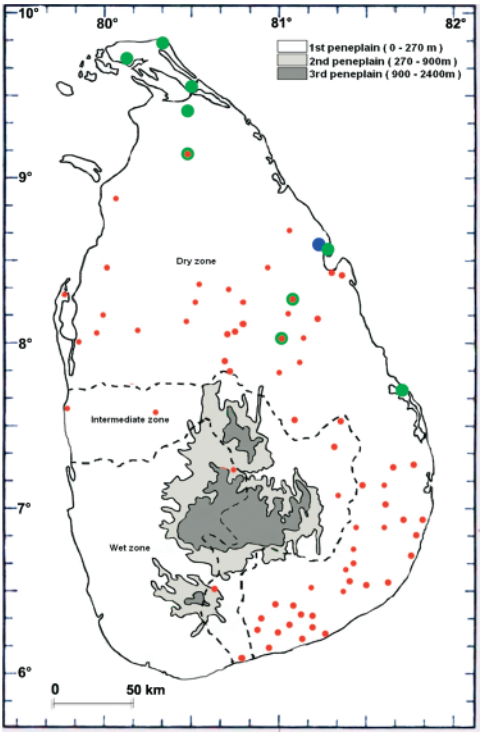
Potential causes of changes in distribution: ***Anthropogenic***—expansion of anthropogenic habitats; transportation of timber, fruits and vegetables (especially bananas), coconut husks, woven coconut leaves and bricks. It is mainly gecko eggs that are transported. Several live specimens were obtained from passenger boats and fishing trawlers in Baththalankunduwa, Negambo, Beruwala and Galle. ***Natural***—many individuals were observed on floating logs in the Hiniduma area after the floods of the Gin ganga.

Hemidactylus leschenaultii Dumeril and Bibron, 1836—Cinnamon gecko or Bark gecko

This is the stoutest and second largest of the *Hemidactylus* geckos in the country. This species mainly inhabits large trees (especially *Terminalia arjuna*, *Feronia limonia* and

Fig. 5. Adult *H. leschenaultii*. Photo by Ruchira Somaweera.

Fig. 6. Juvenile *H. leschenaultii*. Photo by Mendis Wickramasinghe.



Map 4. Distribution of *Hemidactylus leschenaultii*.

Azadirachta indica), rock outcrops, boulders, houses and other man-made structures. It is considered to be diurnal and is seen openly lying on the underside of large branches and on the walls of houses during daytime. Though the typical ground color of the body is whitish/grayish with a wavy pattern of dark brown and grey in most individuals, predominantly yellowish specimens can be observed in the Ritigala area. It is known to attack (and sometimes feed on) most other conspecific gecko species, and an incident of *H. leschenaulti* trying to prey on a snake (*Lycodon striatus*) was also observed during the study (Somaweera, 2005). Males are somewhat territorial but groups comprising both adults and juveniles occur, most often comprising a single adult male and several females.

Current distribution: Throughout the dry zone of the country and in some parts of the intermediate and semi-arid zones. It is absent on the Baththlankunduwa islands though it is very common in the immediate vicinity on the mainland. De Silva (1957), records it from the Delft islands and Nainativu while Deraniyagala (1932) records it from Elephant Pass, Jaffna, Kilinochchi, Mankulum and Pt. Pedro in the north. Refer map No. 4 and Appendix 1.

Net change in range: Though we were able to record this species in many new locations, these need not be considered true range extensions. It probably reflects records from previously under-surveyed locations.

Potential causes of changes in distribution: ***Anthropogenic***—in August 2005, several eggs were obtained from a fire-wood stock prepared by the Dept. of Wildlife Conservation of Sri Lanka by cutting large trees in the refuges in the Lower Walawe Irrigation Extension Project from Sooriyawewa to Mirijjawela area. Activities such as these can totally eliminate the species from some areas where it is already restricted to few refugia. Fishing trawlers operating between the islands and the mainland may also affect range extension.

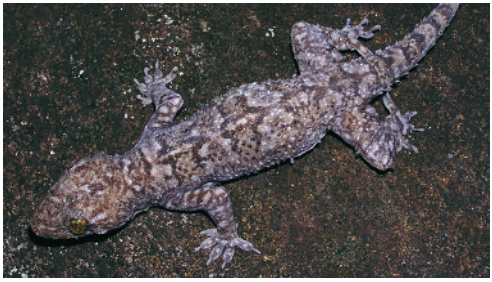
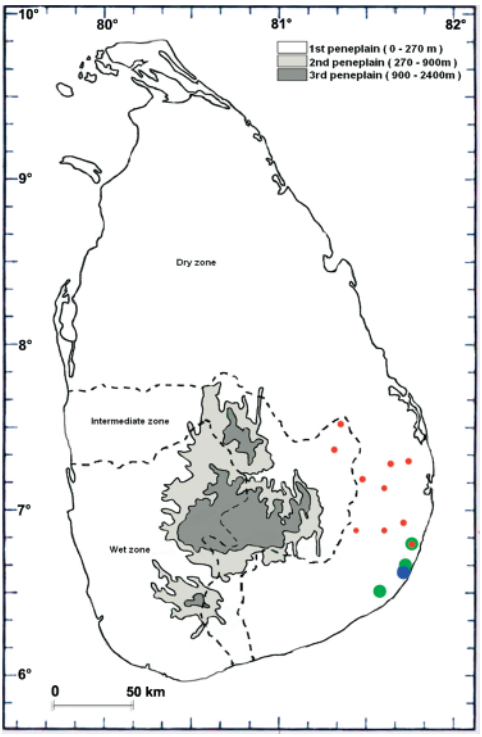


Fig. 7. Adult *H. maculatus hunae*. Photo by Ruchira Somaweera.

Fig. 8. Subadult *H. maculatus hunae*. Photo by Mendis Wickramasinghe.



Map 5: Distribution of *H. maculatus hunae*.

Hemidactylus maculatus hunae Deraniyagala, 1937—Spotted giant gecko or Rock gecko

This is the largest of the Sri Lankan *Hemidactylus* species and attains total lengths of ca. 220 mm. It inhabits rock boulders, caves, large trees and old houses adjoining forests in a few locations of the low country dry zone. It is a fast-moving species and bites savagely when first caught. Nocturnal in behavior. Though not observed by us, Deraniyagala (1953) states that there is communal oviposition in this subspecies.

Current distribution: Found in a few narrowly separated locations in the Uva and Eastern provinces. Senaratne (1995) records this species from the northern part of the Eastern province, but we did not find it there, nor in its type locality at Okanda. Refer map No. 5 and Appendix 1.

Net change in range: We were able to record this species in a number of new locations. As shown on the map these are situated in a defined geographic area adjacent to the earlier records. We do not consider this necessarily as a true range extension rather they are again likely new records from previously under-surveyed areas.

Potential causes of changes in distribution: ***Anthropogenic***—this is predominantly a forest species but individuals are commonly found within plantations (mainly rubber) in the Maragala area at Moneragala. This is probably due to the fact that these plantations were created in one of its formerly favorite habitats which included many rocky areas. The populations in these areas seem to be well adapted for their new surroundings as population sizes sometimes exceed those in forested areas. There could be population impacts through transportation of eggs and juveniles with rubber tree trunks or further habitat alteration when the rubber plants are removed etc. We

were only able to observe one road kill of this species (at Bulupitiya in Galoya National Park).

Hemidactylus platyurus (Schneider, 1792)—Frill-tailed gecko

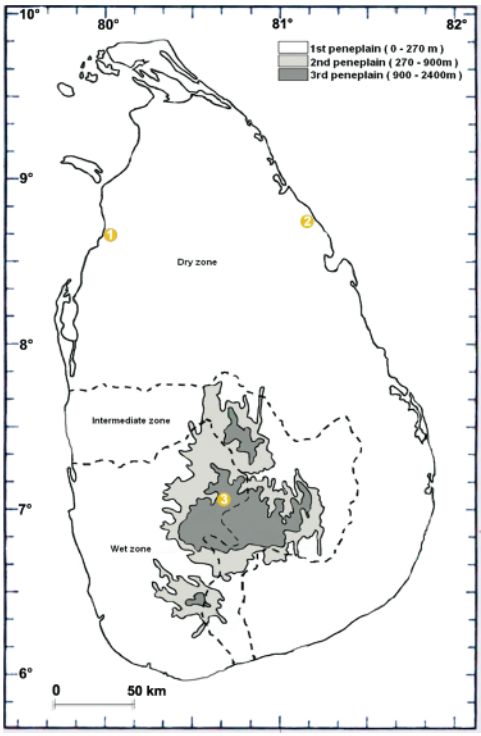
Only previously known from Sri Lanka by two specimens sent to the British Museum by Kelaart in 1855. Deraniyagala (1932 & 1953) doubts the collection location and stated that they may be not from Sri Lanka at all. Taylor (1953) mentioned that he saw no specimens. Although Manamendra-Arachchi (1995) gives its distribution as 'island-wide, up to 1000m', according to Das & De Silva (2005) there are no recent records of this species from Sri Lanka.

Fig. 9. Specimen of *H. platyurus* collected by Kelaart in the British Museum of Natural History collection (BMNH 56.1.17.3). Scale Bar = 1 cm. Photo by Ruchira Somaweera.

Hemidactylus scabriceps (Annandale, 1906)—Scaly gecko

This arboreal, nocturnal, dry-zone species (Smith & Deraniyagala, 1934; Deraniyagala, 1953; Manamendra Arachchi, 1997) has been recorded from Mariccukatte area in the Northern province [location 1]. Taylor (1953) mentions that he saw no specimen. The only recent published record of *H. scabriceps* states its presence in the northernmost tip of the Eastern

Fig. 10. Specimen of *Hemidactylus scabriceps* collected by Deraniyagala in the British Museum of Natural History collection (BMNH 1933.11.24.1). Scale Bar = 1 cm. Photo by Ruchira Somaweera.



Map 6: Location records for *H. scabriceps*.

province [location 2] along with *H. depressus*, *H. leschenaultii*, *H. maculatus hunae* and *Geckoella yakhuna* (Senaratne, 1995). However, no data on exact location, habitat, number of specimens collected or photographic evidence is given for such a rare finding! The only published work on the herpetofauna of the northern islands (De Silva, 1957), does not record it. Surprisingly, the site of collection of the only specimen deposited in the NMSL (No.

NMSL/RG17) is denoted as NuwaraEliya [location 3], which is the coldest district in the island located in the highlands of the wet zone! Our studies in both NuwaraEliya and in the Eastern province have failed to record any specimens, although we observed an 'unusual' type of *Hemidactylus* species (most probably) near the canopy of a large tree in a home garden at Welimada, which we were unable to collect or photograph. Thus further detailed studies are required to clarify the situation.

Current distribution: Refer map No. 6

Hemidactylus triedrus lankae Deraniyagala , 1953— Termite hill gecko

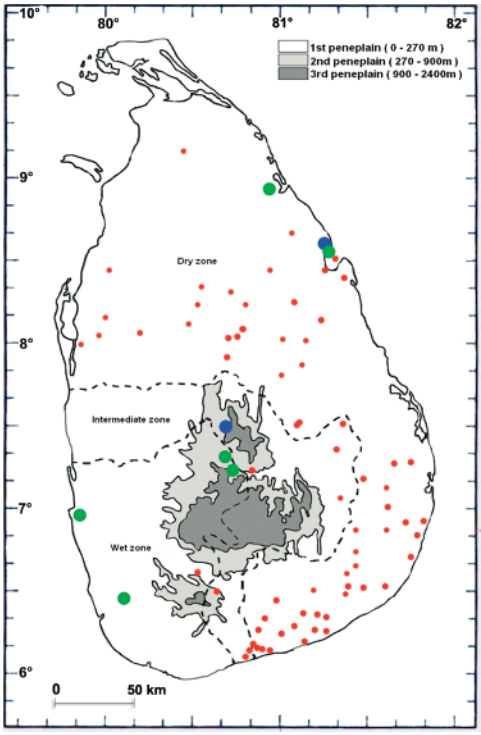
This gecko inhabits termite mounds, rock outcrops, large trees, boulders and rock piles in both natural and anthropogenic habitats. It usually dwells close to ground level. Social behavior is shown whereby several animals or pairs share the same microhabitat niche. Though Deraniyagala (1953) states that it lays 2-6 separated eggs, we have never observed more than two eggs in one clutch. This subspecies is endemic to Sri Lanka.

Current distribution: Throughout the dry zone of the country and in most parts of the intermediate and semi-arid zones. De Silva (1957) records it from Eluvativu island. We were unable to record it from Colombo, Kandy and Kumbalgamuwa areas given by Deraniyagala (1932), or from Rattota area given by Taylor (1953). Refer map No. 7 and Appendix 1.

Net change in range: A probable long-term range reduction has taken place as it is absent from most of the areas in the wet zone where earlier it had been recorded.

Major causes of changes in distribution: ***Anthropogenic***—several adults and eggs were obtained from lorries transporting bricks and logs. Two such eggs (one damaged) were from

Fig. 11. *H. triedrus lankae*. Photo by Carol Withers.



Map 7: Distribution of *H. triedrus lankae*.

a lorry that transported bricks from Pallebedda in Ambilipitiya (Dry zone) to Waddauwa in Panadura (Wet zone). It is possible that this species may further spread with the transportation of furniture and other household items as it is common inside houses. Forest fires due to chena cultivation are very common in most of its range, thus are a significant factor affecting its distribution. As it is almost a 'ground gecko', predation on this species by domestic animals is common. Similarly, road kills are also a noteworthy threat.

Discussion

The almost cosmopolitan distribution of geckos of the genus *Hemidactylus* and their colonization capabilities, constitute important challenges for systematists and evolutionary biologists who aim to understand their biogeography. Revisions and other accounts dealing with these geckos in the country are usually focused on taxonomic aspects. Thus little detailed study of their distribution has been carried out recently.

The key factors leading to the changes in the distribution of Sri Lankan geckos, especially the *Hemidactylus* species, are as follows:

1. **Expansion in human settlements**
   In general most *Hemidactylus* species are not under severe threat in the country. This may be due to their ability to adapt to anthropogenic and man-modified environments such as plantations etc., and a broad habitat and climatic condition tolerance. Most *Hemidactylus* species in the country are commensal with people, often occurring in and around anthropogenic habitats and human habitation. Taylor (1953) states that he has never obtained a specimen of *H. frenatus* from a forest and most of his *H. brookii parvimaculatus* specimens were also from human habitations. This status is confirmed by us in the cases of *H. frenatus* and *H. brookii parvimaculatus*, which are now mostly confined to man-made habitats, at least in the wet zone. Additionally, *H. depressus* and *H. leschenaulti* have also turned more towards becoming 'house geckos' in the past years. Both Smith (1935) and Taylor (1953) stated that they had never found *H. leschenaultii* inside human habitations. Now it is commonly found inside and around human habitations within its range.

   The area of human settlements on the island has expanded drastically during the past few decades. This has been caused by, colonizing of remote areas due to lack of lands around urban areas; illegal or legal agricultural practices, especially chena cultivation; relocation programs due to reservoir construction; war; catastrophes like floods, tsunami and also the development of tourism potentials in remote areas. Thus with the transportation of goods during these activities, 'house geckos' have increased their distribution ranges.

2. **Transportation of food, logs and materials**
   'Geckos are the most widespread of tropical reptiles being readily transported, both by drifting timber and by human agency such as ships' (Deraniyagala, 1932). As large-scale cultivation of banana is localized in different areas, mass transportation during the end of the harvesting season is common. This situation has increased with the development of the infrastructure in rural areas and the formation of economic zones and large markets that collect food items and distribute them to other areas. Good examples are Ambilipitiya and Dambulla economic zones, which collect vegetables and fruits from throughout the lowland dry zone and subsequently distribute them, mainly in the wet zone. Several species of reptiles were found among the transported goods. These include a *Chrysopelea taprobanica* (Anandalal Nanayakkara, pers. comm.), *Ahaetulla nasuta*, *Cnemaspis* spp., *Cyrtodactylus* spp. and *Hemidactylus* spp. The *Hemidactylus* species obtained from transport vehicles included two species, *H. brookii parvimaculatus* and *H. frenatus* from transported banana stocks; four species, *H. brookii parvimaculatus*, *H. depressus*, *H. frenatus* and *H. leschenaultii* from logs and timber loads; two species, *H. triedrus lankae* and *H. brookii parvimaculatus* from brick and roof tile loads; and two species, *H. brookii parvimaculatus* and *H. frenatus* from hiring vehicles, passenger trawlers and fishing trawlers.

   The cases involving *Cyrtodactylus* spp. and *Cnemaspis* spp. are significant as these geckos show zone-restricted distribution

patterns in the country. Additionally, we have obtained three species of bird-eating tarantulas (*Poecilotheria fasciat*a, *P. ornata* and *P. pederseni*) in log loads in Moratuwa, Lunawa and Koralawella areas. Transportation of such animals not only alters their own distribution, but also introduces a new predator for geckos and other smaller animals into new habitats. Additionally, a *Python reticulatus* and *Eryx conicus* were secured from the Colombo harbor after accidentally having been transported with log stock from Malaysia and a vehicle stock from India, respectively (Premasiri Peiris, pers. comm.). Both are now at the reptilium of the National Zoological Gardens of Sri Lanka. Thus there is a potential for Sri Lankan reptiles being transported into other countries in a similar way. Certainly both *H. brookii parvimaculatus* and *H. frenatus* are common in the Katunayake international airport and the Colombo harbor, which could result in trans-boundary movement of these two species.

3. **Floating objects in the sea**
   Geckos are a family of lizards that are particularly well suited to overseas dispersal (Kluge, 1969), and *Hemidctylus* has more apparent cases of large range extensions than any other reptilian group (Carranza & Arnold, 2006). During the study, although several floating and stranded objects, including logs, planks, boxes, cans etc., were checked at different locations along the coast, no geckos were observed on them. Nevertheless there is a high probability of geckos being carried away by floating objects in the sea, as the coastal belt is a highly populated region and most of the solid waste is normally dumped into the sea. Brown and Alcala (1957) have demonstrated that the eggs of *H. frenatus* and some other species are viable even after continuously wetting them with sea water for eleven days. Thus, floating objects can enable herps (including geckos) to move between coastal areas and the peripheral islands of Sri Lanka.
4. **Floods**
   Most areas in the Kalu ganga and Gin ganga basins experience floods after the southwest monsoons in May during some years. This has drastically altered not only animal distribution, but also human distribution in the area. Due to the regularity of the floods, the animals, especially terrestrial ones, have now shifted to somewhat higher grounds. Both *H. frenatus* and *H. brookii parvimaculatus* were observed during this study on floating logs in the floods of the Gin ganga at Hiniduma and Kukule ganga at Kalawana, in May of 2001 and 2003, respectively.
5. **Deforestation**
   Deforestation or the reduction of wild land habitats to less than the critical amount necessary for the survival of the species has become a serious environmental issue on the island. Over 1000 hectares of forests and grasslands are known to be set on fire annually, damaging many geckos and their eggs. The human population is continuously growing and people are trying to develop their standard of living through economic development based on natural resource utilization in general, and particularly on exploiting forest resources. According to the recent census the present human population of the island is around 19 million, almost 290 people per km^2, making Sri Lanka one of the most densely populated countries in Asia. Secondary effects of deforestation, such as soil erosion, climatic changes and exposure to predators also affects the gecko fauna.
6. **Other factors**
   As a result of habitat loss and urbanization, many geckos have become more vulnerable to natural and domestic predators and native opportunistic fauna. Domestic cats are generally considered the worst predator and have often been observed preying on

geckos. Cats were recorded to prey on all species of *Hemidactylus* geckos, except *H. scabriceps* and *H. platyurus* (not recorded during the study), *H. maculatus hunae and H. leschenaultii*. Fragmentation of habitats and exposure to road risks, due to habitat alteration, are also considerable factors. During the sampling bouts done in the southern dry zone of the country, a considerable variation in the species subjected to road kills was observed. *H. triedrus lankae* accounted for the highest number of gecko road kills in forested areas, whilst *H. frenatus* accounted for the highest number within anthropogenic habitats. The high incidence of *H. triedrus lankae* road kills is due to its terrestrial behavior, which is not as common in the other *Hemidactylus* species. The increased practice of pesticide use has also directly or indirectly affected geckos.

However, according to our observations, none of these factors has shown enough potential to change the distribution ranges of geckos. Thus, although they have affected the populations, they have not affected the distribution ranges.

In previous conservation assessments, *H. depressus* and *H. platyurus* (as *Cosymbotus platyurus*) are listed as a 'Threatened species' in the 1999 IUCN list of Threatened Fauna and Flora of Sri Lanka and in the more recent 2007 IUCN list of Threatened Fauna and Flora of Sri Lanka, *H. maculatus hunae* is listed under the Near-Threatened category while *H. scabriceps* and *H. platyurus* (as *Cosymbotus platyurus*) are listed as Data Deficient. According to the CAMP (Conservation Assessment and Management Plan) report for Amphibians and selected taxa of Reptiles of Sri Lanka (2000), the following species are listed in the respectively cited categories; *H. maculatus hunae* as Endangered (EN); *H. depressus* and *H. triedrus lankae* as Lower Risk: near threatened (LRnt) and *H. brookii parvimaculatus* as Lower Risk: least concerned (LRlc). As these statuses have been derived mostly based upon earlier distribution data, there is a strong possibility that any current assessment conducted using the distribution data reported in this study would change the status of some species.

Acknowledgements

We are grateful to the following persons for their support. Nilusha Somaweera, Nuwan Bandara and Nayana Wijethilake (Department of Zoology, University of Peradeniya), Senani Karunartne (Wayamba University, SL) and Prasanna Samarawickrema, Naalin Perera and Bhathiya Kekulandala (IUCN – Sri Lanka) for their help during field work; Dr. Harry Andrews (Madras Crocodile Bank Trust) for providing valuable literature; Swarnapali Samaradivakara and Lalith Kariyawasam (National Museum of Sri Lanka - NMSL) for their assistance in museum reference work; Mr. Anandalal Nanayakkara and Mr. Premasiri Peiris (Curator- Reptilium, National Zoological Gardens of Sri Lanka) for providing personal comments; Prof. Yehudah L. Werner (The Hebrew University of Jerusalem, Israel) for commenting on an earlier draft of this manuscript; John Rudge (GGA) for all various courtesies.

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Appendix I
Sites where *Hemidactylus* species were recorded during the study period

(Place names refers to those in the 'Road Map of Sri Lanka' published by the Survey Department of Sri Lanka)

Province	District	Location	*H. brookii parvimaculatus*	*H. depressus*	*H. frenatus*	*H. leschenaultii*	*H. maculatus hunae*	*H. platyurus*	*H. scabriceps*	*H. triedrus lankae*
Southern	Galle	Ahungalla	+	+	+					
		Ambalangoda	+	+	+					
		Baddegama	+	+	+					
		Balapitiya	+	+	+					
		Benthota	+	+	+					
		Dodanduwa	+	+	+					
		Elpitiya	+	+	+					
		Galle	+	+	+					
		Gonapeenuwala	+	+	+					
		Habaraduwa	+		+					
		Hikkaduwa *	+	+	+					
		Hiniduma	+	+	+					
		Induruwa	+	+	+					
		KDN complex #	+	+	+					
		Koggala	+		+					
		Kosgoda	+		+					
		Kottawa #	+	+	+					
		Neluwa	+	+	+					
		Pitigala	+	+	+					
		Udugama	+	+	+					
		Uragasmanhandiya	+	+	+					
		Walahanduwa	+	+	+					
	Matara	Akuressa	+	+	+					
		Deniyaya #	+	+	+					
		Gandara	+		+					
		Hakmana	+	+	+					
		Henegama	+		+					
		Kamburupitiya	+	+	+					
		Kirinda	+	+	+					
		Kotapola	+	+	+					
		Morawaka #	+	+	+					
		Mulatiyana	+	+	+					
		Urubokka	+	+	+					
	Hambantota	Ambalantota	+	+	+	+				+
		Angunakolapellessa	+		+					+
		Bandagiriya	+	+	+	+				+
		Bundala *	+	+	+	+				+
		Dembarawewa	+	+	+	+				+
		Gannoruwa	+	+	+	+				+
		Hungama	+	+	+					+
		Katagamuwa *	+	+	+	+				+
		Kataragama *	+	+	+	+				+
		Katuwana	+	+	+					
		Kirinda	+	+	+	+				+
		Lunugamwehera *	+	+	+	+				+
		Meegahajandura	+	+	+	+				+
		Middeniya	+	+	+					
		Nonagama	+	+	+					+
		Ranna	+	+	+					+
		Ridiyagama	+	+	+	+				+
		Sooriyawewa	+	+	+	+				+
		Tangalla	+		+					

			H. brookii parvimaculatus	*H. depressus*	*H. frenatus*	*H. leschenaultii*	*H. maculatus hunae*	*H. platyurus*	*H. scabriceps*	*H. triedrus lankae*
		Thissamaharama	+	+	+	+				+
		Walasmulla	+	+	+					
		Weeraketiya	+	+	+					+
		Weerawila	+	+	+	+				+
		Weligatta	+	+	+	+				+
		Yala block I, II *	+	+	+	+				+
Eastern	Trincomalee	Kanniyai			+					
		Kantalai	+	+	+	+				+
		Kinniyai	+		+					+
		Mutur	+		+	+				
		Nilaweli	+		+					
		Seruwawila	+	+	+	+				+
		Somawathi *		+		+				+
		Tiriyai	+		+					
		Trinco islands	+	+	+					+
		Trincomalee	+		+					
	Batticaloa	Batticaloa	+		+					
		Passikudha	+		+					
		Vakarai	+		+	+				
	Ampara	Ampara *	+	+	+	+	+			+
		Deegawapi	+	+	+	+	+			+
		Dehiattakandiya	+	+	+	+				+
		Galoya *	+	+	+	+	+			+
		Kalmunai	+		+					
		Kokagala	+	+	+	+	+			+
		Kumana *	+	+	+	+	+			+
		Lahugala *	+	+	+	+	+			+
		Maduruoya *	+	+	+	+				+
		Mahaoya	+	+	+	+	+			+
		Okanda	+	+	+	+				+
		Panama	+	+	+	+				+
		Potuvil	+		+	+				+
		Sammanthurai	+							
		Uhana	+	+	+	+				+
Sabaragamuwa	Kegalle	Aranayake	+	+	+					
		Avissawella	+	+	+					
		Deraniyagala	+	+	+					
		Galapitamada	+	+	+					
		Karawanella	+	+	+					
		Kegalle	+	+	+					
		Kithulgala #	+	+	+					
		Maliboda	+	+	+					
		Pindeniya	+	+	+					
		Rambukkana	+	+	+					
		Ruwanwella	+	+	+					
		Yatiyantota	+	+	+					
	Ratnapura	Balangoda	+	+	+					
		Belihul oya	+	+	+					
		Chandrika wewa	+	+	+					
		Dela	+	+	+					
		Eheliyagoda	+	+	+					
		Embilipitiya	+	+	+	+				+
		Gilimale #	+	+	+					
		Kalawana	+	+	+					
		Kuruwita	+	+	+					
		Madampe	+	+	+					
		Mahawalatenna	+	+	+					
		Nivitigala	+	+	+					

			H. brookii parvimaculatus	*H. depressus*	*H. frenatus*	*H. leschenaultii*	*H. maculatus hunae*	*H. platyurus*	*H. scabriceps*	*H. triedrus lankae*
		Pallebedda	+	+	+					+
		Pimbura	+	+	+					
		Rakwana	+	+	+					
		Ratnapura #	+	+	+					
		Sinharaja #	+	+	+					
		Wawulpane	+	+	+					
		Weddagala #	+	+	+					
Central	Matale	Dambulla	+	+	+	+				+
		Kandalama	+	+	+	+				+
		Matale	+	+	+					
		Menikdena	+	+	+	+				+
		Nalanda	+			+				
		Naula	+	+	+	+				
		Pallegama	+	+	+					
		Pitawalapathana #		+	+					
		Rattota #	+	+	+					
		Sigiriya	+		+	+				+
	Kandy	Corbets Gap #	+	+	+					
		Gampola	+	+	+					
		Kandy	+	+	+					
		Loolwatte	+	+	+					
		Nawalapitiya	+	+	+					
		Peradeniya	+	+	+					
		VRR *	+	+	+	+				+
	NuwaraEliya	Ginigathhena	+	+	+					
		Hatton			+					
		Norton Bridge	+	+	+					
		Peak Wilderness *#	+	+	+					
		Ramboda	+	+	+					
		Hakkgala			+					
Uva	Badulla	Badulla	+	+	+					
		Bandarawela	+	+	+					
		Beragala	+	+	+					
		Bintenna	+	+	+					
		Ella	+	+	+					
		Koslanda	+	+	+					
		Namunukula	+	+	+					
		Passara	+	+	+					
		Rawana Falls	+	+	+					
		Ulhitiya	+	+	+					
	Monaragala	Bibile	+	+	+	+				+
		Kuda Oya	+	+	+	+				+
		Maligawila	+	+	+					
		Monaragala	+	+	+	+	+			+
		Nilgala *	+	+	+	+	+			+
		Okkampitiya	+	+	+	+				+
		Siyabalanduwa	+	+	+	+	+			+
		Thanamalwila	+	+	+	+				+
		Udawalawa *	+	+	+	+				+
North Central	Anuradhapura	Anuradhapura	+	+	+	+				+
		Eppawala	+	+	+	+				+
		Galenbindunuwewa	+	+	+	+				+
		Horowpatana	+	+	+	+				+
		Medawachchiya	+	+	+	+				+
		Padawiya	+	+	+	+				+
		Ritigala *	+	+	+	+				+
		Thalawa	+	+	+	+				+
		Wilpattu *	+	+	+	+				+

			H. brookii parvimaculatus	*H. depressus*	*H. frenatus*	*H. leschenaultii*	*H. maculatus hunae*	*H. platyurus*	*H. scabriceps*	*H. triedrus lankae*
	Pollonnaruwa	Dimbulagala	+	+	+	+				+
		Elahera	+	+	+	+				+
		Flood plains *	+	+	+	+				+
		Kaudulla *	+		+	+				
		Minneriya-Giritale *	+	+	+	+				+
		Pollonanruwa	+	+	+	+				+
		Wasgomuwa *	+	+	+	+				+
North Western	Puttalam	Baththalankunduwa	+		+					
		Chilaw	+		+	+				
		Kalpitiya	+		+	+				
		Karuwalagaswewa	+	+	+	+				+
		Puttalama	+		+	+				+
		Tabbowa *	+	+	+	+				+
	Kurunegala	Ambanpola	+	+	+	+				+
		Galgamuwa	+	+	+	+				+
		Giriulla	+	+	+					
		Ibbagamuwa	+		+					
		Kuliyapitiya	+		+					
		Kurunegala	+	+	+	+				
		Nikaweratiya	+	+	+					
		Polgahawela	+	+	+					
Northern	Mannar	Giants tank *	+		+	+				
		Mannar Island			+					
		Mankulam	+		+	+				+
Western	Gampaha	Gampaha	+		+					
		Horagolla *	+		+					
		Kandana	+		+					
		Katunayake	+		+					
		Meerigama	+		+					
		Minuwangoda	+		+					
		Negambo	+		+					
		Ragama	+		+					
		Seeduwa	+		+					
		Yakkala	+		+					
	Colombo	Bambalapitiya	+		+					
		Colombo	+		+					
		Dehiwala	+		+					
		Kelaniya	+		+					
		Kesbewa	+		+					
		Kottawa	+		+					
		Kotte	+		+					
		Maharagama	+		+					
		Moratuwa	+		+					
		Nugegoda	+		+					
	Kalutara	Beruwala	+		+					
		Bulathsinhala #	+	+	+					
		Horana	+	+	+					
		Kalutara	+		+					
		Mahagama	+		+					
		Mathugama #	+	+	+					
		Neboda	+		+					
		Panadura	+		+					
		Pelawatta	+	+	+					
		Pimbura	+		+					
		Wadduwa	+		+					
		Waskaduwa	+	+	+					

* Areas protected under the Department of Wildlife Conservation (DWC), # Areas protected under the Forest Department (FD)