Revisión sistemática y distribución de los gekos enanos de Madagascar, género *Lygodactylus*

Por

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Para optar al grado de Doctor Europeo

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Review of the systematics and distribution of Malagasy dwarf geckos, genus *Lygodactylus*

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Antonio Palanca Soler,
Profesor del Departamento de Ecoloxía e Bioloxía Animal de la Universidad de Vigo, HACE CONSTAR que la presente memoria, titulada "Revisión sistemática y distribución de los gekos enanos de Madagascar, género *Lygodactylus*" y presentada por la licenciada Marta Puente Molins para optar al grado de Doctor Europeo en Biología, ha sido realizada en el área de Zoología del Departamento de Ecología y Biología Animal bajo mi dirección, cumpliendo las condiciones exigidas para su presentación, la cual autorizo.

Fdo. Dr. Antonio Palanca Soler

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Objetivos - Objectives

El objetivo de esta memoria es proporcionar una descripción taxonómica completa de las especies Malgaches de *Lygodactylus*. Revisar el material disponible en diferentes colecciones europeas y malgaches, aumentar en lo posible las descripciones existentes con una diagnosis completa y estandarizada para todas las especies malgaches con la intención de facilitar la determinación dentro del género y añadir a las colecciones nuevos especimenes capturados disponibles para nuevos estudios, y dar nuevos datos en morfología y distribución.

The aim of this study is to provide a complete taxonomic description of the known Malagasy *Lygodactylus* species, to review the available material held in several European and Malagasy collections, to extend the existent descriptions with a complete standardized diagnosis in order to facilitate determination within the genus, and to add newly captured specimens to collections available for research in *Lygodactylus*, and thus giving more data on morphology and distribution.

I. - SPANISH AND ENGLISH ABSTRACT

I.1. - RESUMEN

Las especies malgaches del geko del género *Lygodactylus* han sido ignoradas en recientes estudios en herpetofauna, en parte debido a su pequeño tamaño y similitud morfológica superficial. Desde la descripción más antigua, *Lygodactylus tolampyae* en 1872, estos estudios y la valided de algunas especies no está clara. Algunas especies han sido descritas en la base de ejemplares inmaduros, o basadas en un número de especimenes muy reducido de una localidad y sin datos en variación geográfica.

En este estudio, también ofrecemos una revisión de los *Lygodactylus* malgaches, basada en el material disponible en diversos museos de historia natural, incluyendo material tipo de la mayoría de las especies y material propio colectado en Madagascar.

En total, se examinaron más de mil ejemplares. Para cada especie, aportamos diagnosis morfológicas, descripciones estandarizadas de 26 characteres, una lista de locaclidades y discusiones de variaciones geográficas si las hubiera, dentro de las especies examinadas. Facilitamos una clave de identificación e ilustraciones, mostrando los principales caracteres para la determinación.

Mantenemos las tres lineas originales (Oriental, Meridional y Occidental), pero proponemos extender estas lineas con otro gran grupo, La línea Montana formada por las especies *Lygodactylus mirabilis* y *L. intermedius*, *L. montanus* y *L. blanci*.

Aportamos nuevo material de *L. klemmeri* de la colección de la Universidad de Antananarivo, Madagascar, con una actualización en la descripción del Holotipo hecha por Pasteur en 1964 basado en un único specimen del bosque Antsingy en el Oeste de Madagascar, que se suponia conservado en el museo de Paris, pero parece haberse perdido. Adicionalmente, describimos detalladamente una putative nueva especie procedente de Manantantely.

Las especies del género *Lygodactylus* son difíciles de distinguir debido a su pequeño tamaño y coloración críptica. Llevar a cabo la determinación e identificación en el género es difícil y requiere del uso de instrumentos ópticos. La mayoría de los caracteres discriminates estan basados en morfología de las escamas con una elevada variabilidad intraespecífica. Hemos encontrado que la morfología hemipenial es un carácter importante en determinación en Lygodactylus, considerado ya importante carácter en camaleones (Klaver *et al.*, 1986; Glaw *et al*. 1999).

Se hizo un análisis filogenético basado en secuencias parciales del gen 16S rRNA mitocondrial. Comparamos estos resultados con los obtenidos basados en la morfología. Encontramos concordancia de ambos estudios con respecto a las lineas en Lygodactylus y relaciones entre las especies. Encontramos evidencias de que *Lygodactylus bivittis* previamente definido por Pasteur como el género Microscalabotes, podría considerarse como Lygodactylus basándonos en los datos morfológicos y moleculares (Puente *et al.* 2005).

I.2. - SUMMARY

The Malagasy species of the dwarf gecko genus *Lygodactylus* have been largely neglected in recent studies on the herpetofauna of Madagascar, mainly because of their small size and superficial morphological similarity. Since the taxonomic description of the oldest species, *Lygodactylus tolampyae* in 1872, many taxonomic issues and the validity of several species are still unclear. Descriptions were made on the basis of immature specimens or based on a low number of specimens, without assessments of geographic variation.

In this study, we provide a review of Malagasy *Lygodactylus* based on preserved material including types of most species from a number of major natural history museums worldwide as well as on specimen collected in Madagascar. In total, we examined more than 1,000 specimens. For each species we provide morphological diagnoses, standardized descriptions of 26 morphological features, a list of localities and discussions of geographical variation. We provide an actualized identification key and illustrations showing the principal characters needed for species determination.

We keep the original three main lineages (Oriental, Meridional and Occidental lineages), but we suggest the extension with an additional main group, the Mountain lineage, formed by the species *Lygodactylus mirabilis* and *L. intermedius*, *L. montanus* and *L. blanci*.

We report on new material of *L. klemmeri* from the collection of the University of Antananarivo, Madagascar, and provide an update on the morphology of the holotype, described by Pasteur 1964 on the basis of a single specimen from the Antsingy forest in western Madagascar, which was deposited in the Paris museum, but might got lost. In addition, we describe

detailed description of a putatively new species from Manantantely.

The species of the genus *Lygodactylus* are difficult to distinguish because of their small size and their cryptical colour pattern. Reliable determination and identification within this genus is difficult and requires the use of optical tools. Most discriminative characters are related to scale features, which show a high interspecific variability. We find that the hemipenial morphology is an important character in species determination in *Lygodactylus*, similar as reported in chamaleons before (Klaver *et al.*, 1986; Glaw *et al*. 1999).

A phylogenetic analyis is done based on partial sequences of the mitochondrial 16S rRNA gene. We compare the results of the molecular analysis with the Logodactylus systematics based on morphological data. We find accordance of both studies with respect to the *Lygodactylus* main lineages and relationships among species. We find additional evidence that *Lygodactylus bivittis*, previously included by Pasteur, in the monotypic genera *Microscalabotes*, can be considered as *Lygodactylus* based on our molecular and morphological data (Puente *et al.* 2005).

II. - PREVIOUS WORK

II.1. - GENERAL

Geckos are successful lizards, worldwide distributed and found in a great variety of habitats (Pough et al., 2001). Most geckos are nocturnal, but a few genera are diurnal and presumably derived from nocturnal ancestors (Tansley, 1964; Röll and Henkel, 2002). In Madagascar the family Gekkonidae supports 12 genera with approximately 90 species (Bauer, 2003) and is one of the most diversified families of reptiles. Three genera of these geckos are diurnal (*Phelsuma*, *Lygodactylus* and *Microscalabotes*) (Ikeuchi et al., 2005).

Lygodactylus are dwarf and mostly cryptic lizards belonging to the family Gekkonidae. The genus is formed by small sized species, with snout-vent lengths usually below 40 mm, although some African forms can reach 42 mm (Pasteur, 1964). In contrast to many other geckos, they are diurnal and have round pupils. While other diurnal geckos are often brightly coloured, most species of *Lygodactylus* have a cryptic colour and pattern. Based on current knowledge, the genus consists of 61 species distributed with highest diversity in Sub-Saharan Africa (36 species) and Madagascar (22 species), as well as in South America, with two species often classified in their own genus *Vanzoia* (Bons and Pasteur, 1977).

There are some issues in the systematics and phylogenetic relationships of *Lygodactylus* that are still controversially discussed in the literature, for instance the assignment of species to closely related genera or the synonymisation of previously different genera with *Lygodactylus*. The genus *Microscalabotes* (Boulenger 1883) is closely related to *Lygodactylus* (Puente *et al*. 2005). The genus *Millotisaurus*, described by Pasteur (1962), was

later synonimized with *Lygodactylus*, but the the species *L. mirabilis* and *L. intermedius* were not assigned to any of the lineages in this genus (Pasteur, 1995). The systematics and phylogenetic relationships of these diurnal geckos are still largely uncharted.

Field work and studies of collections in museums were necessary to give relevant information about the species. For instance, *Lygodactylus klemmeri* Pasteur 1964, has been described on the basis of an adult male specimen from Antsingy forest in western Madagascar, but this specimen got lost and thus could not have been reviewed again. No further data on this species has become available since, except some morphological comparisons based on the holotype (Pasteur 1965), and a short mention in a species inventory list (Emanueli and Jesu 1995). Since 1992 we have been unable to retrieve the holotype in the collection of the Paris museum, where it had originally been deposited, and it might be lost (G. Pasteur, pers. comm. in 2001). According to its morphological characters, this species has been assigned to the *Lygodactylus verticillatus* group within the Occidental lineage of Malagasy *Lygodactylus* (Pasteur 1964).

In the Malagasy region (including the small Mozambique Channel
islands Europa and San Juan de Nova), *Lygodactylus* are broadly distributed and populate many different environments, such as rainforest, dry forest, semi-desert, as well as high mountain habitats with altitudes up to 2700 m in the Ankaratra Massif (Glaw and Vences, 1994).

A large problem in *Lygodactylus* systematic is the incomplete morphological descriptions of many species, because morphological characters were often mentioned only if they were useful to distinguish a new species from its putatively closest relatives. Furthermore, previous studies suffer from the lack of

lists of material examined, and corresponding lists of locality records.

II.2. - TAXONOMIC REMARKS OF MALAGASY *Lygodactylus*

The systematic of Malagasy dwarf geckos has been studied by several authors (Grandidier 1872; Boettger 1881, 1913; Peters 1883; Günther 1891; Mocquard 1895; Angel 1930, 1942; Loveridge, 1947; Pasteur 1959, 1960; Mertens 1965; Blanc and Blanc, 1967; Pasteur and Lumaret, 1976; Rösler 1998) in the last 134 years. However, most Malagasy species were described by Georges Pasteur (1962, 1964, 1967, 1995; Pasteur & Blanc 1967, 1973, 1991).
According to Pasteur (1965), the Madagasy *Lygodactylus* are divided into three monophyletic main lineages: the Oriental, Occidental and Meridional lineages. The Oriental lineage has been formally described as subgenus *Domerguella* Pasteur 1965, whereas no subgenus name was assigned to the remaining two lineages.

Pasteur divided the Malagasy *Lygodactylus* into Phylums. According to Glaw and Vences (1994) we term these groups "lineages" of the genus *Lygodactylus*.

Oriental lineage

The Oriental lineage was described by Pasteur (1965) as a new subgenus called *Domerguella* within *Lygodactylus*. The three species *Lygodactylus miops*, *L. guibei*, and *L. madagascariensis* were assigned to this group and have in common so-called postanal sacs (Pasteur 1965). Later, *Lygodactylus expectatus* and *L. rarus* were added to this group (Pasteur 1967). However, *Lygodactylus septemtuberculatus* is not mentioned by Pasteur and Blanc in their publications on

Domerguella, although Angel (1942) described *L. septemtuberculatus* and according to the morphology this species should be considered as belonging to the *Domerguella* subgenus. Nowadays this *L. septemtuberculatus* is considered as *L. miops*.

The group locality of this group is characterized by an Oriental dominion, (before the human colonization a dense equatorial forest) with a distribution from the south to the north, plus a nor-occidental area with typical "Oriental" forest characteristics (Nosy Be region and Montagne d'Ambre) (Pasteur, 1967).

Meridional lineage

Pasteur (1964) describes the Meridional lineage as a group formed by the geographically and demographically closely related species *Lygodactylus robustus*, *Lygodactylus tuberifer* and *L. montanus*. In 1967, Pasteur describes *L. blanci* as a new species belonging to the Meridional lineage due to its similarities to *L. montanus*, although the distribution is more to the north as expected for this group.

The name *robustus* is a synonym of *pictus*. Pasteur considered *L. pictus* as "nomen oblitum", but today it is accepted as the valid name. The lectotype of *L. tuberifer* is actually considered as *L. tolampyae*; Pasteur, designated a new lectotype from the syntype series, but Mertens, criticized this proceeding as not in accordance with the nomenclative rules; he described a new species, *L. tuberosus* with the holotype, the same specimen that Pasteur designated as the new *L. tuberifer* lectotype (*L. tolampyae*).

The original group was formed by the three species *Lygodactylus robustus*, *Lygodactylus tuberifer*, and *L. montanus.* All species show no general common characters and thus this group was considered as the most heterogeneus group in *Lygodactylus* (Pasteur, 1965). In 1967, Pasteur described *L. blanci* as a new species with a northern distribution, but morphologically close related to *L. montanus*, so due to this was assigned it to the Meridional lineage.

The group is defined by its meridional distribution. The locality is characterized by a similar constant humid climate as the Occidental group living in East Madagascar (Pasteur 1965).

Occidental lineage

Pasteur (1965) described the Occidental lineage as the most primitive and most closely related to African formes with an Occidental distribution. Pasteur divided this heterogeneous lineage into two different groups formerly considered as two different "phylums", the *Lygodactylus verticillatus* group (*Lygodactylus verticillatus*, *L. heterurus*, *L. decaryi*, *L.arnoulti*, *L. klemmeri*) most are characterized by a striped colouration and a SVL less than 30 mm, also characterized to present three postmental scales and five postpostmentals. The other "phylum", *Lygodactylus tolampyae* group contains only one species (*Lygodactylus tolampyae*) (Pasteur 1965).

L. ornatus Pasteur 1965 and *L. pauliani* Pasteur & Blanc 1991 are considered as intermediate species between *tolampyae* and *verticillatus*-group.
Lygodactylus praecox Pasteur 1995, was considered as belonging to *L. verticillatus* group limited to Antsingy.

The genus *Millotisaurus* **and** *Microscalabotes*

In 1962, Pasteur described a new genus closely related to *Lygodactylus* called *Millotisaurus*. This genus is geographically isolated and lives in altitudes of 2300 up to 2500 m (Pasteur 1962). Originally, it was formed by *Millotisaurus mirabilis* only characterized by keeled and imbricated dorsal scales, no adhesive scales in the extremity of the tail, an absent first finger, and a tail, which is 1 ½ times longer than the body (Pasteur 1962). In 1995, Pasteur added *Lygodactylus (Millotisaurus) intermedius* to the group, but compared to *M. mirabilis* characterized by the presence of the first finger.

In 1965, Pasteur mentioned in his studies about *Lygodactylus* the genus *Microscalabotes* (Boulenger, 1883) as a close related genus according to a note from Boulenger (1883) in which two Malagasy geckos were described as very similar to *Lygodactylus* except for the extremity structure, which had not divided adhesive lamelles.

III. - MATERIALS AND METHODS

III.1.-SPECIMENS EXAMINED

We reviewed voucher specimens deposited in the following herpetological collections: Muséum National d'Histoire Naturelle, Paris (MNHN); British Museum Natural History, London (BMNH); Museo Regionale di Scienze Naturali, Torino (MRSN); Zoologisches Forschungsinstitut und Museum A. Koenig, Bonn (ZFMK); Zoologische Staatssammlung München (ZSM); Zoölogisch Museum Amsterdam (ZMA); Senckenberg Museum und Forschungsinstitut Frankfurt am Main, (SMF); Antananarive University collection (UADBA).

Information on localities of voucher specimens is given according to the catalogues of the respective collections, with adaptations of old names or spellings to the ones used at present by the National Geographic Institute of Madagascar. This refers to the use of Andasibe instead of Perinet, Lokobe instead of Loucoube, Nosy Be instead of Nossibe, Toamasina instead of Tamatave, Tulear instead of Toliara. The localities from own material include GPS data.

Details on localities and catalogue numbers of individual specimen we give within the description for the individual species and lineages in chapter IV. In total more than 1000 specimens were examined and processed. For each species examined we include with the diagnosis and description, the catalogue data available. This includes the name-bearing type, type locality, other types, etymology.

We include our habitat and distribution information and in some of them, the hemipenial description. And the reference of an ilustration of each species with the most representative

characters exposed in chapter IV.4.1 and hemipenial structures in chapter IV.4.2.

III.2.-MORPHOMETRY AND MORPHOLOGY

The specimens are stored in 70 % ethanol. Hemipenial structures were everted shortly after death by injection of 70 % ethanol.

All specimens were examined in detail and their morphologic characters were recorded. We include original draws of some representative characters, for instance mental scales, postmental scales, postpostmental scales, internasal scales, preanal pores, finger lamellae, and hemipenial structures. These drawing were made for 21 species (Figures 1-23) from specimens deposited in museums from Paris (MNHN), Torino (MRSN), and München (ZSM).

Morphometric measurements were taken with a calliper to the nearest 0.1 mm. The following measurements were taken:

(1) SVL, snout-vent length in mm
(2) TL, tail length in mm
(3) In addition, for each specimen examined, we recorded the states of the following meristic and morphological characters:
(4) Shape of dorsal scales (granular, keeled or pseudokeeled)
(5) Presence of the first finger (present, absent or reduced)
(6) Presence of the claw I, which is the claw belonging to the first finger (present or absent)
(7) Number of subdigital lamellae on the fourth toe
(8) Shape of the mental scale as the first scale of the snout in which the infralabial scales converge (undivided or tripartite, where the mental scale consists of three parts with interjacent sutures)
(9) Contact between mental and infralabial scale (no contact, contact or distinct contact)

(10) Number of postmental scales (scales located immediately behind the mental scale.
(11) Symmetry of postmental scales (symmetrical, bisymmetrical or asymmetrical)
(12) Number of postpostmental scales
(13) Number of infralabial scales
(14) Number of supralabial scales
(15) Number of internasal scales
(16) Number of preanal pores (in males only)
(17) Presence and pigmentation of strengthened scales around the femoral-preanal area
(18) Verticillation of the tail (and number of verticilles if any)
(19) Number of dorsolateral tubercles
(20) Number of scales in each tubercle
(21) Dorsal fond colour
(22) Dorsal pattern
(23) Ventral pattern
(24) Number of dorsal scales along the body (from the snout until the tail)
(25) Number of dorsal scales around the body until the first ventral scale.
(26) Number of ventral scales (from the mental scale until the cloaca)

We use the statistical program SPSS 12.0 for Windows for calculating the mean, standard deviation, mode, maximum, and minimum of the measured characters for each species.

We exclude immature specimens and juveniles for the characters snout-vent length (SVL) and tail length (TL) as well as mature specimens with broken or not yet fully regenerated tails for the character TL.

The determination of the adult status for males is can easily be recognized by the presence of preanal pores (Greer, 1967; Röll, 2000, pp. 189-198). Unless eggs in pregnant females can be

recognized, the adult status of females was assumed if their size was equal or larger in comparison with the size of the smallest male of the same species.

Density plots for the character SVL (snout-vent length) was computed and plotted using the R software environment for statistical computing and graphics (http://www.r-project.org/) using the "density" and "plot" R functions with standard parameters on subsets of the measurement data (e.g. according to sex, *Lygodactylus* groups). The area under the density curves is normalized to 1 and thus unbiased for sample sizes.

III.3.-MOLECULAR ANALYSIS

Tissue samples were taken from specimens collected in the field and stored in 90-96% ethanol. DNA was extracted using standard salt extraction protocols. A fragment of the mitochondrial 16S rRNA gene (498 bp) was amplified with the primers 16SAL and 16SBH (Palumbi *et al*., 1991). Cycle sequencing was performed with the primer 16SAL, and subsequently the product was on an automated sequencer (ABI 3100). Sequences were aligned manually in the program Sequence Navigator, and all hypervariable and gapped positions (altogether 93 characters) were excluded. Phylogenetic analysis was performed using the program PAUP*, version 4b10 (Swofford, 2002). We calculated a maximum likelihood tree after determining the substitution model best fitting the data using the program Modeltest (Posada and Crandall, 1998).

A full heuristic search was performed. Robustness of nodes was tested using maximum likelihood (100 replicates) and maximum parsimony bootstrapping (1000 replicates). For the maximum likelihood method, several very similar or identical conspecific haplotypes were excluded from the data set due to computational constraints. A species of the diurnal gecko genus *Phelsuma* was used as the outgroup. Table 1 describes voucher specimens used and the Genbank accession numbers of DNA sequences being submitted to the Genbank database (http://www.ncbi.nlm.nih.gov/).

Table 1. Localities, voucher numbers and Genbank accession numbers of *Lygodactylus*
specimens studied. Collection acronyms used: UADBA, Universite d'Antananarivo,
Département de Biologie Animale; ZSM, Zoologische Staatssamlung München; ZMA,
Zoological Museum Amsterdam. Some vouchers have not yet been catalogued and are given
with their field numbers (MV, collection of M.Vences; FGMV, collection of F.Glaw and
M.Vences). All specimens except for the first five originated from Madagascar.

Species	**Locality**	**Specimen-Voucher**	**Genbank accession**
Lygodactylus cf. *capensis*	Namibia, Popa falls	not collected	AY653248
Lygodactylus sp. 2	Africa (pet trade)	not collected	AY653249
Lygodactylus sp. 1	South Africa	not collected	AY653277
Lygodactylus gutturalis	Guinea Bissau	tissueWME13	AY653251
Lygodactylus gutturalis	Guinea Bissau	tissueWME30	AY653252
Lygodactylus arnoulti	Mount Ibity	tissue 2000B.31	AY653240
Lygodactylus arnoulti	Mount Ibity	UADBA-MV 2001.501	AY653241
Lygodactylus blancae	Lac Itasy	UADBA-MV 2001.260	AY653245
Lygodactylus blancae	Lac Itasy	ZSM 498/2001	AY653246
Lygodactylus guibei	Vohidrazana	ZMA 19631	AY653250
Lygodactylus heterurus	Sambava	ZSM 388/2000	AY653253
Lygodactylus madagascariensis	Tsaratanana	ZSM 781/2001	AY653254
Lygodactylus madagascariensis	Manongarivo	ZSM-FGMV 2002.778	AY653239
Lygodactylus madagascariensis	Manongarivo	FGMV 2002.722	AY653255
Lygodactylus madagascariensis	Manongarivo	UADBA-FGMV 2002.779	AY653256
Lygodactylus madagascariensis	Montagne d'Ambre	ZSM-FGMV 2002.942	AY653257
Lygodactylus madagascariensis	Manongarivo	ZSM-FGMV 2002.721	AY653258
Lygodactylus miops	Ranomafana	ZSM-FGMV 2002.456	AY653260
Lygodactylus miops	Ranomafana	ZSM-FGMV 2002.458	AY653261
Lygodactylus miops	Ranomafana	ZSM-FGMV 2002.459	AY653262
Lygodactylus miops	Ranomafana	UADBA 20735	AY653263
Lygodactylus mirabilis	Ankaratra	ZSM 388/2000	AY653247
Lygodactylus pauliani	Itremo	ZSM 490/2001	AY653264
Lygodactylus aff. *pictus*	Isalo	ZMA 19595	AY653238
Lygodactylus pictus	Ambositra	MV 2002.778	AY653259

Lygodactylus pictus	Ambositra	ZMA 19532	AY653265
Lygodactylus pictus	Ambositra	ZMA 19535	AY653266
Lygodactylus pictus	Ambositra	ZMA 19536	AY653267
Lygodactylus pictus	Ambositra	ZMA 19537	AY653268
Lygodactylus pictus	Ambositra	ZMA 19538	AY653269
Lygodactylus pictus	Sendrisoa	UADBA-FGMV 2001.608	AY653270
Lygodactylus pictus	Ambositra	ZMA 19531	AY653271
Lygodactylus pictus	Ambositra	ZMA 19534	AY653272
Lygodactylus pictus	Antsirabe	MV 2002.2	AY653276
Lygodactylus rarus	Ankarana	UADBA-FGMV 2002.892	AY653273
Lygodactylus rarus	Ankarana	ZSM-FGMV 2002.941	AY653274
Lygodactylus sp.	Tsaratanana	ZSM 783/2001	AY653275
Lygodactylus tolampyae	Berara	ZSM 419/2000	AY653278
Lygodactylus tolampyae	Ankarafantsika	tissue 2001C.5	AY653279
Lygodactylus tolampyae	Ankarafantsika	ZSM 501/2001	AY653280
Lygodactylus tuberosus	Toliara	UADBA 21069	AY653281
Lygodactylus tuberosus	Toliara	ZMA 19600	AY653282
Lygodactylus tuberosus	Toliara	UADBA 21073	AY653283
Lygodactylus tuberosus	Toliara	ZMA 19601	AY653284
Lygodactylus tuberosus	Toliara	ZMA 19599	AY653285
Lygodactylus tuberosus	Toliara	FGMV 2002.1589	AY653286
Lygodactylus tuberosus	Toliara	FGMV 2002.1591	AY653287
Lygodactylus tuberosus	Toliara	ZMA 19608	AY653288
Lygodactylus verticillatus	Ifaty	ZMA 19596	AY653289
Lygodactylus verticillatus	Ifaty	FGMV 2002.2013	AY653290
Lygodactylus verticillatus	Ifaty	FGMV 2002.2062	AY653291
Microscalabotes bivittis	Andasibe	tissue 2001A.21	AY653242
Microscalabotes bivittis	Andasibe	tissue 2001A.3	AY653243
Microscalabotes bivittis	Andasibe	tissue 2001B.9	AY653244

III.4. - STUDY AREA

In Madagascar, *Lygodactylus* occupied different kind of environments, there are rainforest species living in trees, dry forest, desert species, also including High Mountain with animals living in habitats up to 2700 m in the Ankaratra Massif (Glaw and Vences 1994). In Madagascar, *Lygodactylus* occupy different kind of environments: rainforest and dry forest species usually living on trees, species of the spiny desert, and species adapted to High Mountain up to 2700 m in the Ankaratra Massif (Glaw & Vences 1994) which usually live on rocks.

III.4.1. - General characters

Madagascar Island is one of the world's hottest biodiversity hotspots (Jörg *et al*., 2001). Based on an action plan recently released by Madagascar's Association Nationale pour la Gestion des Aires Protégés (ANGAP), the national agency responsible for management of protected areas, Madagascar can be divided into a series of Ecoregions and Transition zones.
The **Eastern Ecoregion** is characterized by lowland rainforest. It extends along the East coast from North of Sambava to Fort Dauphin. This is perhaps the richest region in Madagascar in terms of species diversity and local centres of endemism.

The **Central Ecoregion** is a heterogeneous ensemble of moist and dry formations located parallel to the Eastern Ecoregion and extending westward across the central plateau. This part of the island has been largely deforested or modified by human activities. Nevertheless, some of the original forest is still intact.

The **Mountains Ecoregion** corresponds to the former Central Domain and is an area of high endemism for amphibians and reptiles. It includes two geographically distinct high mountain regions, Tsaratanana and Marojejy.

The **Western Ecoregion** is the largest ecoregion. It is a vast zone of dry deciduous forests on the western coastal plains and limestone plateau, ranging from sea level up to 800 m of altitude and covering the area from Antsiranana in the north to Morombe in the southwest as well as a smaller area in the extreme northern part of the country, which represents a major centre of plant endemism. It is characterized by a dry season of almost seven months. Together with the eastern lowland forests, the Western Ecoregion should be considered as one of the most endangered forest ecosystems in Madagascar. Enclosed within the Western Ecoregion there is the **Analavelona Transition Zone**, a tiny fragment of moist forest with characteristics of the Central Ecoregion.

The dry forests of the **Southern Ecoregion** are characterized by deciduous thicket or thorn scrub. They extend southward from Morombe along the coast covering much of the southern tip from sea level up to 400 m of altitude. Rainfall in this region is sparse and irregular and as such these are the driest forests in Madagascar and often called the *spiny desert*.

III.4.2. - Our sampling localities

We sampled specimens of *Lygodactylus* from the following areas in Madagascar in alphabetical order: Ambatomenaloha, Ambolokopatrika, Ambositra, Ampahana, Ampefy, Analalava Forest, Andasibe, Andohahela, Angavo Massif, Ankarafantsika, Ankarana, Ankaratra-Tsiatajavona, Antsingy, Antsirabe, Bekopaka, Berara, Besariaka, Col de Tapias, Ifanadiana, Ifaty, Itremo, Ivohibe, Lac Itasy, Manantantely, Mandritsara, Manjarivolo, Andringitra, Manongarivo, Masoala, Mont Ibity, Montagne d'Ambre, Montagne des Français, Moramanga, Nosy Be, Ranomafana, Sahembendrana, Sambava, Toliara, Tolongoina, Tsaratanana, Tsiafajavona, Tsimanampetso, Vohidrazana.

The exact localities including the GPS coordinates for all sampled specimens are given in Table 2.

Table 2. Sampling localities with the coordenates and the *Lygodactylus* species found.

Coordinates	Localities	Species
19° 13' 2" S, 47° 8' 60" E	Ambatomenaloha	*Lygodactylus pauliani*
14° 32' 1'' S, 49° 26' 2'' E	Ambolokopatrika	*Lygodactylus miops*
20° 31' 3" S, 47 15' 4" E	Ambositra	*Lygodactylus pictus*
14° 45' 1" S, 50° 13' 1" E	Ampahana	*Lygodactylus heterurus trilineigularis*
16° 4' 3" S, 45° 39' 1" E	Ampefy	*Lygodactylus blancae*
21° 12' 0" S, 44° 32' 0" E	Analalava Forest	*Lygodactylus pictus*
18° 55' 3 "S, 48°25 '22" E	Andasibe	*Lygodactylus guibei, L. bivittis*
24° 32' S, 46° 42' E	Andohahela	*Lygodactylus miops, L. montanus*
24°50' 30'' S, 45°47' 59" E	Angavo Massif	*Lygodactylus decaryi*
16° 16' 0 " S, 46° 34' 60 " E	Ankarafantsika	*Lygodactylus tolampyae*
12° 57' 43" S, 49° 07' 15" E	Ankarana	*Lygodactylus expectatus, L. rarus, L. heterurus trilineigularis*
19° 22' 60" S, 47° 21' 0" E	Ankaratra-Tsiatajavona	*Lygodactylus mirabilis*
15° 48' 0" S, 46° 13' 0" E	Antsingy	*Lygodactylus klemmeri, L.*

19° 51' 41" S, 47° 02' 03" E	Antsirabe	*Lygodctylus pictus*
19° 45' 2" S, 44° 37' 3" E	Bekopaka	*Lygodactylus klemmeri*
14° 18' 32" S, 47° 54' 54" E	Berara	*Lygodactylus tolampyae*
14° 48' 0" S, 49° 41' 0" E	Besariaka	*Lygodactylus miops*
20° 14' 34" S, 47° 6' 3" E	Col de Tapias	*Lygodactylus arnoulti*
21° 21' 13" S, 47° 36' 28" E	Ifanadiana	*Lygodactylus miops*
23° 28' 0" S 43° 46' 3" E	Ifaty	*Lygodactylus tuberosus, L. verticillatus*
20° 35' 1" S, 46° 38' 3" E	Itremo	*Lygodactylus pauliani*
22° 29' 8" S, 46° 53' 16" E	Ivohibe	*Lygodactylus montanus*
19° 3' 5" S, 46° 48' 4" E	Lac Itasy	*Lygodactylus blancae*
24° 58' 59" S, 46°54' 58" E	Manantantely	*Lygodactylus sp. nov.*
18° 48' 0" S, 47° 43' 60" E	Mandritsara	*Lygodactylus ornatus*
22° 14' 23" S, 46° 55' 0" E	Manjarivolo, Andringitra	*Lygodactylus intermedius*
15° 10' 60" S, 47° 53' 60" E	Manongarivo	*L. m. madagascariensis*
15° 40' 19" S, 50° 12' 94" E	Masoala	*Lygodactylus miops*
20° 04' 40" S, 47° 00' 10"E	Mont Ibity	*Lygodactylus arnoulti, L. blanci*
12°31'12"S, 49°10'32"E	Montagne d'Ambre	*L. m. petteri*
12° 19' 59" S, 49° 21' 1" E	Montagne des Français	*Lygodactylus heterurus trilineigularis*
18° 56' 59" S, 48° 13' 11" E	Moramanga	*Lygodactylus miops*
13° 21' 7" S, 48° 16' 33" E	Nosy Be	*L. m. madagascariensis, L. heterurus heterurus*
21° 15' 40" S, 47° 27' 3" E	Ranomafana	*Lygodactylus miops, L. guibei, L. pictus*
18° 10' 0" S, 49° 22' 60" E	Sahembendrana	*Lygodactylus miops*
14° 14' 13" S, 50° 1' 27" E	Sambava	*Lygodactylus heterurus trilineigularis*
23° 21' 0" S, 43° 40' 0" E	Toliara	*Lygodactylus tuberosus*
21° 33' 4" S, 47° 30' 58" E	Tolongoina	*Lygodactylus miops*
13 01' 01" S, 49 43' 22" E	Tsaratanana	*L. m. madagascariensis*
17° 37' 1" S, 46° 57' 59" E	Tsiafajavona	*Lygodactylus mirabilis*
23° 42' 54" S, 43° 42' 43" E	Tsimanampetso	*Lygodactylus tuberosus*
18° 13' 60 S, 49° 8' 60 E	Vohidrazana	*Lygodactylus guibei*

IV.-RESULTS

IV.1. - Morphological systematics in Malagasy *Lygodactylus*

IV.1.1. - Oriental lineage.

***Lygodactylus madagascariensis* group**

(Contains: *Lygodactylus madagascariensis madagascariensis*, *L. madagascariensis petteri*, *L. miops*, *L. guibei*, *L. expectatus* and *L. rarus*)

The species belonging to the *L. madagascariensis* group are characterized to have a SVL 20.5-38.3 mm; granular dorsal scales; first finger present, without claw; mental scale undivided with two postmental scales; males with 5-7 preanal pores and postanal sacs; brownish dorsal colouration without a clear dorsal pattern. The species from this group have a oriental distribution with arboreal habitudes typical from the rainforest in the East Ecoregion of Madagascar.

Lygodactylus madagascariensis madagascariensis (Boettger, 1881)
Scalabotes madagascariensis Boettger, 1881. - *Name-bearing type*: male lectotype SMF 8937 (designated by Mertens), collected by A. Stumpff. - *Type locality*: Nosy Be; "hab. In insula Nossi-Bé rarus", according to the original description. - *Other types*: no data according to the original description.- *Etymology*: name derived from its general provenance, Madagascar.

Diagnosis. From other species of the *Lygodactylus madagascariensis* group, *L. madagascariensis madagascariensis* is distinguished as follows: from *L. madagascariensis petteri* by the smaller size (26.8-34.5 mm versus 33.2-36.8 mm in *L. madagascariensis petteri*, mean 30.6 mm versus 35.1 mm), by the number of 1-3 internasal scales (versus 1-2 in *L. madagascariensis petteri*); from *L. miops* by the number of usually four postpostmental scales (versus usually five in *L. miops*), by the number of 6-7 preanal pores (versus five or six in *L. miops*); fom *L. expectatus* by the bigger size (26.8-34.5 mm versus 27.5-29.7 mm in *L. expectatus*, mean 30.6 versus 26.6), by the absence of two pattern spots in both sides of the neck (versus present in *L. expectatus*); from *L. guibei*, by the absence of big tubercles in the base of the tail (versus present in *L. guibei*); from *L. rarus*, absent or indistinct colour rings in the tail (versus present and distinct in *L. rarus*).

Description. (1, 2) medium sized species. Adult specimens are 26.8-36.8 mm snout-vent length (SVL) (mean ± SD 30.6 ± 1.99 mm, n = 17); (2) tail length (TL) 26.6-39.0 mm (mean ± SD 33.37 ± 3.92 mm, n= 11); (3) granular dorsal scales, (4, 5) first finger without claw; (6) three pairs of lamellae (mean ± SD 3.35 ± 0.49, n = 17); (7, 8) mental scale undivided broad contact between infralabial scale and mental scale if exists, not distinct; (9, 10) two postmental scales, asymmetrical or symmetrical; (11) usually four postpostmental scales; (12) 5-8 infralabial scales (mean ± SD 6.47 ± 0.71, n = 17); (13) 5-8 supralabial scales (mean ± SD 6.71 ± 0.84, n = 17); (14) 1-3 internasal scales (mean ± SD 2.12 ± 0.69, n = 17); (15) males with 6-7 preanal pores (mean ± SD 6.60 ± 0.54, n = 5); (16) tail usually with coloured verticilles with 6-13 verticilles; (17, 18) without dorsolateral tubercles; (19, 20) dorsal colour beige-brownish but without a clearly defined pattern, sometimes slightly striated; (21) there can be some ventral spots in the gular area, but not distinct; (22) 179-212 dorsal scales along the body (mean ± SD 195.17 ± 12.56, n =

6); (23) 73-99 dorsal scales around the body (mean ± SD 88.89 ± 8.10, n = 9); (24) 96-117 ventral scales (mean ± SD 104.33 ± 6.74, 96, n = 8). (Figure 1).

Hemipenial structure. Based on ZSM 783/2001, adult male from Tsaratanana. Hemipenis with a total length of ca. 2 mm., short pedicel (ca. 0.5 mm). The truncus is set with small but deep calyces, giving the truncus a papillate appearance. Papillae fields absent. Sulcus spermaticus without well developed sulcal lips and with two channels from the pedicel to the apex. The calyces around the sulcus spermaticus absent. Apex bilobed formed by two big lobes with ca. 1.8 mm each one. (Figure 1.2).

Material examined. BMNH 1988.9-16 (C. J. Raxworthy, 12 Jan., 11. Feb. 1988, Manongarivo Special Reserve), MRSN R 1892 (F. Andreone, 1997, Ambolokopatrika), MRSN R 1909-1910 (F. Andreone, Feb. 1999, Nosy Be), MRSN R 1919 (F. Andreone, Feb. 2001, Tsaratanana), MRSN.R.1920 (F. Andreone, Feb. 2001, Tsaratanana), SMF 8937 (Lectotype, A. Stumpff d. 1881, Nosy Be), ZFMK 48241 (Nosy Be, Lokobe), ZFMK 51238 (Ankarafantsika), ZMA 19370 (M. Vences, F. Glaw, Jan. 2003, Manongarivo), ZMA 19581 (M. Vences, F. Glaw, Feb. 2003, Manongarivo), ZSM 332/2003 (M. Vences, F. Glaw, Feb. 2003, Manongarivo), ZSM 782/2001 (Tsaratanana), ZSM 783/2001 (Tsaratanana), ZSM 813/2003 (M. Vences, F. Glaw, 31. Jan. 2003, Camp Norbert, Manongarivo), ZSM 832/2003 (Manongarivo, 1. Feb. 2003).

Distribution. Nosy Be (type locality). According to specimens examined in the field, this species is known from Nosy Be, Nosy Mamoko, Manongarivo, Ankarafantsika and Tsaratanana.

Habitat. Angel (1942) reports this species from tree trunks and large rocks in primary forest, but it is uncertain whether this refers to well-identified specimens. At Manongarivo, we found

specimens on trees in disturbed low-altitude rainforest, usually in trees close to rivers ca. 1-1.5 m from the ground (personal observation).

Remark. The specimen ZSM 783/2001 (Tsaratanana) morphologically similar to *L. m. madagascariensis*, seems to be a different species according to the molecular analysis results (Puente et al., 2005). This specimen is quite similar morphologically to another specimen also collected at Tsaratanana, ZSM 782/2001 which is placed within *Lygodactylus madagascariensis madagascariensis* in the molecular analysis (Puente *et al.*, 2005) (but erroneously appears as ZSM 781 in Table 1 of that publication). Unfortunately we had no specimens from Nosy Be (*L. m. madagascariensis* type locality) to include in the analysis for molecular analyis. The specimen ZSM 783/2001,differs from *L. expectatus* by having three internasal scales (versus 1-2 in *L. expectatus*) and with 4 pairs lamellae (versus 3 in *L. expectatus*). So because of the morphological characters we can assume that ZSM 783/2001 cannot be attributed to *L. expectatus* also known from Tsaratanana (Pasteur & Blanc 1973).

The two specimens of *L. m. madagascariensis* from Manongarivo and Ankarafantsika, are not considered *L. m. petteri* because the SVL is between 26.8 and 32.7 mm. (versus 33.2-36.8 mm. in *L. m. petteri*), the number of lamellae in this specimens is 3 (versus 4 in *L. m. petteri*).
The specimen ZFMK 51239 (Ankarafantsika) has been catalogued as *Lygodactylus madagascariensis madagascariensis*; female; 29.4 mm SVL; tail broken; granular dorsal scales; first finger present bearing the claw in one finger (versus never claw in the first finger in *L. m. madagascariensis*); three pairs lamellae; to be *Lygodactylus madagascariensis madagascariensis* the mental scale should be undivided, but in this specimen one of the sides is divided; contact between infralabial and mental scale recognizable but not distinct; three bisymmetrical postmental

scales; five postpostmental scales; five infralabial scales; six supralabial scales; one internasal scale; no preanal pores; tail broken and thus it was not possible to check the verticilles; dorsolateral tubercles absent; dorsal colour brown-beige, with an indistinct pattern of longitudinal stripes; ventral colour light.

Lygodactylus madagascariensis petteri Pasteur, 1967
Lygodactylus madagascariensis petteri Pasteur, 1967. - *Name-bearing type*: holotype MNHN 1990.4, female of 36 mm body length. - *Type locality*: "Montagne d'Ambre, forêt ancienne-Roussettes" according to the original description. - *Other types*: two paratypes; MNHN 1990.5, male; and MNHN 1893.194.- *Etymology*: dedicated to Jean-Jacques Petter.

Diagnosis. From other taxa of the *Lygodactylus madagascariensis* group, *L. madagascariensis petteri* is distinguished as follows: from *L. madagascariensis madagascariensis* by the bigger size (33.2-36.8 mm versus 26.8-34.5 mm in *L. madagascariensis madagascariensis*, mean 35.1 mm versus 30.6 mm), by the number of 1-2 internasal scales (versus 1-3 in *L. madagascariensis madagascariensis*); from *L. miops* by the number of four postpostmental scales (versus usually five in *L. miops*), by the number of seven preanal pores (versus 5-7 in *L. miops*); fom *L. expectatus* by the bigger size (33.2-36.8 mm versus 27.5-29.7 mm in *L. expectatus*, mean 35.1 mm versus 28.3 mm), by the absence of two pattern spots in both sides of the neck (versus present in *L. expectatus*); from *L. guibei* by the absence of big tubercles in the base of the tail (versus present in *L. guibei*); from *L. rarus* by the number of 1-2 internasal scales (versus 1-3 in *L. rarus*) and by the absent or indistinct colour rings in the tail (versus present and distinct in *L. rarus*).

Description. (1, 2) medium sized species. Adults specimens are 33.2-36.8 mm snout-vent length (SVL) (mean ±

SD 35.1 ± 1.52 mm, n = 4). (2) tail length (TL) 39 mm (mean ± SD 39.0 ± 0 mm, n= 1); (3) granular dorsal scales, (4, 5) first finger without claw; (6) four pairs lamellae (mean 3.43 ± 0.53, n = 7); (7, 8) mental scale undivided broad contact between infralabial scale and mental scale can exists but not distinct; (9, 10) two postmental scales usually symmetrical; (11) four postpostmental scales; (12) 6-7 infralabial scales (mean 6.57 ± 0.53, n = 7) ; (13) 6-8 supralabial scales (mean ± SD 6.57 ± 0.78, n = 7); (14) 1-2 internasal scales (mean ± SD 1.33 ± 0.51, n = 6); (15) males with seven preanal pores; (16) tail usually make coloured verticilles but no entire tails were observed; (17, 18) without dorsolateral tubercles; (19, 20) dorsal colour beige-brownish but without a clear defined pattern, sometimes slightly striated; (21) there can be some ventral spots in the gular area, but indistinct; (22) 190 dorsal scales along the body (mean 190 ± 0, n = 1); (23) 91 scales around the body (mean ± SD 91 ± 0, n = 1); (24) 73 ventral scales (mean ± SD 73 ± 0, n = 1).

Material examined. MNHN 1990.4 (holotype, J. J. Petter [don. C. A. Domergue], 10. Nov. 1965, Montagne d'Ambre), MNHN 1990.5 (paratype, J. J. Petter [don. C. A. Domergue], 10. Nov. 1965, Montagne d'Ambre), MNHN 1893.194 (Pasteur et Blanc, 1967, Mararaomby, Montagne d'Ambre), ZSM 914/2003 (FGMV 2002. 942) (Montagne d'Ambre, Feb. 2003), FGZC 0518 (Montagne d'Ambre).

Distribution. Montagne d'Ambre (type locality).

Habitat. Arboreal species from humid forest at Montagne d'Ambre (Pasteur & Blanc, 1967).

Remark. *L. m. madagascariensis* and *L. m. petteri* were considered as different subspecies based on morphological characters, like the body size, the scales size, and the colouration (Pasteur & Blanc, 1967), also molecular divergences were

observed (Puente *et al*. 2005). An additional problem is that we had no *L. m. madagascariensis* from Nosy Be (the type locality) to include in the molecular analysis. Unless more data on the genetic differentiation among populations in the *L. madagascariensis* complex become available, we prefer to consider *L. m. petteri* as a subspecies.

Lygodactylus miops Günther, 1891
Lygodactylus miops Günther, 1891. - *Name-bearing type*: holotype, BMNH 1946.8.2255, female, 31.8 mm SVL. - *Type locality*: "Sahembendrana, Madagascar" according to BMNH catalogues (probably referring to Sahembendrana; see Blommers-Schlösser & Blanc 1991). - *Other types*: none according to original description.- *Etymology*: no data from the original description.

Microscalabotes spinulifer Boettger, 1913. - *Name-bearing type*: holotype, SMF 8931 (Holotype *L. miops*, F. Sikora, Moramanga, according to the SMF catalogues was originally "Typus zu: *Microscalabotes spinulifer*"). - *Other types*: - *Type locality*: "Fort Dauphin, SO. Mad." according to the original description. - *Etymology*: no data from the original description.

Lygodactylus septemtuberculatus Angel, 1926. - *Name-bearing type*: female holotype MNHN 1893.63. - *Type locality*: "provenant de l'Est de Madagascar: forêt de Moramanga" according to the original description. – *Other types*: no further types following the original description.- *Etymology*: The name derives from the prominent scales (tubercles) on the flanks of the species, according to the original description.

Diagnosis. From other species of the *Lygodactylus madagascariensis* group, *L. miops* is distinguished as follows: from *L. madagascariensis madagascariensis* by the number of usually five postpostmental scales (versus usually four in *L.*

madagascariensis madagascariensis) and the number of 5-6 preanal pores (versus seven in *L. madagascariensis madagascariensis*); from *L. madagascariensis petteri* by the smaller size (20.5-32.6 mm versus 33.2-36.8 mm in *L. madagascariensis petteri*, mean 27.9 mm versus 35.1 mm), by the number of usually five postpostmental scales (versus four in *L. madagascariensis petteri*), the number of three pairs of lamellae (versus 3-4 in *L. madagascariensis petteri*) and the number of 5-6 preanal pores (versus seven in *L. madagascariensis petteri*); from *L. expectatus* by the absence of two pattern spots in both sides of the neck (versus present in *L. expectatus*), by the number of usually five postpostmental scales (versus four in *L. expectatus*), the number of 5-6 preanal pores (versus 6-7 in *L. expectatus*), the number of 1-3 internasal scales (versus 1-2 in *L. expectaus*); from *L. guibei* by the usual absence of tubercles in the base of the tail (versus present and distinct in *L. guibei*), by the number of usually five postpostmental scales (versus usually four in *L. guibei*) and the number of 5-6 preanal pores (versus 6-7 in *L. guibei*); from *L. rarus* by the smaller size (20.5-32.6 mm versus 31.6-36.5 mm in *L. rarus*, mean 27.9 mm versus 34.0 mm), by the number of usually five postpostmental scales (versus four in *L .rarus*) and by absent or indistinct colour rings in the tail (versus present and distinct in *L. rarus*).

Description. (1) medium sized. Adult specimens are 20.5-32.6 mm snout-vent length (SVL) (mean ± SD 27.9 ± 2.56 mm, n = 44); (2) tail length (TL) 17.4-36.7 mm (mean ± SD 28.0 ± 4.70 mm, n= 23); (3) granular dorsal scales; (4, 5) first finger without claw; (6) three pairs of lamellae present; (7,8) mental scale undivided and broad contact with infralabial scales; (9, 10) two postmental scales, sometimes three (mean ± SD 2.10 ± 0.30, n = 45), normally asymmetrical; (11) five postpostmentals, 4-6 can occur (mean ± SD 4.84 ± 0.56, n = 45); (12) the number of infralabial scales are 5-8, (mean ± SD 6.29 ± 0.75, n = 45); (13) 5-8 supralabial scales present (mean ± SD 6.91 ± 0.70, n = 45);

(14) 1-3 internasal scales (mean ± SD 2.33 ± 0.60, n = 45); (15) 5-7 preanal pores (mean ± SD 6.30 ± 0.67, n = 10); (16) tail tends to be verticillated, with a colour rings; (17) can appear dorsolateral tubercles 2-6 with one spiny scale, possibly two, but the second scale quite smaller; (18) the number of scale-tubercles seen are four and five; (19, 20) dorsal colour it is beige-brownish but without a clear defined pattern; (21) present a light ventral colour; it could be two distinct spinous scales in both sides of the base of the tail, but not distinct as *L. guibei*; (22) 134-235 number of dorsal scales along the body (mean ± SD 208.96 ± 20.17, n = 23); (23) 70-112 number of dorsal scales around the body (mean ± SD 90.64 ± 9.82, n = 28); (24) 73-113 number of ventral scales (mean ± SD 95.82 ± 10.05, n = 28). (Figure 2).

Hemipenial structure. Based on MRSN.R.1893, adult male from Ambolokopatrika. Hemipenis with a total length of ca. 3 mm. short pedicel (ca. 1 mm). The truncus is set with small but deep calyces, giving the truncus a papillate appearance. Papillae fields absent. Sulcus spermaticus without well developed sulcal lips and with two channels from the pedicel to the apex. The calyces around the sulcus spermaticus absent. Apex bilobed formed by two big lobes with a little bit more than 2 mm each one. (Figure 2.2).

Material examined. BMNH 1948.8.2255 (holotype of *Lygodactylus miops*), BMNH1946.8.2255 (Majastre, Senbendrana), BMNH 1998.65 (C. Raxworthy, 25. Aug. 1986, Anandrivola forest, NE Madagascar), MNHN 1893.63 (holotype of *L. septemtuberculatus*, Angel, Forêt de Moramanga, collector name not given in catalogue), MNHN 1921.251-252 (collector and locality unknown), MNHN 1930.269 (Karianga), MNHN 1935.122 (Bezabona, Tolagnaro region), MNHN 1938.195 (South Madagascar), MNHN 1990.1839 (C. Domergue, locality unknown), MNHN 1990.1857 (environments of Maroantsetra, 1963), MNHN 1990.1875 (C. P. Blanc, 28. Nov. 1963, Mananara), MRSN R 1888-1891 and MRSN R 1893-1894 (F.

Andreone, 1997, Ambolokopatrika), MRSN R 1897-1898 (F. Andreone, Jun. 1996, Besariaka), MRSN R 1899-1904 (F. Andreone, Dec. 1998, Masoala), MRSN R 1905-1906 (F. Andreone, Dec. 1999, Masoala), MRSN R 1907-1908 (F. Andreone, Jan. 1999, Moramanga), MRSN R 1923 (F. Andreone, Jun-Jul. 1995, Tolongoina), MRSN R 1924-1925 (F. Andreone, 1997, Ambolokopatrika), MRSN R 1150 (F. Andreone, Nov. 1994, Andohahela), MRSN R 1179.1-2 (F. Andreone, May 1994, Ifanadiana), MRSN R 1195.1-2 (F. Andreone, Apr. 1994, Andohahela), SMF 8931 (Holotype *L. miops*, F. Sikora, Moramanga, according to the SMF catalogues was originally "Typus zu: *Microscalabotes spinulifer*"), ZFMK 17713 (leg. H. Meier, Jan. 1976, Kianjavato), ZFMK 50591 (leg. F.W. Henkel and others, May 1989, Ranomafana), ZFMK 52304 (leg. F.W. Henkel & W. Schmidt, no date of coll. Lac Arnouche, Toamasina), ZMA 19678-19679 (field numbers LLS 182 and 223, B. van Opzeeland, Mananara), ZSM 731/2003 (FGMV 2002. 456) (Ranomafana region, Jan. 2003), ZSM 732/2003 (FGMV 2002. 458) (M. Puente, Ranomafana region, Jan. 2003), ZSM 733/2003 (FGMV 2002. 459) (M. Puente, Ranomafana region, Jan. 2003).

Distribution. Sahembendrana (type locality). According to specimens examined in the field, the species is known from localities at low and mid-altitudes along the Malagasy East Coast, from the far south-east to the north-east. Ordered roughly from north to south, the verified localities are: Sahembendrana, Anandrivola, Ambolokopatrika, Besariaka, Masoala, Maroantsetra, Mananara, Lac Arnouche, Moramanga, Ranomafana, Ifanadiana, Tolongoina, Kianjavato, Andohahela, Bezabona (Tolagnaro). A further locality that we could not reliably locate is Karianga.

Habitat. Forest (Angel 1942). We found this species in Ranomafana, in the rainforest, and living in trees (personal observation).

Geographical variation. The 21 specimens examined from north-eastern localities (Maroantsetra, Mananara, Ambolokopatrika, Besariaka, Masoala) reach slightly larger sizes (SVL 22.8-32.6 mm, 28.04 mm) compared to the three specimens from central eastern (Moramanga) (SVL 25.3-29.0 mm, 26.9 mm) and the 13 specimens from south-eastern Madagascar (Ifanadiana, Andohahela, Kianjavato, Ranomafana, Bezabona-Tolagnaro, Tolongoina) (SVL 13.3-31.3 mm, 26.6 mm). Most specimens from the north-east with contact between mental and infralabial scales, versus most specimens from the south-east without contact between mental and infralabial scales; 1-3 internasal scales are found in specimens from north-eastern and central-eastern Madagascar, while in the south-east 2-3 internasal scales, none of the nine specimens examined bearing a single internasal; the males examined have 6-7 preanal pores in north-eastern individuals and 5-6 in south-eastern individuals (no males examined from central eastern Madagascar).

The specimens from Ambolokopatrika and Besariaka (NE Madagascar) show further morphological differentation. Three of the five males examined have seven preanal pores instead 5-6 which is typical for *L. miops*. This observation needs a molecular support since in Puente *et al*. 2005, all the *L. miops* included in the analysis are from Ranomafana (SE Madagascar).

Lygodactylus guibei Pasteur 1964
Lygodactylus guibei Pasteur 1964. - *Name-bearing type*: BGP 198 male "à 7 pores et queue partiellement coupée (corps: 30 mm).", according to the original description. - *Type locality*: "Périnet (Est)" (=Andasibe), according to the original description. - *Other types*: According to the original description, there were two paratypes, of which only one of these could be located and examined, the male MNHN 1933.156 (paratype, Moramanga). - *Etymology*: Dedicated to J. Guibé.

Diagnosis. From other species of the *Lygodactylus madagascariensis* group, *L. guibei* is distinguished as follows: from *L. madagascariensis madagascariensis* by the bigger size (28.6-38.3 mm versus 26.8-34.5 mm in *L. madagascariensis madagascariensis*, mean 33.2 mm versus 30.6 mm), by the number of 5-6 infralabial scales (versus 6-8 in *L. madagascariensis madagascariensis*) and the presence of two big tubercles on the base of the tail (versus absent in *L. madagascariensis madagascariensis*); from *L. madagascariensis petteri* the presence of two big tubercles on the base of the tail (versus absent in *L. madagascariensis petteri*); from *L. miops*, by the number of usually four postpostmental scales (versus usually five in *L. miops*), by the presence of two big tubercles on the base of the tail (versus usually absent or if present not distinct in *L. miops*); from *L. expectatus* by the absence of two pattern spots in both sides of the neck (versus present in *L. expectatus*), by the presence of two big tubercles on the base of the tail (versus absent in *L. expectatus*); from *L. rarus*, by the presence of big tubercles on the base of the tail (versus absent in *L. rarus*), by the number of 1-2 internasal scales (versus 1-3 in *L. rarus*), by absent or indistinct colour rings in the tail (versus present and distinct in *L. rarus*).

Description. (1, 2) medium sized. Adult specimens are 28.6-38.3 mm snout-vent length (SVL) (mean ± SD 33.2 ± 3.23 mm, n = 15); (2) tail length (TL) 31.3-46.5 mm (mean ± SD 40.0 ± 4.10 mm, n= 10); (3) granular dorsal scales; (4, 5) first finger without claw; (6) 3-4 pairs lamellae (mean ± SD 3.13 ± 0.35, n = 15); (7,8) mental scale undivided with broad contact not distinct with infralabial scales; (9, 10) 2-3 postmental scales (mean 2.13 ± 0.35, n = 15), normally asymmetrical; (11) usually four postpostmental scales, but can be 4-6 (mean ± SD 4.20 ± 0.56, n = 15); (12) 5-7 infralabial scales, (mean ± SD 5.80 ± 0.56, n = 15); (13) 6-8 supralabial scales (mean ± SD 6.60 ± 0.63, n = 15); (14) 1-2 internasal scales (mean ± SD 1.73 ± 0.45, n = 15); (15)

six or seven preanal pores (mean ± SD 6.25 ± 0.50, n = 4); (16) tail no distinct verticillated, just colour verticilles, 10-14 verticilles; (17, 18) usually appear dorsolateral tubercles with one spiny scale; (19, 20) beige-brownish dorsal colour, but without a clear defined pattern; (21) light ventral colour; postanal sacs are prominent with one big spiny scale each sac; (22) 143-186 number of dorsal scales along the body (mean ± SD 168.00 ± 22.33, n = 3); (23) 80-86 number of dorsal scales around the body (mean ± SD 83.00 ± 4.24, n = 2); (24) 94 number of ventral scales (mean ± SD 94 ± 0, n = 1). (Figure 3).

Material examined. MNHN 1933.156 (paratype, Moramanga), MNHN 1990.1853-1855 (coll. Domergue, 11. 1965, Andasibe), MNHN 1990.3567 (18. Nov. 1986, Ambohitantely), MNHN 1990 3568 (28. Feb. 1987, Ambohitantely), MNHN 1993.60 (C. Domergue, 31. Oct. 1960, Andasibe), ZMA 19631 (FG/MV, Feb. 2003, Vohidrazana) ZFMK 17711 (Andasibe), ZFMK 51873 (Wasserthal, Nov. 1989, Andasibe), ZFMK 53945 (F. Glaw & J. Müller, 1991/92, Andasibe), ZFMK 61534 (J. Krüger, 15-16. Sep. 1994, Andasibe), ZFMK 61536-61537 (Andasibe), ZFMK 62553 (K. Liebel, Andasibe); ZMA 19631 (Andasibe), FGZC 2689 (Andasibe), ZSM 733 (M. Puente, 2003, Ranomafana).

Distribution. Andasibe (type locality).

Remark. Andasibe and the isolated locality Ambohitantely are geographically at a distance of about 150 km from each other. We could not identify any relevant morphological or meristic difference among specimens from these two areas. However, considering that haplotypes of several widespread species such as *Mabuya gravenhorstii* and *Phelsuma lineata* differ distinctly between these two sites, it will be necessary to obtain genetic data for conclusive data on the differentiation of *L. guibei* from the two populations.

Habitat. We found this species in rainforest in trees at ca. 1-3 m from the ground during the day, in each tree, only one adult male was found and several females and juveniles (personal observation).

Lygodactylus expectatus Pasteur & Blanc 1967

Lygodactylus expectatus Pasteur & Blanc 1967. - *Name-bearing type*: male holotype MNHN 1990.1 (original number BP 640), "(7 pores préanaux) à queue partiellement régénérée et à corps de 31 millimètres" according to the original description. - *Type locality*: "Karst d'Ambilobé (Ankarana), à une douzaine de kilomètres au NNW de cette localité", according to the original description.- *Other types*: according to the original description, five specimens were examined but explicity only two of these were designated as paratypes, namely MNHN 1990.2-3 (BP 641, female, and 642, young female, according to original description).- *Etymology*: G. Pasteur and C. P. Blanc were expecting to find a new species close related to *L. madagascariensis* in Karstic regions od Ambilobé. "D'une part, il existait au muséum de Paris un spécimen étiqueté <Ambilobé> qui, quoique voisin de *L. madagascariensis*, semblait en différer suffisamment pour faire prévoir qu'il représentait une autre espèce; Pasteur l'avait inscrit comme <*Lygodactylus sp*.?> dans son catalogue des *Domerguella* (1964, chap. III). De son côté, Blanc suggérait que le massif karstique situé au nord-ouest d'Ambilobé, annexe occidentale de l'Ankarana et enclave très sèche, pouvait receler des formes spéciales de Reptiles." (according to the original description).

Diagnosis. From other species of the *Lygodactylus madagascariensis* group, *L. expectatus* is distinguished as follows: from *L. madagascariensis madagascariensis* by the smaller size (27.5-29.7 mm versus 26.8-34.5 mm in *L. madagascariensis madagascariensis*, mean 28.3 mm versus 30.6 mm), by the number of 5-6 infralabial scales (versus 6-8 in *L.*

madagascariensis madagascariensis) and the presence of two big pattern spots on both sides of the neck (versus absent in *L. madagascariensis madagascariensis*); from *L. madagascariensis petteri* by the smaller size (27.5-29.7 mm versus 33.2-36.8 mm in *L. madagascariensis petteri*, mean 28.3 mm versus 35.1 mm), by the number of 5-6 infralabial scales (versus 6-7 in *L. madagascariensis petteri*) and the presence of two big pattern spots on both sides of the neck (versus absent in *L. madagascariensis petteri*); fom *L. miops* by the number of four postpostmental scales (versus usually five in *L. miops*), by the presence of two pattern spots on both sides of the neck (versus absent in *L. miops*); from *L. rarus* by the smaller size (27.5-29.7 mm versus 31.6-36.5 mm in *L. rarus* mean 26.6 mm versus 34.0 mm), by the presence of two pattern spots on both sides of the neck (versus absent in *L. rarus*), by the number of 1-2 internasal scales (versus 1-3 in *L. rarus*), by the absent or indistinct colour rings in the tail (versus present and distinct in *L. rarus*).

Description. (1) medium sized. Adults are 27.5-29.7 mm snout-vent length (SVL) (mean ± SD 28.3 ± 1.03 mm, n = 5); (2) tail length (TL) 25.3-29.7 (mean ± SD 28.9 ± 5.16 mm, n=2); (3) granular dorsal scales, (4, 5) first finger without claw; (6) three pairs of lamellae (mean 3.00 ± 0, n = 9); (7,8) mental scale undivided with contact with infralabial scales; (9, 10) two postmental scales (mean ± SD 2.00 ± 0, n = 8) symmetrical; (11) four postpostmentals (mean ± SD 4.00 ± 0, n = 8); (12) the number of infralabial scales are 5-6 (mean ± SD 5.38 ± 0.51, n = 8); (13) 5-7 supralabial scales (mean ± SD 6.00 ± 0.53, n = 8); (14) 1-2 internasal scale (mean ± SD 1.13 ± 0.35, n = 8); (15) 6-7 preanal pores (mean ± SD 6.33 ± 0.57, n = 3); (16) tail usually with colour verticilles; (17) 6-8 verticilles; (17, 18) dorsolateral tubercles absent; (19, 20) beige-brownish dorsal colour, but without a clear defined pattern. Two dark spots with a white border on both sides of the neck; (21) light ventral colour; (22) 113-145 number of dorsal scales along the body (mean ± SD

129.00 ± 22.66, n = 2); (23) 57-63 number of dorsal scales around the body (mean ± SD 60.00 ± 4.24, n = 2). (Figure 4).

Material examined. MNHN 1933.168 (Ankarana, cave entrance), MNHN 1990.1-3 (holotype and paratypes, G. Pasteur and C. P. Blanc, 11. 11. 1966, karst d'Ambilobe [Ankarana]), UADBA 06059 (Karst d'Ambilobe [Ankarana]), ZSM 282/2004 and ZSM 284/2004 (F. Glaw, M. Puente, R. Randrianiaina, Ankarana, nahe Point de Vue Petit Tsingy).

Distribution. Karst d'Ambilobé (Ankarana), (type locality). According to specimens examined by us, the species is only known from Ankarana in north-western Madagascar.

Habitat. In the shelter of vegetation in rocky areas (Pasteur & Blanc 1967). We observed this species at Ankarana during the day on trees around the karstic rocks, at ca. 1-2 m from the ground (personal observation).

Lygodactylus rarus Pasteur & Blanc 1973
Lygodactylus (Domerguella) rarus Pasteur & Blanc 1973. - *Name-bearing type*: holotype, MNHN 1990.6, female, SVL 23 mm - *Type locality*: "falaise orientale du karst d'Ambilobé (extrémité nord-est du Massif de l'Ankarana)", according to the original description. - *Other types:* none according to original description.- *Etymology*: Derived from latin *rarus* (unusual).

Diagnosis. From other species of the *L. madagascariensis* group, *L. rarus* is distinguished as follows: from *L. madagascariensis madagascariensis* by the presence of colour rings on the tail (versus absent or indistinct in *L. madagascariensis madagascariensis*); from *L. madagascariensis petteri*, by the number of 1-3 internasal scales (versus 1-2 in *L. madagascariensis petteri*), by the presence of colour rings on the tail (versus absent or indistinct in *L. madagascariensis petteri*);

from *L. miops*, by the number of four postmental scales (versus usually five in *L. miops*), by the presence of colour rings on the tail (versus absent or indistinct in *L. miops*); from *L. guibei* by the absence of big tubercles in the base of the tail (versus present and distinct in *L. guibei*), by the number of 1-3 internasal scales (versus 1-2 in *L. guibei*), by the presence of distinct colour rings in the tail (versus absent in *L. guibei*); from *L expectatus* by the bigger size (31.6-36.5 mm versus 27.5-29.7 mm in *L. expectatus*, mean 34.0 mm versus 28.3 mm), by the absence of two big pattern spots on both sides of the neck (versus present in *L. expectatus*) and by the presence of colour rings on the tail (versus absent or indistinct in *L. expectatus*).

Description. (1, 2) small species 31.6-36.5 mm SVL, (mean ± SD 34.0 ± 2.45 mm, n = 3); (2) tail length (TL) 31.5-43.7 mm (mean ± SD 37.9 ± 6.12 mm, n= 3); (3) granular dorsal scales, (4, 5) first finger without claw; (6) 3-4 pairs of lamellae (mean ± SD 3.20 ± 0.44, n = 5); (7,8) mental scale undivided without broad contact with infralabial scales, one specimen present broad contact, but not distinct; (9, 10) two postmental scales, symmetrical; (11) 4-5 postpostmental scales (mean ± SD 4.20 ± 0.44, 4, n = 5); (12) five or six infralabial scales (mean ± SD 5.80 ± 0.44, n = 5); (13) 6-8 supralabial scales (mean ± SD 6.80 ± 0.83, n = 5); (14) 1-3 internasal scales (mean ± SD 2.00 ± 1.00, n = 5); (15) males with seven preanal pores (mean ± SD 7.00 ± 0, n = 2); (16) no verticilles, nevertheless, the tail has colour rings grey and white; (17, 18) without dorsolateral tubercles; (19, 20) dorsal colouring with grey spots larger than longer, sometimes beige-brownish dorsal colour but without a clearly defined pattern, usually with some striations in the leg area; (21) light ventral colour; (22) 167-181 dorsal scales along the body (mean ± SD 174.00 ± 9.89, n = 2); (23) 73-87 dorsal scales around the body (mean ± SD 80.00 ± 9.89, n = 2); (24) 99-116 ventral scales (mean ± SD 107.50 ± 12.02, n = 2). (Figure 5).

Hemipenial structure. Based on ZSM 913/2003 (MV 2002- 941), adult male from Ankarana. Hemipenis with a total length of ca. 1.5-2 mm., short pedicel (ca. 0.75 mm). The truncus is set with small but deep calyces, giving the truncus a papillate appearance. Papillae fields absent. Sulcus spermaticus without well developed sulcal lips and with two channels from the pedicel to the apex. The calyces around the sulcus spermaticus absent. Apex bilobed formed by two lobes with ca. 1 mm. each one. (Figure 5.2).

Material examined. MNHN 1990.6 (holotype, north-eastern extreme of Ankarana Massif), MNHN 1990.1887-1888 (C. P. Blanc, 4. Nov. 1966, Mangindrano), ZSM 913/2003 (F. Glaw, Ankarana, Feb.2003), ZSM 860/2003 (F. Glaw, Ankarana, Feb.2003).

Distribution. Karst d'Ambilobé (Ankarana), (type locality). According to specimens examined by us, the species is known from Ankarana.

Habitat. Karstic mountains in north-western Madagascar, humid forest on the Tsaratanana mountains (Pasteur & Blanc 1973). This species lives on big karstic rocks, with low vegetation density and is possible to see it during the sun hours (personal observation).

IV.1.2. - Meridional lineage

(contains: ***Lygodactylus pictus* group** with, *Lygodactylus pictus* and *L. tuberosus*; and ***Lygodactylus bivittis* group** with *L. bivittis*).

The species belonging to Meridional lineage are characterized to have a SVL 12.7-38.2 mm; granular dorsal scales; mental scale tripartite with two postmental scales; males with 6-9 preanal pores; and a brownish colouration without a clear dorsal pattern. All the species from this lineage have a central-south distribution living in the dry forest also known as spiny desert.

***Lygodactylus pictus* group**
(Contains: *Lygodactylus pictus* and *L. tuberosus*)

Lygodactylus pictus (Peters 1883)
Scalabotes pictus Peters 1883. - *Name-bearing type*: No data from original description- *Type locality*: "Es fehlt leider die genaue Angabe des Fundorts, aber sie gehören unzweifelhaft dem Centrum dieser grossen Insel an." (Central Madagascar), according to the original description. - *Other types*: no data from the original description. - *Etymology*: "Unten schmutziggelb, am Unterlippenrande und in der Submentalgegend schwarz punktirt", according to the original description.
Lygodactylus robustus Boettger 1913. - *Name-bearing type*: "N° 4160.6a", according to the original description. - *Type locality*: "Süd und Südost- Madagascar, die 25 vorliegenden Originale von Ankarimbela (coll. Senckenberg N° 4160.6a).", according to the original description. - *Other types*: "Mad. 3 Weibchen und 2

Junge (coll. Senckenberg N° 4160.4b)" according to the original description. - *Etymology*: Derived from Latin *robust* (strong and hardy).
Lygodactylus pictus (Peters 1883).

Diagnosis. From other species of the *Lygodactylus pictus* group, *L. pictus* is distinguished as follows: from *L. tuberosus* by the number of 3-4 digital lamellae (versus three in *L. tuberosus*), by the number of 6-8 supralabial scales (versus 5-8 in *L. tuberosus*), by the absence of a clear dorsal pattern (versus special dark spots in *L. tuberosus* neck region), by the presence of dark spots in the gular area (versus absent or faint dark spots in *L. tuberosus*), characteristic yellow colouration all along the ventral side, nevertheless, this colour disappears after few hours in alcohol (versus light ventral colour in *L. tuberosus*) from *L. sp. nov.* by the number of 4-6 infralabial scales (versus 7 in *L. sp. nov.*) , by the absence of distinct pattern (versus present two distinct dark spots in both sides of the neck).

Description. (1, 2) big sized specimens. Adults specimens are 11.9-37.7 mm snout-vent length (svl) (mean ± s.d. 31.34 ± 5.87 mm, n = 40); (2) tail length (TL) 26.7-52.5 mm (mean ± s.d. 37.0 ± 6.7 mm, n = 15); (3) Granular dorsal scales; (4, 5) first finger present, and bearing a claw; (6) 3-4 pairs lamellae (mean ± s.d. 3.38 ± 0.49 mm, n = 45); (7, 8) mental scale tripartite, broad contact between infralabial and mental scale can appear, but not distinct; (9, 10) usually two postmental scales (mean ± s.d. 2.24 ± 0.48, n = 45) symmetrical, but can appears three; (11) usually five postpostmental scales (mean ± s.d. 4.67 ± 0.52, n = 45); (12) the number of infralabial scales are 4-6, (mean ± s.d. 5.44 ± 0.58, n = 45); (13) 5-8 supralabial scales (mean ± s.d. 6.40 ± 0.65, n = 45); (14) with 1-3 internasal scales, (mean ± s.d. 1.67 ± 0.56, n = 45); (15) males with 6-8 preanal pores (mean ± s.d. 7.06 ± 0.44, n = 16), with femoral-preanal strengthened scales, but not pigmented; (16) tail with 7-11 colour verticilles; (17, 18) usually present

dorsolateral tubercles 4-6 with 1-6 scales each one; (19, 20) beige-brownish dorsal colour, but without a clear defined pattern; (21) usually present a throat striation, always with dark spots and sometimes with one dark line following the mouth line, some ventral lines in the gular area, and present ocular area striated, like *L. tuberosus*, but this one has a dark spot with spiny scales behind the ocular area. Distinct yellow colour in the ventral side; (22) 143-200 number of dorsal scales along the body (mean ± SD 175.67 ± 24.95, n = 6); (23) 41-87 number of dorsal granular scales around the body (mean ± SD 74.17 ± 17.39, n = 6). (Figure 6).

Variation: (MNHN 1990.3561 and 1930.267); those specimens have three internasal scales, one of them with the third scale reduced (MNHN 1930.267), and the other with three postpostmental scales (MNHN 1990.3561).

Material examined. MNHN 1899.342-343 (coll. unknown, Nov. 1898, Ikongo forest, Vinanitelo), MNHN 1930.267-268 (Ivohibe), MNHN 1950.261 (Millot, Sep. 1949, Andringitra, Fivahona forest), MNHN 1965.282 (coll. and locality unknown, 5. 1951), MNHN 1990.105-106 (coll. unknown, 20. Jan. Andringitra, Andohabatomanara, 106: Riviere Ampanasana, petit sous affluent de la zamandao dans le Massif du Vohidray), MNHN 1990.1889-1891 (C.P.Blanc, Mar. 1967, between Ambositra and Manakara), MNHN 1990.3550-3564 (C. P. Blanc, winter 1970-1971, forested areas of Andrigitra, Ambalamarovandana), ZFMK 58224 (leg. Klaus Liebel, no date, Antananarivo), ZFMK 17712 (leg. H. Meier, I. 1976, E Madagascar, Fieriantsou), ZFMK 54516 (leg. G. Trautmann, IV. 199, Madagascar: no further locality), ZFMK 59843 (leg. F. Glaw & M. Vences, no date, but before 1995, Central Madagascar: near Sendrisoa), ZFMK 47245 (leg. H. Meier, XI. 1987, Tolongoina), ZFMK 20724 (leg. Dr. Forsyth Maior, 1903, Fianarantsoa), ZMA 19531 (2002-0072), (coll. FG/MV-2003, Ambositra), ZMA 19532 (2002-0073)-(2002-0082), (coll. M.

Vences, P. Bora and R. Rabemananjara, 2003, Ambositra), ZMA 19595 (2002-1468), (coll. FG/MV-2003, Analalava Forest), ZMA 19597 (2002-0654), (coll. FG/MV-2003, Limit Ranomafana NP, parcel 2, Road to Fiaranantsoa), ZMA 19621 (2002-0656), (coll. FG/MV-2003, Limit Ranomafana NP, parcel 2, Road to Fiaranantsoa), SMF 8956 (Holotype "*Lygodactylus robustus*", A. Voeltzkow, Anharimbela, S-Madagascar), ZSM 7/2004, ZSM 8/2004, ZSM 10/2004, ZSM 11/2004, ZSM 12/2004, ZSM 13/2004, ZSM 15/2004 (F. Glaw, M. Puente, M. Thomas & R. Randrianiaina, 19-20. Jan. 2004, Antsirabe)

Distribution. According to the original description the type locality occurs in Central Madagascar. According to specimens examined in the field, the species is known from the localities: Ambositra, Analalava Forest, Limit Ranomafana NP Road to Fiaranantsoa.

Habitat: Inhabits mainly the humid south-east, it has been found in dense rainforest (Pasteur 1965). Found in dispersal trees in towns, one male and several females and juveniles observed per tree, several eggs were deposited in the bark of the tree (personal observation).

Remark. The specimen ZMA 19595, share the morphological characters typical for *L. pictus* (*Lygodactylus aff. Pictus* ZMA 19595, male, 31.4 mm SVL, granular dorsal scales, first finger present, bearing a claw, three divided lamellae, mental scale divided, two postmental scales asymmetrical, four postpostmental scales, six infralabial scales, seven supralabial scales, two internasal scales, seven preanal pores, beige dorsal colouration without a distinct pattern), although in our first molecular results is not placed within the other L. pictus included in the analysis (Puente et al. 2005).

Lygodactylus tuberosus Mertens 1965
Lygodactylus tuberosus Mertens 1965. - *Name-bearing type*: holotype, SMF 8949, female- *Type locality*: "Tsimanampetso, SW-Madagaskar.", according to the original description.- *Other types*: paratypes SMF 8950-2, three females.- *Etymology*: no data from the original description.

Diagnosis. From other species of the *Lygodactylus pictus* group, *L. tuberosus* is distinguished as follows: from *L. pictus* by the number of 0-2 internasal scales (versus 1-3 in *L. pictus*), no clear dorsal colour pattern but with special dark spots in the neck region (versus absent in *L. pictus*), by the absence or faintly present dark spots in the gular area (versus always present in *L. pictus*), light ventral colour in the ventral side (versus the presence of a characteristic yellow colouration all along the ventral side in *L. pictus*, this colour disappears after few hours in alcohol); from *L. sp. nov.* by the no distinct dark spots in the neck (versus distinct and bigger in *L. sp. nov.*), by the absence of yellow colouration in the ventral side (versus present in *L. sp. nov.*).

Description. (1, 2) medium sized species. Adult specimens are 12.7-38.2 mm snout-vent length (SVL) (mean ± SD 28.4 ± 40.7 mm, n = 225); (2) tail length (TL) 8.6-43.0 mm (mean ± SD 29.9 ± 5.05 mm, n = 94); (3) granular dorsal scales, (4, 5) first finger without claw; (6) three pairs of lamellae (mean ± SD 3.01 ± 0.14, n = 228); (7, 8) mental scale undivided broad contact between infralabial scale and mental scale can exist but is not distinct; (9, 10) usually two postmental scales (mean ± SD 2.02 ± 0.21, n = 230), asymmetrical or symmetrical; (11) usually four postpostmental scales (mean ± SD 4.66 ± 0.63, n = 230); (12) 4-8 infralabial scales (mean ± SD 5.64 ± 0.58, n = 230); (13) 5-9 supralabial scales (mean ± SD 6.70 ± 0.76, n = 230); (14) 0-2 internasal scales (mean ± SD 1.30 ± 0.47, n = 230); (15) males with usually seven preanal pores, (1-9) (mean ± SD 6.85 ± 1.14, n

= 126), males with femoral-preanal strengthened scales not pigmented; (16) tail not verticillated like *L. pictus*; (17, 18) often with 3-7 dorsolateral tubercles with 1-7 scales each one; (19, 20) beige-brownish dorsal colour, but without a clear defined pattern, it could have ocular and legs region striated; (21) usually throat striation is present, some ventral lines in the gular area, sometimes the ocular area is striated. Usually a dark spot with spiny scales appears behind ocular area near the ear. Bigger scales in groups of 1-3 spiny-scales bigger than the others, but not so distinct as *L.verticillatus*; (22) 143 number of dorsal scales along the body (mean ± SD 143.00 ± 0, n = 1); (23) 80 number of dorsal scales around the body (mean ± SD 80.00 ± 0, n = 1); (24) 87-89 ventral scales (mean ± SD 88.00 ± 1.41, 78, n = 2). (Figure 7).

Hemipenial structure. Based on ZSM 583/2000 (FG/MV 2000- 598), adult male from Ifaty. Hemipenis subcylindrical with relatively large pedicel ca. 1.8-2 mm. (total length ca. 3.5 mm.). The truncus and the arms are covered with papillae fields. Sulcus spermaticus formed by two channels finishing in each apex arm, no distinct sulcal lips and no papillae around it. The apex is divided in two arms with 1.5 mm each (Fig. 7.2).

Material examined. MNHN 1901.239 (Ambovombe), MNHN 1901.147 (Andrahomana), MNHN 1920.420 (Pere Affert, 8. Apr. 1960, Morombé), MNHN 1924.69 (Onilahy valley), MNHN 1929.70 (near Ianzamaly), MNHN 1929.73 (Toliara), MNHN 1930.265 (Antanimoza near Tolagnaro), MNHN 1930.266 (Andrahomana), MNHN 1935.123-124 (Amboasary, Mandrare river), MNHN 1938.193-196 (unknown, sud de Madagascar), MNHN 1990 (10-11. Dec. 1972, Ihotry), MNHN 1990.401 (8. Nov. 1961, Vohitomotsy, 80 km SE Tolira, piste Soalara), MNHN 1990.402 (11. Nov. 1961, Vohitomotsy, 80 km SE Toliara," sur tronc d'un Kily"), MNHN 1990.403-406 (Nov. 1961, Ankazomanga, Plateau Mahafaly), MNHN 1990-407 (23. Nov. 1961, Ankazomanga, Plateau Mahafaly, "tronc d'arbre

fourri"), MNHN 1990.408 (27.Nov., Andreboka, 35 km SSW Betioky), MNHN 1990.409 (23. Nov., Egogy, 17.5 km SW Ampanihy), MNHN 1990.410 (Jun. 1961, Aniriky, 3 Km W Mahavelo), MNHN 1990.411 (spiny forest between Marolinta and Ampokata), MNHN 1990.413 (19. Nov., Kaz (Mahafaly) sur tronc kily), MNHN 1990.414 (unknown, 22. Nov., Kaz (Mahafaly) sur tronc kily), MNHN 1990.412,415 (3. Jul., Zampongotra), MNHN 1990.416 (unknown, 15. Jul., Zampongotra), MNHN 1990.417 (Saraondry, sur tronc de kily), MNHN 1990.418 (Sakaraha forest, on dead wood), MNHN 1990.419 (C. P. Blanc, 2. Jan. 1964, Toliara, on dead tree), MNHN 1990.421 (C. P. Blanc, 22. Dec. 1966, Toliara, on dead tree), MNHN 1990.422 (3. Jul, around Zampongotra, 30 km W Beloha), MNHN 1990.423-425 (15. Jul. 1966?, Zampongotra), MNHN 1990.426-430 (C. A. Domergue, 25. Aug. 1971, Ihotry), MNHN 1990.431-433 (C. A. Domergue, Jan. 1966, Ampanihy), MNHN 1990.434 (C. A. Domergue, 12. Nov. 1965, Ihotry), MNHN 1990.438 (C. A. Domergue,1-2. Nov. 1967, Ihotry), MNHN 1990.439-440 (C. A. Domergue, 27-28. Apr. 1969, Ihotry), MNHN 1990.441 (C. A. Domergue, 11. Jul. 1968, Ihotry), MNHN 1990.462-488 (10-11. Dec. 1972, Ihotry), MNHN 1990.501-511 (18. Mar. 1973, Ihotry), MNHN 1990.603-613 (6. Dec. 1975, Ihotry), MNHN 1990.624-645 (15. Jan. 1966, Ampanihy), MNHN 1990.646-659 (unknown, 15. Jan. 1966, Ampanihy), MNHN 1990.669-672 (5-6. Apr. 1967, Belalanda), MNHN 1990.1860-1866 (C. A. Domergue, Ihotry), MNHN 1990.1840-1841 (C. A. Domergue, Toliara harbor), MNHN 1990.1842-1843 (C. A. Domergue, Ihotry), MNHN 1990.1844-1846 (C. A. Domergue, 28. Mar. 1968, Ampanihy), MNHN 1990.3233-3240 (C. A. Domergue, 15. Jan. 1966, Ampanihy), MNHN 1990.3250-3263 (C. A. Domergue, 2. Mar. 1967, Belalanda), MNHN 1990.3264-3270 (C. A. Domergue, 5-6. Apr. 1967, Belalanda), MNHN 1994.1737 (Lamberton, southern Madagascar), ZFMK 21814 (leg. H. Meier, I. 1978, SW Madagascar: Toliara), ZFMK 59803 (leg. M. Vences & F. Glaw, 1994/1995, SW Madagascar: Toliara), ZFMK 70005 (leg. N.

Lutzmann, no date (but before 1999), Madagascar: Toliara), ZMA 19608 (2002-2011), (M. Puente, 2003, Ifaty), ZMA 19600 (2002-1505), (M. Puente, 2003, Arboretum, Toliara), ZSM 583/2000 (F. Glaw, K. Schmidt, L. Rakotozafy & R. Razafindrasoa, 26.Mar. 2000, Ifaty), ZSM 584/2000 (F. Glaw, K. Schmidt, L. Rakotozafy & R. Razafindrasoa, 1.Apr. 2000, Toliara), ZSM 591/2000 (F. Glaw, K. Schmidt, L. Rakotozafy & R. Razafindrasoa, 27. Mar. 2000, Ifaty), ZSM 947/2003 (M. Puente, M. Thomas, 4. Feb. 2003, Arboretum Toliara).

Distribution. Tsimanampetso (type locality). According to specimens examined in the field, the species is known from the localities: Tulear, Ifaty, Arboretum, Toliara.

Habitat. Inhabits exclusively arid zones in the south-west. It could been found in open forests, on isolated trees or fallen tree trunks, and also in dry bush areas (personal observation).

Remark. For the MNHN specimens 1990.413 and 1990.414 the locality information is doubtful "Kaz (Mahafaly)" is an unknown locality. These three specimens MNHN 1990.435-436 (10 Jan. 1970, Col des Tapias), MNHN 1990.437 (20 Dec.1966, Col. des Tapias), have been catalogued as *L. tuberosus* and apparently belong to this species, but their locality is atypical for this species; two other species, *L. arnoulti* and *L. blanci*, are known from the Col des Tapias / Mt. Ibity region. The specimens are two females and one male (MNHN 1990.436); SVL 20.6-31.0 mm (*L. blanci* and *L. arnoulti* are bigger, the smallest specimen of each measuring more than 21.4 mm); TL 18.6 mm (the males MNHN.1990.435 and 437 have broken or regenerated tails); granular dorsal scales (*L. blanci* has pseudokeeled dorsal scales); first finger with claw; three pairs of lamellae; mental scale tripartite; faint contact between infralabial and mental scale; two symmetrical postmental scales (*L. blanci* and *L. arnoulti* have three postmental scales); five postpostmental scales; six infralabial scales; 6-8 supralabial scales; one internasal scale,

MNHN 1990.435 with two; the male with seven preanal pores (*L. blanci* and *L. arnoulti* have 9-11 preanal pores); the intact tail with 12 faint coloured verticilles; dorsal colour beige-brown without a clear pattern; ventral colour light with spots. MNHN 1990.664 (Ambohitantely, "bambou au sol", collected by Seguier): Catalogued as *L. tuberosus*, but the locality Ambohitantely is located in central Madagascar whereas *L. tuberosus* appears to be restricted to southern and southwestern Madagascar. The specimen is a female; 29.2 mm SVL; 25.5 mm regenerated tail; dorsal scales granular; first finger present and with claw; five pairs of lamellae (*L. tuberosus* with three pairs); mental scale tripartite; no contact between mental and infralabial scales; two asymmetrical postmental scales; four postpostmental scales; six infralabial scales; seven supralabial scales; two internasal scales; Dorsolateral tubercles absent; dorsal colour brown-beige, dorsal pattern tending to be striated (*L. tuberosus* without a clear dorsal pattern, and ocular region striated with a dark spot); ventral colour light with spots.

***Lygodactylus sp. nov.* Manantantely**

Diagnosis. From other species of the *Lygodactylus pictus* group, *Lygodactylus sp. nov.* is distinguished as follows: from *L. pictus* and *L. tuberosus* by the absence of claw in finger I (versus present in *L. pictus* and *L. tuberosus*), by the number of four lamellae (versus usually three in *L. pictus* and *L. tuberosus*); from *L. pictus* by the number of seven infralabial scales (versus usually 6 in *L. pictus*), by the dorsal pattern, brownish with two dorsal lines and by the presence of a big dark spot in both sides of the neck (versus absence of this lines and spots in *L. pictus*); from *L. tuberosus* by the dorsal pattern, the presence of a big dark spot in both sides of the neck (versus two dark spots in the neck fainter and smaller and with bigger white scales in *L. tuberosus*), by the absence of dark stripes around the eyes (present in *L. tuberosus*). Dorsal colour is beige-brownish without a distinct pattern,

however with white and black colored big spots on both sides of the neck. With dark spots on the throat, the living specimen had a yellow colouration in the gular area, like in *L. pictus*, although this coloration disappeared after alcohol preservation.

Description. (1, 2) Big sized specimen. Adult specimen 23.6 mm snout-vent length (SVL) (mean ± SD 23.6 ± 0 mm, n = 1); (2) no tail data; (3) Granular dorsal scales;(4,5) first finger present, without bearing a claw; (6) 4 pairs lamellae (mean ± SD 4.00 ± 0, n = 1); (7, 8) mental scale tripartite, broad contact between infralabial and mental scale can appears but not distinct; (9, 10) usually two postmental scales (mean ± SD 2.00 ± 0, n = 1) symmetrical; (11) five postpostmental scales (mean ± SD 5.00 ± 0, n = 1); (12) the number of infralabial scales are 7, (mean ± SD 7.00 ± 0, n = 1); (13) 7 supralabial scales (mean ± SD 7.00 ± 0, n = 1); (14) with 2 internasal scales, (mean ± SD 2.00 ± 0, n = 1); (15) male with 6 preanal pores (mean ± SD 6.00 ± 0, n = 1); (16) without verticilles; (17, 18) present dorsolateral tubercles 4 with 1-2 scales each one; (19, 20) beige-brownish dorsal colour, with two big spots white coloured and black around, in both sides of the neck; (21) dark throat spots are present, the living specimen with yellow colouration in the gular area like in *L. pictus*; (22) 185 number of dorsal scales along the body (mean ± s.d. 185.00 ± 0, n = 1); (23) 88 number of dorsal granular scales around the body (mean ± s.d. 88.00 ± 0, n = 1). (Fig. 21).

Hemipenial structure. Based on FGZC 2324, adult male from Manantantely. Hemipenis subcylindrical with relatively large pedicel ca. 1.8 mm. (total length ca. 2.5 mm.). The apex is divided in two short arms with ca. 0.8-1 mm. The truncus and arms are covered with papillae fields. Sulcus spermaticus formed by two channels (until the apex of each arm), no distinct sulcal lips and no papillae around it. (Figure 21.2).

Material examined. FGZC 2324 (M. Vences, F. Glaw, 2005, Manantantely).

Distribution. Manantantely.

Habitat. Rain Forest from the South East Madagascar.

***Lygodactylus bivittis* group**
(contains: *Lygodactylus bivittis*)

The species belonging to the *Lygodactylus bivittis* group have a SVL of 28.3-36.1 mm; granular dorsal scales; first finger present with a claw; undivided adhesive lamells in the fingers; mental scale tripartite with two postmental scales; males with nine preanal pores; brownish colouration sometimes with two yellowish parallel lines. The species belonging to this group have a central-south distribution with arboreal habitudes.

Lygodactylus bivittis (Peters 1883)
Scalabotes bivittis Peters 1883. - *Name-bearing type*: "Ein einziges Exemplar". - *Type locality*: "Es fehlt leider die genaue Angabe des Fundorts, aber sie gehören unzweifelhaft dem Centrum dieser grossen Insel an." (Central Madagascar), according to the original description. - *Other types*: no data from the original description. -*Etymology*: no data from the original description. *Scalabotes Hildebrandti* Peters 1883. - *Name-bearing type*: "Ein einziges Exemplar". - *Type locality*: "Es fehlt leider die genaue Angabe des Fundorts, aber sie gehören unzweifelhaft dem Centrum dieser grossen Insel an." (Central Madagascar), according to the original description. - *Other types*: no data from the original description. -*Etymology*: no data from the original description.
Microscalabotes bivittis (Peters 1883).

Diagnosis. From other species of the Meridional lineage, *L. bivittis* is distinguished as follows: from *L. pictus* by the number of 3-6 undivided digital lamellae (versus 3-4 in *L. pictus* and always divided), by the number of 8-9 preanal pores in males (versus 6-8 in *L. pictus*), by the brown-yellowish dorsal colouration with usually two dorsal stripes (versus absent and beige-brownish colouration without this two stripes in *L. pictus*); from *L. tuberosus* by the the number of 3-6 undivided digital lamellae (versus three in *L. tuberosus* always divided), by the number of 8-9 preanal pores in males (versus usually seven in *L. tuberosus*), by the brown-yellowish dorsal colouration with usually two dorsal stripes (versus absent and beige-brownish colouration without this two stripes in *L. tuberosus*).

Description. (1, 2) big sized specimens. Adults specimens are 28.3-36.1 mm snout-vent length (SVL) (mean ± SD 30.6 ± 2.21 mm, n = 10); (2) tail length (TL) 28.3-41.5 mm (mean ± SD 35.26 ± 5.60 mm, n = 5); (3) granular dorsal scales; (4, 5) first finger present with claw; (6) 3-6 undivided pairs lamellae (mean ± SD 4.83 ± 1.11, n = 12); (7, 8) mental scale tripartite, broad contact between infralabial and mental scale can appears, but not distinct; (9, 10) 2-3 postmental scales (mean ± SD 2.42 ± 0.51, n = 12), bisymmetrical, asymmetrical; (11) 4-5 postpostmental scales (mean ± SD 4.50 ± 0.52, n = 12); (12) the number of infralabial scales are 5-9, (mean ± SD 6.58 ± 1.24, n = 12); (13) 5-8 supralabial scales (mean ± SD 6.58 ± 0.79, n = 12); (14) 1-3 internasal scales (mean ± SD 1.58 ± 0.66, n = 12); (15) males with 8-9 preanal pores (mean ± SD 8.67 ± 0.57, n = 3) and not femoral-preanal strengthened scales appear; (16) tail not verticillated; (17, 18) usually present dorsolateral tubercles 3-5 with one scale each one; (19) brown-yellowish dorsal colour; (20) dorsal pattern striated, like two parallel lines following the body line; (21) light ventral colour with some dark spots in throat area; (22) 165 dorsal scales along the body (mean ± SD 165.00 ± 0, n = 1); (23) 75-89 dorsal scales around the body (mean ± SD 84.33 ±

0.08, n = 3); (24) 78-87 ventral scales (mean ± SD 83.67 ± 4.93, 78, n = 3).

Hemipenial structure. Based on ZSM 496/2001, adult male from Andasibe. Hemipenis subcylindrical with long pedicel ca. 2 mm. (total length 3 mm.). The truncus and the arms are covered with papillae fields. Sulcus spermaticus formed by two channels (each one will finish in each apex arm), no distinct sulcal lips and no papillae around it. The apex is divided in two short arms with ca. 1.5 mm. each. (Figure 22).

Material examined. MRSN.R.1896 (F. Andreone, 1998, Perinet), MRSN.R.1926 (F. Andreone, 1998, Perinet), UADBA ?? (2399) (Andasibé), UADBA 03303 (2394) (Andasibé), ZFMK 61533 (leg. Jens Krüger, 15/16. Sept. 1994, E Madagascar: Andasibe), ZFMK 61538-61540 (leg. Jens Krüger, 15/16. Sept. 1994, E Madagascar: Andasibe), ZSM 493/2001 (Miguel Vences, 2001, Andasibe), ZSM 494/2001-496/2001 (Miguel Vences, 2001, Andasibe).

Distribution. According to the original description the type locality occurs in Central Madagascar. According to specimens examined in the field, the species is known from Andasibe.

Habitat: Forest. In trees near streams, in the trunks during the day at ca. 1-3 m from the ground, in this case, several females and juveniles were found in the same tree (personal observation).

Remark. *Lygodactylus bivittis* described as a different genus (Peters, 1883) might be considered as *Lygodactylus* synonym (Puente *et al*. 2005).

IV.1.3. - Occidental lineage.

(contains: ***Lygodactylus verticillatus* group** with, *Lygodactylus verticillatus*, *L. heterurus*, *L. decaryi*, *L. arnoulti*, *L. blancae* and *L. klemmeri*; ***Lygodactylus tolampyae* group** with *Lygodactylus tolampyae*; ***Lygodactylus ornatus* group** with *Lygodactylus ornatus* and *L. praecox*; and ***Lygodactylus pauliani* group** with *Lygodactylus pauliani*).

The species belonging to Occidental lineage have a SVL 13.2-36.2 mm, granular dorsal scales; present first finger with claw; mental scale tripartite with three postmental scales; males with 7-11 and 15 preanal pores. All the species from this lineage have a western distribution with arboreal habitudes.

***Lygodactylus verticillatus* group**
(contains: *Lygodactylus verticillatus*, *L. heterurus*, *L. decaryi*, *L. arnoulti*, *L. klemmeri*, *L. blancae*)

The species belonging to *L. verticillatus* group are characterized to be small sized specimens less that 30 mm SVL, except *L. verticillatus*, *L. arnoulti* and *L. blancae*; with granular dorsal scales; first finger present, and bearing a claw; mental scale tripartite with three postmental scales and usually five postpostmentals; with 1-2 internasal scales; males with more than nine preanal pores, usually with 9-11, but *L. decaryi* has 15; with a brownish colouration and usually without a distinct dorsal pattern (except *L. arnoulti* with a striated or ocelated pattern); one clear character present in every species of this group, is to have a very distinct verticillated tail.

Lygodactylus verticillatus Mocquard 1895
Lygodactylus verticillatus Mocquard 1895. - *Name-bearing type*: two specimens as syntypes, "deux spécimens d'une longeur totale de 40 mm", according to the original description. - *Type locality*: no data from the original description. -*Other types*: no data from the original description. -*Etymology*: "par la disposition annelée de sa queue", according to the original description.

Diagnosis. From other species of the *Lygodactylus verticillatus* group, *L. verticillatus* is distinguished as follows: from *L. heterurus* by the number of usually one internasal scale (versus three in *L. heterurus heterurus*), by the absence of distinct gular striation (versus present in *L. heterurus heterurus*); from *L. heterurus trilineigularis* by the number of usually one internasal scale (versus 1-2 in *L. heterurus trilineigularis*), by the number of usually 9 not pigmented preanal pores in males (versus 9-11 distinct pigmented in *L. heterurus trilineigularis*), by the brownish dorsal colouration (versus beige greyish in *L. heterurus trilineigularis*), by the absence of distinct gular striation (versus present in *L. heterurus trilineigularis*); from *L. decaryi* by the number of usually nine preanal pores in males (versus 15 in *L. decaryi*); from *L. arnoulti* by the smaller size (11.2-34.2 mm versus 19.1-36.9 mm in *L. arnoulti* mean 22.8 mm versus 30.0 mm), by the presence of broad contact between the mental scale and the infralabials (versus usually absent in *L. arnoulti*), by the absence of a clear dorsal pattern (versus a clear ocelated or striated pattern in *L. arnoulti*); from *L. klemmeri* by the presence of a not distinct dorsal pattern with brownish colouration (versus the presence of distinct black throat stripes, by the beige greyish dorsal colouration with greenish head in *L. klemmeri*); from *L. blancae* by the smaller size (11.2-34.2 mm versus 24.3-35.0 mm in *L. blancae* mean 22.8 mm versus 30.3 mm), by the presence of dark spots in both sides in the neck (versus absent in *L. blancae*).

Description. (1, 2) Small-sized specimens. Adults specimens are 11.2-34.2 mm snout-vent length (SVL) (mean ± SD 2.28 ± 3.02 mm, n = 169); (2) tail length (TL) 12.2-31.3 mm (mean ± SD 20.8 ± 3.42 mm, n = 38); (3) granular dorsal scales; (4, 5) first finger with claw; (6) three pairs lamellae (mean ± SD 3.00 ± 0, n = 188); (7, 8) mental scale tripartite and with broad contact between infralabial and mental scale, but not so distinct as *L. tolampyae*; (9, 10) usually three postmental scales (mean ± SD 2.99 ± 0.10, n = 189) bisymmetrical; (11) 4-7 postpostmental scales but usually five (mean ± SD 5.09 ± 0.39, n = 189); (12) 4-7 infralabial scales (most frequent five), (mean ± SD 5.06 ± 0.50, n = 189); (13) 5-7 supralabial scales, (mean ± SD 5.71 ± 0.84, n = 189); (14) usually one internasal scale (mean ± SD 1.26 ± 0.47, n = 189); (15) males with nine preanal pores, but can be 6-10 (mean ± SD 8.86 ± 0.68, n = 98) without the femoral-preanal strengthened scales but if appears always not pigmented; (16) tail strongly verticillated, with distinct 8-16 verticilles; (17, 18) usually without dorsolateral tubercles but if appear present 3-7 with 1-5 scales; (19, 20) without a clear pattern, brownish dorsal colour and has the ocular and leg area striated, Easy to distinguish because of its dark spot behind the ears with a bigger spine-scale, (Mocquard, 1895), present two dark spots in both sides of the neck; (21) usually present throat spots, and light ventral colour; (22) 128-141 dorsal scales along the body (mean ± SD 134.50 ± 9.19, n = 2); (23) 58-81 dorsal scales around the body (mean ± SD 69.50 ± 16.26, n = 2); (24) 67-67 ventral scales (mean ± SD 67.00 ± 0, 67, n = 1).. (Figure 8).

Material examined. BMNH 1930.7.1.118 (Topotype, E. d. White, Hotel Dubound, Tulear), MNHN 1990.661 (28. Mar. 1968, Ampanihy), MNHN 1990.665-668 (15. Jan. 1966, Ampanihy), MNHN 1990.660 (15. Jan. 1966, Ampanihy), MNHN 1990.3234 (C. A. Domergue, 15. Jan. 1966, Ampanihy), MNHN 1990.2257 (C. A. Domergue, 8-9. Apr. 1967, Ihotry), MNHN 1990.804 (C. A. Domergue, 17. Oct .1962, La Sakoa),

MNHN 1990.1849-1852 (C. A. Domergue, 5-12. Feb. 1969, Manja hotel), MNHN 1990.3282 (Lamboromakandro), MNHN 1990.3286 (Aug. 1962, Ankagoabo-Sud), MNHN 1990.3314-3321,3287-3294 (C. A. Domergue, 15. Jan. 1966, Ampanihy), MNHN 1990.3295-3301 (C. A. Domergue, 11-12.Dec.1972, Ihotry), MNHN 1990.2864-2873 (C. A. Domergue, 18. Jun. 1966, Ihotry), MNHN 1990.1738-1751 (C. A. Domergue, 2-4. May 1965, Ihotry), MNHN 1990.2103-2109 (C. A. Domergue, Jul. 1966, Ihotry), MNHN 1990.422 (22/ Jun, around Zampongotra, 30 km from Beloha), MNHN 1990.2534-2539 (C. A. Domergue, 11. Sept. 1968, Ihotry), MNHN 1990.1752-1800,1901-1903 (C. A. Domergue, 20. Jun. 1965, Ihotry), MNHN 1990.3283 (C. P. Blanc, 13. Aug. 1964, Manombo), MNHN 1990.3284 (14. Jul. 1960, Morombe district), MNHN 1990.3285 (Apr.1961, Morombe district), MNHN 1990.2349-2369 (C. A. Domergue, 1. Dec. 1967, Ihotry), ZFMK 40513 (leg. Ch.A. Domergue, 4. May 1968, Madagascar: 170 km N Toliara: Ihotry), ZFMK 21813 (leg. H. Meier, I. 1978, S Madagascar: Toliara), ZFMK 40512 (leg. Ch.A. Domergue, 4. May 1968, Madagascar: 170 km N Toliara: Ihotry), ZFMK 40514 (leg. Ch.A. Domergue, 4. May. 1968, Madagascar: 170 km N Toliara: Ihotry), ZMA 19596 (Field number 2002-2012; coll. FG/MV 2003, Ifaty), ZMA 19601, (coll. FG/MV 2003, Ifaty), 2363 (locality unknown).

Distribution. According to specimens examined by us, the species is known from the localities: Ifaty, Morombe district.

Habitat. Occurs in dry forest, in houses, fences and trunks (Pasteur, 1977). Also occurs in isolated trees and shrubs in semi-arid areas, found in dispersal trees and fences in towns, (personal observation).

Lygodactylus heterurus heterurus Boettger 1913
Lygodactylus heterurus Boettger 1913. - *Name-bearing type*: Lectotype; A. Voeltzkow l. 1897- *Type locality*: Nosy Be *Other types*: no data from the original description.- *Etymology*: no data from the original description.

Diagnosis. From other species of the *L. verticillatus* group, *L. heterurus heterurus* is distinguished as follows: from *L. verticillatus* by the number of three internasal scale (versus usually one in *L. verticillatus*), by the beige greyish dorsal colouration (versus brownish in *L. verticillatus*), by the presence of distinct gular striation (versus absent in *L. verticillatus*); from *L. heterurus trilineigularis* by the number of three internasal scale (versus 1-2 in *L. heterurus trilineigularis*), by a clear throat striation with five black stripes (versus three distinct stripes in *L. heterurus trilineigularis*); from *L. decaryi* by the presence of broad contact between the mental scale and the infralabials (versus usually absent in *L. decaryi*), by the presence of distinct gular striation (versus absent in *L. decaryi*); from *L. arnoulti*, by the presence of broad contact between the mental scale and the infralabials (versus usually absent in *L. arnoulti*), by the absence of a clear dorsal pattern (versus a distinct ocelated or striated pattern in *L. arnoulti*), by the presence of distinct gular striation (versus absent in *L. arnoulti*); from *L. klemmeri* by a clear throat striation with five distinct black stripes (versus distinct throat striation with black stripes and fond yellow colour in *L. klemmeri*); from *L. blancae* by the smaller size (24.6 mm versus 24.3-35.0 mm in *L. blancae* mean 24.6 mm versus 30.3 mm), by the number of three internasal scales (versus 1-3 in *L. blancae*), by the presence of distinct gular striation (versus absent in *L. blancae*).

Description. (1) small sized specimen. 24.6 mm SVL (mean ± SD 24.6 ± 0, n = 1); (2) no tail data; (3) granular dorsal scales; (4, 5) first finger present, and bearing; (6) three pairs lamellae (mean ± SD 3.00 ± 0, n = 1); (7, 8) mental scale

tripartite, without broad contact between infralabial and mental scale; (9, 10) three postmental scales bisymetrical; (11) five postpostmental scales; (12) five infralabial scales; (13) six supralabial scales; (14) three internasal scales; (15) no males seen; (16) tail distinct verticillated; (17, 18) without dorsolateral tubercles; (19, 20) grey-beige dorsal colour, without a clear pattern, but darkish lines; (21) *L. heterurus* present a clear throat and ventral distinct striation on brownish colour.

Material examined. MRSN.R.1911 (coll. F. Andreone, 10.Feb.99, Nosy Be).

Distribution. Nosy Be (type locality). According to specimens examined by us, the species is known from Nosy Be.

Habitat: Living in trees, in dry forest.

Lygodactylus heterurus trilineigularis Rösler 1998
Lygodactylus heterurus trilineigularis Rösler 1913. - *Name-bearing type*: holotype, MTKD D 39054, male - *Type locality*: "Ampahana (Locus typicus), nordostliches Madagasakar", according to the original description. - *Other types*: Paratypes, MTKD D 39055, female.- *Etymology*: derived from latin *tri-* (three), *linea-* (lines), *gula-* (throat), with three lines in the throat.

Diagnosis. From other species of the *L. verticillatus* group, *L. heterurus trilineigularis* is distinguished as follows: from *L. verticillatus* by the number of 11 distinct pigmented preanal pores in males (versus usually nine not pigmented in *L. verticillatus*), by the beige greyish dorsal colouration (versus brownish in *L. verticillatus*), by the presence of distinct gular striation (versus absent in *L. verticillatus*); from *L. heterurus heterurus* by thenumber of 1-2 internasal scales (versus three in *L. heterurus heterurus*), by a clear throat striation with three black stripes (versus five in *L. heterurus heterurus*); from *L. decaryi* by the presence of broad contact between the mental scale and the

infralabials (versus usually absent in *L. decaryi*), by the number of 10-11 distinct pigmented preanal pores in males (versus 15 not pigmented in *L. decaryi*), by the presence of distinct gular striation (versus absent in *L. decaryi*); from *L. arnoulti*, by the presence of broad contact between the mental scale and the infralabials (versus usually absent in *L. arnoulti*), by the presence of pigmented preanal pores in males (versus not pigmented in *L. arnoulti*), by the absence of a clear dorsal pattern (versus a clear ocelated or striated pattern in *L. arnoulti*), by the presence of distinct gular striation (versus absent in *L. arnoulti*); from *L. klemmeri* by the number of two internasal scales (versus one in *L. klemmeri*), by a clear throat striation with three distinct black stripes (versus throat striation with black stripes and fond yellow colour in *L. klemmeri*); from *L. blancae* by the smaller size (versus bigger in *L. blancae*), by the number of 1-2 internasal scales (versus 1-3 in *L. blancae*), by the presence of pigmented preanal pores in males (versus not pigmented in *L. blancae*), by the presence of distinct gular striation (versus absent in *L. blancae*).

Description. (1) small sized specimens 22.9-27.5 mm SVL, (mean ± s.d. 24.8 ± 1.50 mm, n = 7); (2) Tail length (TL) 22.9-26.0 mm (mean ± s.d. 24.2 ± 1.38 mm, n = 4); (3) granular dorsal scales; (4, 5) first finger present, and bearing; (6) three pairs lamellae (mean ± s.d. 3.00 ± 0, n = 7); (7, 8) mental scale tripartite, broad contact between infralabial and mental scale can appear, but not distinct; (9, 10) three postmental scales (mean ± s.d. 3.00 ± 0, n = 7) bisymetrical; (11) 5-6 postpostmental scales (mean ± s.d. 5.14 ± 0.38, n = 7); (12) five infralabial scales (mean ± s.d. 5.00 ± 0, n = 7); (13) 6-7 supralabial scales (mean ± s.d. 6.14 ± 0.37, n = 7); (14) 1-2 internasal scales (mean ± s.d. 1.71 ± 0.48, n = 7); (15) 9-11 preanal pores (mean ± s.d. 9.75 ± 0.95, n = 4) with femoral-preanal strengthened scales distinct pigmented; (16) tail verticillated, with distinct 14-15 verticilles; (17, 18) without dorsolateral tubercles; (19, 20) grey-brownish dorsal

colour, without a clear pattern, but darkish lines; (21) with a clear throat and ventral distinct striation; (22) 160-190 number of dorsal scales along the body (mean ± s.d. 179.20 ± 11.43, n = 5); (23) 17-99 number of dorsal scales around the body (mean ± s.d. 73.60 ± 32.50, n = 5); (23) 90 number of ventral scales (90 ± 0, n = 1). (Figure 9).

Hemipenial structure. Based on ZSM 560/2000 (FG/MV 2000- 388), adult male from Sambava. Hemipenis subcylindrical with relatively large pedicel ca. 1.5 mm. (total length ca. 2,5 mm.). The truncus and the arms are covered with papillae fields being more dense in the arms. Sulcus spermaticus formed by one channel, it will divided in several subchannels in the apex. No distinct sulcal lips and no papillae around it. The apex is divided in two arms with 1.8 mm each (Fig. 9.2).

Material examined. ZSM 560/2000 (M. Vences, 20.3.2000, Sambava, bei Hotel Club Plag), ZSM 561/2000 (M. Vences, 20.March.2000, Sambava, bei Hotel Club Plage), ZSM 915/2003 F. Glaw, M. Puente & R. Randrianiaina, 20. Feb. 2006, Montagne des Français), ZSM 285/2004-287/2004 (F. Glaw, M. Puente & R. Randrianiaina, 26. Feb. 2006, Ankarana), ZSM 308/2004 (F. Glaw, M. Puente, R. Randrianiaina & Angestellte der Kings Lodge, 28. Feb. 2006, Montagne des Français).

Distribution. Ampahana (type locality). According to specimens examined by us, the species is known from Sambava, Ankarana and Montagne des Français.

Habitat. Forest. Living in trees (Rösler 1998). Living in trees, in dry forest from the north-west Madagascar, usually at 0.5-2 m from the ground during the day (personal observation).

Lygodactylus decaryi Angel 1930
Lygodactylus decaryi Angel 1930. - *Name-bearing type*: MNHN 1930.271 holotype, male with 26.8 mm SVL, "according to the London catalogue" - *Type locality*: "Un exemplaire masculin, capturé dans le Massif de l'Angavo, province de Fort Dauphin, en julliet 1926; altitude 400 mètres; région sub-désertique. Se trouvait sous des écorces.", according to the original description. - *Other types*: No data from the original description.- *Etymology*: "Matériaux de la Mission R. Decary, en 1926".

Diagnosis. From other species of the *L. verticillatus* group, *L. decaryi* is distinguished as follows: from *L. verticillatus* by the number of 15 preanal pores in males (versus usually nine in *L. verticillatus*); from *L. heterurus* by the number of 15 not pigmented preanal pores in males (versus 11 distinct pigmented in *L. heterurus*), by the brownish dorsal colouration (versus beige greyish in *L. heterurus*), by the absence of distinct gular striation (versus distinct in *L. heterurus*); from *L. arnoulti* by the smaller size (22.2-26.8 mm versus 19.1-36.9 mm in *L. arnoulti* mean 25.1 mm versus 30.1 mm), by the absence of a clear dorsal pattern (versus an ocelated or striated pattern in *L. arnoulti*); from *L. klemmeri* by the number of 15 preanal pores in males (versus nine in *L. klemmeri*), by the absence of a clear throat striation (versus distinct in *L. klemmeri*); from *L. blancae* by the smaller size (versus bigger in *L. blancae*).

Description. (1) Medium sized specimens. Adults specimens are 22.2-26.8 mm snout-vent length (SVL) (mean ± SD 25.10 ± 2.52 mm, n = 3); (2) all the specimens examined with broken tail; (3) granular dorsal scales; (4, 5) first finger present, and bearing; (6) three pairs lamellae (mean ± SD 3.00 ± 0, n = 3); (7, 8) mental scale tripartite, broad contact between infralabial and mental scale can appears but not distinct; (9, 10) three postmental scales (mean ± SD 3.00 ± 0, n = 3) bisymmetrical; (11) five postpostmental scales (mean 5.00 ± 0, n = 3); (12) 4-5 infralabial scales (mean ± SD 4.67 ± 0.57, n = 3); (13) 5-6

supralabial scales (mean ± SD 5.33 ± 0.57, n = 3); (14) 1-2 internasal scales (mean ± SD 1.33 ± 0.57, n = 3); (15) males with 15 preanal pores without femoral-preanal strengthened scales; (16) tail verticillated; (17, 18) without dorsolateral tubercles; (19, 20) brownish dorsal colour, without a clear dorsal pattern; (21) light ventral colouring, usually without throat spots, but can appear; (22) 190 number of dorsal scales along the body (mean ± SD 190.00 ± 0, n = 1); (23) 66 number of dorsal scales around the body (mean ± SD 66.00 ± 0, n = 1). (Figure 10).

Material examined. MNHN 1930.271 (holotype, Angavo massif), MNHN 1950.262 (Behara, Bevia forest), MNHN 1930.270 (Andrahamana).

Distribution. South-east, Angavo Massif (type locality).

Habitat. According to Angel (1930) the species was found "sous des ecorces, region sub-desertique" at an altitude of 400 m. Occurs in arid savannah areas.

Lygodactylus arnoulti Pasteur 1964

Lygodactylus arnoulti Pasteur 1964. - *Name-bearing type*: holotype BGP 204 (preliminar collection number of G. Pasteur), male with 21 mm SVL, collected by M. de Saint Ours, data from the MNHN catalogue referring to the holotype specimen, MNHN 1966.1001, male juvenile- *Type locality*: “montagne de l’Ibity, Centre”, according to the original description, “montagne de l’Ibity vers 1900 m sous pieres”, data from the MNHN catalogue referring to the holotype specimen. - *Other types*: No data from the original description- *Etymology*: Dedicated to J. Arnoult.

Diagnosis. From other species of the *L. verticillatus* group, *L. arnoulti* is distinguished as follows: from *L. verticillatus* by the bigger size (19.1-36.9 mm versus 11.2-34.2 mm in *L. arnoulti* mean 30.1 mm versus 22.8 mm), by the absence of broad contact

between the mental scale and the infralabials (versus usually present in *L. verticillatus*), by the striated or ocelated dorsal pattern (versus absent a clear dorsal pattern in *L. verticillatus*); from *L. heterurus heterurus*, by the absence of broad contact between the mental scale and the infralabials (versus usually present in *L. heterurus heterurus*), by the presence of a clear dorsal pattern ocelated or striated (versus absent a distinct dorsal pattern in *L. heterurus heterurus*), by the absence of distinct gular striation (versus present in *L. heterurus heterurus*); from *L. heterurus trilineigularis*, by the absence of broad contact between the mental scale and the infralabials (versus usually present in *L. heterurus trilineigularis*), by the absence of pigmented preanal pores in males (versus present in *L. heterurus trilineigularis*), by the presence of a clear dorsal pattern ocelated or striated (versus absent in *L. heterurus trilineigularis*), by the absence of distinct gular striation (versus present in *L. heterurus trilineigularis*); from *L. decaryi* by the bigger size (19.1-36.9 mm versus 22.2-26.8 mm in *L. decaryi* mean 30.0 mm versus 25.1 mm), by the presence of a clear dorsal pattern ocelated or striated (versus absent a distinct dorsal pattern in *L. decaryi*); from *L. klemmeri* by the bigger size (19.1-36.9 mm versus 23.9-25.2 mm in *L. klemmeri* mean 30.0 mm versus 24.5 mm), by the number of 9-11 preanal pores in males (versus nine in *L. klemmeri*), by the presence of a clear dorsal pattern ocelated or striated (versus absent in *L. klemmeri*), by the absence of a clear throat striation (versus distinct in *L. klemmeri*); from *L. blancae* by the striated or ocelated dorsal pattern (versus absent a clear dorsal pattern in *L. blancae*), by the absence of contact between mental infralabial scales (versus contact present in *L. blancae*).

Description. (1) big sized specimens. Adults specimens are 19.1-36.9 mm snout-vent length (SVL) (mean ± SD 30.1 ± 4.00 mm, n = 51); (2) tail length (TL) 14.8-35.9 mm (mean ± SD 27.23 ± 5.9 mm, n = 12); (3) granular dorsal scales; (4, 5) first finger with claw, (usually strong claws and big fingers); (6) three pairs lamellae (mean ± SD 3.00 ± 0, n = 54); (7, 8) mental scale

tripartite, broad contact between infralabial and mental scale can appears but faintly; (9, 10) three postmental scales (mean ± SD 3.00 ± 0, n = 54) usually bisymmetrical; (11) 5-7 postpostmental scales (mean ± SD 5.40 ± 0.59, n = 54); (12) 4-6 infralabial scales (mean ± SD 4.87 ± 0.55, n = 54); (13) 5-6 supralabial scales (mean ± SD 5.76 ± 0.51, n = 54); (14) 1-3 internasal scales (mean ± SD 1.46 ± 0.53, n = 54); (15) males with 9-11 preanal pores (mean ± SD 9.71 ± 0.84, n = 21) with femoral-preanal strengthened scales not pigmented; (16) tail verticillated, with distinct 12-17 verticilles; (17, 18) usually with dorsolateral tubercles 3-6 with 1-7 scales each one; (19, 20) brownish dorsal colour, usually with ocelated pattern; (21) usually with throat spots, and light ventral colour; possible present bigger scales in the neck like *L.verticillatus*; (22) 182 number of dorsal scales along the body (mean ± SD 182.00 ± 0, n = 1); (23) 75 number of dorsal scales around the body (mean ± SD 75.00 ± 0, n = 1). (Figure 11).

Material examined. MNHN 1966.1002 (C. P. Blanc, Mont Ibity 1700 m), MNHN 1966.1001 (Holotype, M de Saint Ours, Mont Ibity, 1900 m, "sous pierres"), MNHN 1990.1869-1871 (C. P. Blanc, 6. Jan. 1973, Ambatomenaloha), MNHN 1990.1872-1874 (C. P. Blanc, 15-16. Jan. 1973, Analabe), MNHN 1990.3398-3429 (C. P. Blanc, Dec. 1965, Mont Ibity, 700 m), MNHN 1990.3429-3440 (C. P. Blanc, 14.Jan.1973, from Sud de l'Ibity, Ampandrianombilapa), ZSM 394/2000 (M. Vences, Mont Ibity), ZSM 395/2000 (M. Vences, Mont Ibity), ZSM 18/2004 (F. Glaw, M. Puente, M. Thomas & R. Randrianiaina, 20. Jan. 2004, Col. de Tapias).

Distribution. Mont Ibity (type locality). According to specimens examined by us, the species is known from Mont Ibity.

Habitat. Semi-arid savannah areas at an altitude of about 1700 m. Lives in rocks (personal observation).

Lygodactylus klemmeri Pasteur 1964
Lygodactylus klemmeri Pasteur 1964. - *Name-bearing type*: holotype, MNHN 50.259, male, 28 mm corps (according to the original description)- *Type locality*: "forêt de l'Antsingy (Nord-Ouest)", according to the original description. - *Other types*: No data from the original description. - *Etymology*: Dedicated to Dr. Konrad Klemmer.

Diagnosis. From other species of the *L. verticillatus* group, *L. klemmeri* is distinguished as follows: from *L. verticillatus* by the presence of distinct black throat stripes, by the beige greyish dorsal colouration with greenish head (versus brownish in *L. verticillatus*); from *L. heterurus heterurus* by a clear throat striation with black stripes and fond yellow colour (versus five distinct stripes without yellow fond colour in *L. h. heterurus*); from *L. heterurus trilineigularis* by the number of one internasal scale (versus 1-2 in *L. heterurus trilineigularis*), by a clear throat striation with black stripes and fond yellow colour (versus three distinct stripes without yellow colouration in *L. h. trilineigularis*); from *L. decaryi* by the number of 9 preanal pores in males (versus 15 in *L. decaryi*), by the presence of distinct gular striation (versus absent in *L. decaryi*); from *L. arnoulti* by the smaller size (23.9-25.2 mm versus 19.1-36.9 mm in *L. arnoulti* mean 24.5 mm versus 30.0 mm), by the absence of a clear dorsal pattern ocelated or striated (versus present in *L. arnoulti*), by the presence of a clear throat striation (versus absent in *L. arnoulti*); from *L. blancae* by the smaller size (23.9-25.2 mm versus 24.3-35.0 mm in *L. blancae* mean 24.5 mm versus 30.3 mm), by the number of one internasal scale (versus 1-3 in *L. blancae*), by the presence of distinct gular striation (versus absent in *L. blancae*).

Description. (1) Moderately sized for *Lygodactylus*. Adults specimens are 23.9-25.2 mm snout-vent length (SVL) (mean ± SD 24.50 ± 0.54 mm, n = 4); (2) tail length (TL) 22 mm

(mean ± SD 22.0 ± 0 mm, n = 1); (3) they have granular dorsal scales; (4, 5) first finger present, and bearing a claw; (6) three pairs of subdigital lamellae on the fourth toe (mean ± SD 3.00 ± 0, n = 4); (7, 8) a mental scale divided into three parts by sutures. There can be a faint broad contact between infralabial and mental scale; (9, 10) three (mean ± SD 3.00 ± 0, n = 4) postmental scales, bisymmetrical; (11) 5-6 postpostmental scales (mean ± SD 5.50 ± 0.95, n = 4); (12) 5-7 infralabial scales (mean ± SD 5.75 ± 0.95, n = 4); (13) 6-7 supralabial scales (mean ± SD 6.75 ± 0.50, n = 4); (14) one internasal scale (mean ± SD 1.00 ± 0, n = 4); (15) males with 9 preanal pores (9.00 ± 0, n = 1), with non-pigmented enlarged scales in the cloacal and femoral area; (16) tail verticillated, with 11 distinct verticilles; (17, 18) dorsolateral tubercles absent; (19, 20) the main dorsal colour is brownish and grey-olive, the head can be greenish; (21) ventral side with light colour and distinct throat lines, yellow gular colour (Puente *et. al* 2005).

Material examined. UADBA 17819-17820 (A. Raselimanana, 24. Nov. 2001, Bemaraha NP, Bekopaka, Mahajanga), UADBA 17821 (A. Raselimanana, 30. Nov. 2001, Bemaraha NP, Bekopaka, Mahajanga), UADBA 17822 (A. Raselimanana, 3. Dec. 2001, Bemaraha NP, Bekopaka, Mahajanga).

Distribution. Antsingy forest (type locality). According to specimens examined by us, the species is known from Bemaraha NP, Bekopaka, in Mahajanga.

Habitat: on forest (Pasteur 1964). The specimens UADBA 17819, 17820
and 17822 were found active during the day on tree trunks in dry semi-deciduous forest, within a limestone area (Puente et al. 2005).

Lygodactylus blancae Pasteur 1995

Lygodactylus blancae Pasteur 1995. - *Name-bearing type*: holotype, MNHN 1990.39, female, 32 mm SVL (according to the original description)- *Type locality*: "Ampefy, à 1 Km au NW du lac Itasy (NW de l'Ankaratra, vers 1400 m)", according to the original description. - *Other types*: paratypes, MNHN 40-42 and MHNG 2541.29 (adult males), MNHN 1990.43 (juvenile male), MNHN 1990.44-45 (recently born), MNHN 1990.46-47 (embryons), MNHN 1990.38 (adult male) "sur arbres près du lac Itasy", according to the original description.- *Etymology*: Dedicated to Professor F. Blanc.

Diagnosis. From other species of the *L. verticillatus* group, *L. blancae* is distinguished as follows: from *L. verticillatus* by the bigger size (24.3-35.0 mm versus 11.2-34.2 mm in *L. verticillatus* mean 30.3 mm versus 22.8 mm), by a pigmented throat with distinct black spots (versus not distinct dark spots in *L. verticillatus*); from *L. heterurus heterurus* by the bigger size (24.3-35.0 mm versus 24.6 mm in *L. heterurus heterurus* mean 30.3 mm versus 24.6 mm), by the number of 1-3 internasal scales (versus 3 in *L. heterurus heterurus*), by the absence of distinct gular striation (versus present in *L. heterurus heterurus*); from *L. decaryi* by the bigger size (24.3-35.0 mm versus 22.2-26.8 mm in *L. decaryi* mean 30.3 mm versus 25.1 mm), by the number of 9-11 preanal pores in males (versus 15 in *L. decaryi*), by a pigmented throat with distinct black spots (versus not distinct dark spots in *L. decaryi*); from *L. arnoulty* by the absence of a clear dorsal pattern (versus striated or ocelated dorsal pattern in *L. arnoulti*), by a pigmented throat with distinct black spots (versus not distinct dark spots in *L. arnoulti*); from *L. klemmeri* by the bigger size (24.3-35.0 mm versus 23.9-25.2 mm in *L. klemmeri* mean 30.3 mm versus 24.5 mm), by the number 1-3 internasal scales (versus one in *L. klemmeri*), by the absence of a clear throat striation (versus distinct in *L. klemmeri*).

Description. (1) big sized specimens. Adults specimens are 24.3-35.0 mm snout-vent length (SVL) (mean ± SD 30.35 ± 3.65 mm, n = 12); (2) tail length (TL) 20.2-31.9 mm (mean ± SD 27.0 ± 6.10 mm, n = 3); (3) granular dorsal scales; (4, 5) first finger with claw; (6) three pairs lamellae (mean ± SD 3.00 ± 0, n = 14); (7, 8) mental scale tripartite, broad contact between infralabial and mental scale present but not distinc; (9, 10) usually three postmental scales (mean ± SD 3.07 ± 0.47, n = 14) bisymmetrical; (11) 4-7 postpostmental scales (mean ± SD 5.21 ± 0.69, n = 14); (12) 4-6 infralabial scales (mean ± SD 5.43 ± 0.64, n = 14); (13) 4-7 supralabial scales (mean ± SD 6.00 ± 0.87, n = 14); (14) with 1-3 internasal scales (mean ± SD 1.47 ± 0.54, n = 14); (15) males with 9-11 preanal pores 10.20 ± 0.83, n = 5) with femoral-preanal strengthened scales not pigmented; (16) tail verticillated, with distinct 9-18 verticilles; (17, 18) absent dorsolateral tubercles; (19, 20) brownish dorsal colour, without a clear pattern, but with the ocular area striated; (21) usually with throat spots and has a characteristic dark line in mental scale, with a light ventral colour; (22) 184-194 number of dorsal scales along the body; (23) 58-62 number of dorsal scales around the body. (Figure 12).

Hemipenial structure. Based on ZSM 498/2001 (MV 2001- 263), adult male from Lac Itasy. Hemipenis subcylindrical with large pedicel ca. 2.5 mm. (total length ca. 3.5 mm.). The truncus and the arms are covered with papillae fields. Sulcus spermaticus formed by one channel, becoming divided in several subchannels in the apex. No distinct sulcal lips and no papillae around it. The apex is divided in two arms with ca. 1.5-2 mm. each. (Fig. 12.2).

Material examined. MNHN 1990.38 (Paratype, C.P. Blanc, 5. Nov. 1966, Lac Itasy), MNHN 1990.39 (Holotype, C. P.

Blanc, 13. Feb. 1973, Ampefy), MNHN 1990.40-45 (Paratypes, C. P. Blanc, 13. Feb. 1973, Ampefy), ZFMK 48243 (leg. F.W. Henkel & R. Seipp, April 1988, 70 km W Antananarivo), ZFMK 48242 (leg. F.W. Henkel & R. Seipp, April 1988, 70 km W Antananarivo), ZSM 498/2001 (D. R. Vieites, 22. Feb. 2001, Lac Itasy, Hotel close to Ampefy), ZSM 497/2001 (D. R. Vieites, 22. Feb. 2001, Lac Itasy, Hotel close to Ampefy), ZSM 498/2001 (D. R. Vieites, 22. Feb. 2001, Lac Itasy, Hotel close to Ampefy), ZSM 499/2001 (D. R. Vieites, 22. Feb. 2001, Lac Itasy, Hotel close to Ampefy), ZSM 500/2001 (D. R. Vieites, 22. Feb. 2001, Lac Itasy, Hotel close to Ampefy).

Distribution. Ampefy (type locality). According to specimens examined in the field, the species is known from Ampefy, lac Itasy.

Habitat. Small trees around the lake (Pasteur 1995).

***Lygodactylus tolampyae* group**
(contains: *Lygodactylus tolampyae*)

This group was originally described by Pasteur (1964) as a single species group (*Lygodactylus tolampyae*), belonging to Occidental Phylum, characterized to have three postmental scales with five postpostmental scales and a very distinct broad contact with infralabial scales.

Lygodactylus tolampyae (Grandidier 1872)
Hemydactylus tolampyae Grandidier 1872 - *Name-bearing type*: no data from the original description. - *Type locality*: “Forêts de la côte ouest”, according to the original description. - *Other types*: no data from the original description. - *Etymology*: no data from the original description.
Lygodactylus tolampyae Mocquard 1909

Lygodactylus tuberifer Boettger 1913

Diagnosis. From other groups of the Occidental lineage, *L. tolampyae* is distinguished as follows: from *L. verticillatus* group by the presence of distinct contact between mental and infralabial scales (versus faint contact or no contact in *L. verticillatus* group), by the number of seven preanal pores in males (versus 9-11 in *L. verticillatus* group), by the absence of a distinct verticillated tail (versus distinct verticillated in *L. verticillatus* group); from Intermediate group by the presence of distinct contact between mental and infralabial scales (versus faint contact or no contact in Intermediate group), by the number of 2-3 internasal scales (versus 1-2 in Intermediate group).

Description. (1) medium sized specimens. Adult specimens are 20.5-35.0 mm snout-vent length (SVL) (mean ± SD 28.04 ± 3.60 mm, n = 29); (2) tail length (TL) 24.1-34.0 mm (mean ± SD 29.4 ± 3.31 mm, n = 15); (3) granular dorsal scales; (4, 5) first finger bearing the claw; (6) three pairs lamellae (mean ± SD 3.00 ± 0, n = 28); (7, 8) mental scale tripartite with distinct broad contact between infralabial and mental scale; (9, 10) 2-3 postmental scales (mean ± SD 2.89 ± 0.31, n = 28) usually bisymetrical; (11) 4-6 postpostmental scales (mean ± SD 5.00 ± 0.27, n = 28); (12) 5-7 infralabial scales (mean ± SD 5.79 ± 0.56, n = 28); (13) 5-7 supralabial scales (mean ± SD 6.39 ± 0.56, n = 28); (14) 1-3 internasal scales (mean ± SD 2.25 ± 0.70, n = 28); (15) males with seven preanal pores (mean ± SD 6.60 ± 0.96, n = 10) without femoral-preanal strengthened scales; (16) tail with a colouring tend to make verticilles 8-15; (17, 18) dorsolateral tubercles absent; (19) brownish fond dorsal colouring; (20) without a distinct dorsal pattern; (21) usually with light ventral colour, without any clear pattern; (22) 200-296 dorsal scales along the body (mean ± s.d. 230.75 ± 44.01, n = 4); (23) 90-100 dorsal scales around the body (mean ± s.d. 97.00 ± 4.00, n = 5);

(24) 99-112 ventral scales (mean ± s.d. 103.00 ± 5.24, n = 5). (Fig. 13).

Hemipenial structure. Based on ZSM 502/2001, adult male from Ampijoroa (Ankarafantsika). Hemipenis subcylindrical of ca. 4 mm total length with relatively large pedicel of ca. 1.8 mm of length. The truncus and the arms are covered with papillae fields becoming more dense in the arms. Sulcus spermaticus formed by one channel dividing into two subchannels in each branch. No distinct sulcal lips and with papillae field around it. The apex is divided in two very long arms with ca. 2.5 mm. each. (Fig. 13.2).

Material examined. BMNH 1948.1.7.64 (Beroboka), MNHN 1990.1867 (C. A. Domergue, 24. Nov. 1960, Antsingy forest), MNHN 1990.1868 (C. A. Domergue, Belo-sur-Tsiribihina), MNHN 1990.3441 (F. Petter, IRSM, Toliara province), MNHN 1990.3442 (C. P. Blanc, 6. Feb. 1973, Tongahibe, Baie de Baly), MNHN 1990.3443 (coll. unknown, Feb. 1987, Ampijoroa), MNHN 1990.3444 (A.Robinson, Andobo, Antsingy region, Feb. 1957), MNHN 1990.3445 (C. P. Blanc, Antsalova, Antsingy region, on rocks, 4. Aug. 1964), MNHN 1990.3446 (C. P. Blanc, Antsalova, Antsingy region, in forest, 5. Aug. 1964), MNHN 1990.3448 (C. P. Blanc, near Antsalova, Antsingy region, 5. Aug. 1964), MNHN 1990.3449-3451 (C. P. Blanc, Bekopaka, south Antsingy, C. P. Blanc, 6 Aug. 1964), MNHN 1929.71-72 (coll. unknown, Ambongo), MNHN 1899.344 (coll. unknown, around Suberbieville. Bormy), MNHN 1950.260 (J. Millot, Aug. 1949, Itremo rocks), MRSN.R. 1913-1918 (FAZC 10496, 10498, 10499, 10501, 10503, 10504), (coll. F. Andreone, M. Vences, 12. Feb. 99, Sahamalaza, Berara), MRSN.R. 1921, (coll. F. Andreone, M. Vences, 04. Feb. 2000, Sahamalaza, Berara), MRSN.R. 1922, (coll. F. Andreone, M. Vences, 04. Feb. 2000, Sahamalaza, Berara), SMF 8948 (Holotype, A. Voeltzkow, Menabé), ZSM 419.2000 (M. Vences, 18. Feb. 2000, Berara, Anabohazo), ZSM 501.2001 (MV 2001-

300), (M. Vences, 22. Feb. 2001, Ankarafantsika, Ampijoroa), ZSM 502.2001 (MV 2001-301), (M. Vences, 23. Feb. 2001, Ankarafantsika, Ampijoroa).

Distribution. According to the original description the type locality is the forest on the west coast. According to specimens examined in the field, the species is known from Berara, Anabohazo, Ankarafantsika, Ampijoroa, Sahamalaza.

Habitat. Inhabits a wide area in the central west and seems to be a forest species (Grandidier 1872).

Remark. The specimens from the North (Berara) and those from southern localities (Ankarafantsika), don't show distinct morphological differences. All the *Lygodactylus tolampye* examined have five postpostmental scales, except one specimen (MRSN.R.1915) from Berara with six postpostmental scales and another with four (MNHN 1990 1867) from Foret de l'Antsingy. All the other *L. tolampyae* from these localities show five postpostmental scales. The specimens from Berara have 1-3 internasal scales and the other specimens 1-2 internasal scales.

***Lygodactylus ornatus* group**
(contains: *Lygodactylus ornatus*, *L. praecox*)
This group is formed by two species, *Lygodactylus ornatus* and *L. praecox* with two just-hatched specimens. This group is characterized to have divided mental scale with three postmental scales, tail not verticillated and special gular pattern formed by stripes making waves perpendicular to the body line in *L. ornatus* and parallel to the body line in *L. praecox*.

Lygodactylus ornatus Pasteur 1964
Lygodactylus ornatus Pasteur 1964. - *Name-bearing type*: holotype MNHN 1939.48, male, 27 mm SVL. - *Type locality*: "mont Mandritsara (Nord-Ouest)", according to the original

description. - *Other types*: No data from the original description.- *Etymology:* ”Ornatus“ because of the ventral ornamentation, ”7 lignes noires transversales, légèrement onduleuses. Deux paires de belles taches scapulaires à partie médiane noire et parties latérales blanches (une paire en avant du bras et l’autre en arrière)“ (according to the original description).

Diagnosis. From other species of the Intermediate group, *L. ornatus* is distinguished as follows: from *L. praecox* by the number of one internasal scale (versus 1-2 in *L. praecox*), by the distinct throat pattern in the form of a darkly coloured “S”-shape with seven repeats (versus distinct “V”-shaped throat pattern in *L. praecox*).

Description. (1) medium sized specimens 27.7 mm snout-vent-length (svl) (mean ± s.d. 27.7 ± 0 mm, n = 1); (2) without tail; (3) granular dorsal scales; (4, 5) first finger present, and bearing (what???); (6) three pairs lamellae; (7, 8) mental scale tripartite with broad contact between infralabial and mental scale, but not distinct; (9, 10) three posmental scales bisymmetrical; (11) five postpostmental scales; (12) four infralabial scales; (13) four supralabial scales; (14) one internasal scale; (15) male with 11 preanal pores without femoral-preanal strengthened scales; (16) Tail without verticilles; (17, 18) dorsolateral tubercles absent; (19) brownish-beige dorsal colour; (20) without distinct dorsal pattern; (21) light ventral colour, with a characteristic “S” shaped throat pattern with seven repeats (Pasteur, 1964); with relatively long fingers like in the *L. madagascariensis* group, but more faint (comparable to *L. tolampyae*) ; (22) 184 dorsal scales along the body; (23) 60 dorsal scales around the body. (Fig. 14).

Material examined. MNHN 1939.48 (Holotype, Mandritsara).

Distribution. Mount Mandritsara (type locality), (Pasteur 1964).

Habitat. 1000 m of altitude in Mandritsara mountain (Pasteur 1965).

Lygodactylus praecox Pasteur 1995
Lygodactylus praecox Pasteur 1995. - *Name-bearing type*: holotype MNHN 1990.48, just-hatched specimen, 10+8 mm (according to the original description). - *Type locality*: "Antsingy (Ouest central)", according to the original description.- *Other types*: paratype MNHN 1990.49, just-hatched specimen.- *Etymology*: "*L. praecox* est-il limité à l'Antsingy, comme semble l'etre le sympatride *L. klemmeri* Pasteur 1964, Si c'est le cas, la super-spèce *Lygodactylus (heterurus)* est excesivemente relictuelle. *Praecox* fait allusion au fait que les nouveau-nés de cette espèce peuvent sortir de l'oeuf à un stade inhabituellement précoce, alors que la tete est encore (jusqu'aux épaules) aussi longe que le tronc entre bras ey cuisses, et trés sensiblement plus large." (according to the original description).

Diagnosis. From other species of the Intermediate group, *L. praecox* is distinguished as follows: from *L. ornatus* by the number of 1-2 internasal scales (versus one in *L. ornatus*), by a distinct "V"-shaped throat pattern (versus a distinct "S"-shaped throat pattern with seven repeats in *L. ornatus*).

Description. (1) two just-hatched specimens examined with 9.6-14.5 mm SVL (mean ± SD 12.0 ± 3.46 mm, n = 2); (2) no tail data recorded; (3) granular dorsal scales; (4, 5) first finger present, and bearing; (6) three pairs lamellae (mean ± SD 3.00 ± 0, n = 2); (7, 8) mental scale tripartite without broad contact between infralabial and mental scale; (9, 10) three postmental scales (mean ± SD 3.00 ± 0, n = 2) bisymmetrical; (11) 5-6 postpostmental scales (mean ± SD 4.50 ± 0.70, n = 2); (12) 5-6 infralabial scales (mean ± SD 5.50 ± 0.70, n = 2); (13) 5-6 supralabial scales (mean ± SD 5.50 ± 0.70, n = 2); (14) 1-2

internasal scales (mean ± SD 1.50 ± 0.70, n = 2); (15) no males examined; (16) tail without verticilles 13; (17, 18) dorsolateral tubercles absent; (19) brownish dorsal colour; (20) without a distinct dorsal pattern, but seems to tend to striated; (21) usually present a light ventral colour with a characteristic "V"-shaped throat pattern; (22) 185-188 dorsal scales along the body (mean ± s.d. 86.50 ± 2.12, n = 2); (23) 62-69 dorsal scales around the body (mean ± s.d. 65.50 ± 4.94, n = 2).

Easy to distinguish from the others species of the lineage because of the gular pigmentation with dark stripes and white fond colour, "4 paires de raies convergentes partent des labiales et aboutissent postérieurement, après fusion des deux plus antérieures, à 7 stries quasi parallèles don't les latérales parviennent jusqu'au cou" according to the original description (Pasteur 1995) (Fig. 16).

Material examined. MNHN 1990.48-49 (holotype and paratype, Charles et Françoise Blanc, 15. Nov. 1964, Antsingy, Ouest central).

Distribution. Antsingy (type locality).
Habitat. No data available.

Remark. *L. praecox* was described by Pasteur as a species belonging to *verticillatus* group, related to *L. heterurus* (Pasteur 1995).

***Lygodactylus pauliani* group**
(contains: *Lygodactylus pauliani*)

This group is formed by one species *Lygodactylus pauliani* (considered as an intermediate species between *L. verticillatus* and *L. tolampyae*). It was described as a parthenogenetic species and only females were found (Pasteur and Blanc, 1991). This

species has a divided mental scale with three postmental scales, tail not verticillated with an ocelated dorsal pattern.

Lygodactylus pauliani Pasteur & Blanc 1991
Lygodactylus pauliani Pasteur & Blanc 1991. - *Name-bearing type*: holotype, MNHN 1990.7, female "à corps de 331/4 mm" (according to the original description). - *Type locality*: "Ambatomenaloha (1600m), dans la règion sommitale centrale quartzitique du massif de l'Itremo, à 75 Km à l'ouest d'Ambositra", according to the original description. - *Other types*: paratypes, four adult females, MNHN 1990-14-17 and one juvenile MNHN 1990-18, MNHN 1990.3271-3272 (Paratypes, coll. unknown, 20,23.Nov.1992, from Ambatomenaloha, MNHN 1990.3273-3275 unknown, 20,23.Nov.1992, Ambatomenaloha, (see Remark)- *Etymology:* Dedicated to Renauld Paulian.

Diagnosis. From other species of the so-called intermediate species groups described by Pasteur, *L. pauliani* is distinguished as follows: from *L. ornatus* by the absence of a clear throat pattern (versus distinct throat pattern, light ventral colour, with a characteristic "S" shaped throat pattern with seven repeats in *L. ornatus*); from *L. praecox* by the number of one internasal scale (versus 1-2 in *L. praecox*), by the absence of a distinct throat pattern (versus distinct "V"-shaped throat pattern in *L. praecox*).

Description. (1) big sized specimens. Adults specimens are 27.9-35.7 mm snout-vent-length (svl) (mean ± s.d. 33.32 ± 2.58 mm, n = 7); (2) tail length (TL) 34.1-34.5 mm (mean ± s.d. 34.3 ± 0.28 mm, n = 2); (3) granular dorsal scales; (4, 5) first finger present, and bearing the claw; (6) three pairs lamellae (mean ± s.d. 3.14 ± 0.37, n = 7); (7, 8) tripartite mental scale with broad, but faint, contact between infralabial and mental scale; (9, 10) three postmental scales (mean ± s.d. 3.00 ± 0, n = 7) bisymmetrical; (11) 5-6 postpostmental scales (mean ± s.d. 5.29 ± 0.48, n = 7); (12) 5-6 infralabial scales (mean ± s.d. 5.29 ± 0.48, n

= 7); (13) 6-7 supralabial scales (mean ± s.d. 6.29 ± 0.48, n = 7); (14) one internasal scale (mean ± s.d. 1.00 ± 0, n = 7); (15) No males known; (16) tail with a colour tend to make verticilles 11-14; (17, 18) dorsolateral tubercles absent; (19) brownish dorsal colour; (20) usually dorsal ocelated pattern, sometimes the ocular region is striated; (21) usually with a light ventral colour without a clear pattern; (22) 190-195 dorsal scales along the body (mean ± s.d. 192.50 ± 3.53, n = 2); (23) 63-65 scales around the body (mean ± s.d. 64.00 ± 1.41, n = 2). (Fig. 15).

Material examined. MNHN 1990.7 (holotype, C. P. and F. Blanc, 6. Jan. 1973, Itremo, Ambatomenaloha), MNHN 1990.3271-3272 (Paratypes, coll. unknown, 20,23.Nov.1992, from Ambatomenaloha), MNHN 1990.3273-3275 (unknown, 20,23.Nov.1992, (from Ambatomenaloha), MNHN 1990.201 (1973, Itremo, forest 5 km N of Ambatomenaloha), MNHN 1990.202 (Col d'Itremo, 1700 m altitude).

Distribution. Ambatomenaloha (Itremo) (type locality).

Habitat. Different habitats on the Itremo mountain at altitudes of 1500-1600 m; under stones in sandy grassland and in rocky areas with bush vegetation, the predominant vegetation are *Pandanus*, *Podocarpus*, sclerophylas like *Uapaca*, *Sarcolena*, *Agauria*, *Chrysalidocarpus* and grass like gramineas (*Trachypogon*, *Loudetia*), (Pasteur & Blanc 1991).

Remark. - According to the original description (Pasteur & Blanc 1991) the type series consists of the holotype (MNHN 1990.7) and five additional specimens (MNHN 1990.14-18). In the MNHN catalogue, the numbers 1990.14-18 are occupied by five specimens of *Lygodactylus capensis*, two from Mozambique (Amatongas) and three from Zimbabwe (Bulawayo). In contrast, the specimens MNHN 1990.3271-3275, in the catalogue, are also marked as originating from Amatongas, Mozambique (MNHN 1990.3271-3272) and Bulawayo, Zimbabwe (MNHN 1990.3273-

3275). However, these specimens (in the jar G534.4) are well marked (on the jar label) as paratypes of *L. pauliani*, originating from Ambatomenaloha in Madagascar, and correspond to the series of paratypes as described in the original description (four females and one juvenile). Thus, we believe that a cataloguing error (erroneous duplication of locality information) occurred after the numbers originally reserved for the *L. pauliani* paratypes had been assigned to African specimens of *L. capensis*. We conclude that the specimens MNHN 1990.3273-3275 are the paratypes of *L. pauliani* and do not originate in Zimbabwe or Mozambique, and that the paratype numbers as given in the original description are in error.

IV.1.4.- Mountain lineage.

(contains: ***Lygodactylus mirabilis* group** with *Lygodactylus mirabilis* and *Lygodactylus intermedius* and ***Lygodactylus montanus* group** with, *Lygodactylus montanus*, *L. blanci*)

Within the Mountain lineage, we group all the *Lygodactylus* species according to their habitat in high mountain areas. The principal characters for this lineage are, in addition to the common habitat, the "not granular" dorsal scales, which are keeled within the *Lygodactylus mirabilis* group and pseudokeeled within the *L. montanus* group.

***Lygodactylus mirabilis* group**
(contains: *Lygodactylus mirabilis*, *L. intermedius*)

Lygodactylus mirabilis group has keeled dorsal scales, SVL 20.4-30.9 mm, a not verticillated tail; without first finger or with a reduced finger for *L. intermedius*, in this case without the claw; three bisymmetrical postmental scales; males with seven preanal pores with strengthened preanal-femoral scales; clear dorsal pattern ocelated or striated with greenish colors.

Lygodactylus mirabilis (Pasteur 1962)
Millotisaurus mirabilis Pasteur 1962. - *Name-bearing type*: holotype, 152.59 P from Bons-Girot-Pasteur collection. Male with 24 mm SVL, (according to the original description). The holotype of this species is catalogued in the Paris museum under the number MNHN 1966.1000 (collected by J. Millot, 8-9 Sep. 1959) - *Type locality*: "Terre typica: Mont Tsiafajavona, entre 2300 et 2500 mètres.", according to the original description. - *Other types*: MNHN 1966.999 (paratype, J. Millot, 8-9. Sep. 1959), paratypes, 47 individuals taken by Professor Millot in Tsiafajavona, 2300 m, MNHN 47.1 in july/1946, MNHN 48.1

and 48.9 in june/1947, the others from eggs catched at the same time than the type (BGP 58-9.59, 61.59, 116-51.59 P and 153-57.59 P), MNHN 1990.3586-3593 (paratypes, J. Millot, 8. Sep. 1959, Tsiafajavona, Ankaratra, 2300-2500 m), all juveniles, MNHN 1990.3594-3598 (paratypes, J. Millot, 8. Sep. 1959, Tsiafajavona, Ankaratra, 2300-2500 m), MNHN 1990.3572-3585 (paratypes, J. Millot, 8. Sep. 1959, Tsiafajavona, Ankaratra, 2300-2500 m).- *Etymology:* Dedicated to J. Millot. "Je l'ai apellé (1962b) *Millotisaurus mirabilis*, moins dans le sens de <admirable>, bien que sa pigmentation soit assez peu banale pour un gecko, que dans celui de <remarquable>: il est en effet quelque chose de nouveau non seulement parmi les Lygodactyles, mais même pour la famille des Gekkonidés, tout entière", according to the original description (Pasteur 1964).
Lygodactylus mirabilis, Pasteur 1995.

Diagnosis. From other species of the *Lygodactylus mirabilis* group, *L. mirabilis* is distinguished as follows: from *L. intermedius* by the absence of the first finger (versus present but vestigial first finger in *L. intermedius*), by usually the absence of distinct dark spots in the throat (versus presence in *L. intermedius*).

Description. (1, 2) small sized specimens. Adults specimens are 10.4-29.3 mm snout-vent-length (svl) (mean ± s.d. 24.9 ± 2.9 mm, n = 39); (2) tail length (TL) 19.9-39.0 mm (mean ± s.d. 28.1 ± 7.10 mm, n = 6); (3) keeled dorsal scales; (4, 5) first finger absent; (6) three pairs lamellae (mean ± s.d. 3.07 ± 0.25, n = 73); (7, 8) mental scale tripartite, broad contact between infralabial scale and mental scale can appear, but then faintly; (9, 10) 2-4 postmental scales (mean ± s.d. 2.97 ± 0.37, n = 73) usually bisymmetrical; (11) 5-8 postpostmental scales (mean ± s.d. 5.43 ± 0.70, n = 73); (12) the number of infralabial scales are 4-7 (mean ± s.d. 4.84 ± 0.68, n = 73); (13) 4-7 supralabial scales (mean ± s.d. 5.44 ± 0.62, n = 72); (14) 1-2 internasal scales (mean

± s.d. 1.15 ± 0.36, n = 72); (15) males with seven preanal pores and strengthened, but not pigmented, femoral-preanal scales, in rare cases males can have eight preanal pores; (16) tail without verticilles; (17, 18) without dorsolateral tubercles; (19) usually grey-greenish dorsal colour (20) with distinct dorsal pattern, striated or ocelated; (21) with several ventral spots, sometimes with faint lines in light colours along the ventral side; apparently a short snout; (22) 99-125 dorsal scales along the body (mean 113.67 ± 13.31, n = 3); (23) 40-56 scales around the body (mean 46.33 ± 8.50, n = 3); (24) 70-75 ventral scales (mean 72.67 ± 2.51, n = 3). (Fig. 17).

Hemipenial structure. Based on ZSM 389/2000 (FG/MV 2000-428), adult male from Ankaratra. Hemipenis subcylindrical with large pedicel ca. 1.8-2.0 mm. (total length ca. 3 mm.). The truncus and arms are covered with papillae fields. Sulcus spermaticus formed by one channel, and then divided into two subchannels per branch. No distinct sulcal lips and with papillae field around it. The apex is divided in two short arms with ca. 0.5-1 mm. each. (Fig. 17.2).

Material examined. BMNH 1962.269 (paratype, J. Millot. 8-9. Sept. 1959, Tsiafajavona, Ankaratra, 2300-2500 m), MNHN 1948.1 (Pasteur, 1962, Tsiafajavona), MNHN 1990.3586-3593 (paratypes, J. Millot, 8. Sep. 1959, Tsiafajavona, Ankaratra, 2300-2500 m), MNHN 1990.3594-3598 (paratypes, J. Millot, 8. Sep. 1959, Tsiafajavona, Ankaratra, 2300-2500 m), MNHN 1990.3606 (C. P. Blanc, 7. Jan. 1972, Tsiafajavona, Ankaratra), MNHN 1990.3572-3585 (paratypes, J. Millot, 8. Sep. 1959, Tsiafajavona, Ankaratra, 2300-2500 m), MNHN 1966.999 (paratype, J. Millot, 8-9. Sep. 1959, locality unknown), MNHN 1900.3601-3630 (C. P. Blanc, 7.Jan.1972, Tsiafajavona, Ankaratra, 2300-2500 m), MNHN 1990.3631-3636 (Llinares, 21. Feb. 1973, Tsiafajavona, Ankaratra, 2500 m), MNHN 1990.3637 (Llinares, 13. Aug. 1973, Tsiafajavona, Ankaratra, 2500 m), ZFMK 51146-51147 (F. Glaw and M. Vences, Ankaratra), ZSM

388/2000 (F. Glaw and M. Vences, 12. Fev. 2000, Ankaratra), ZSM 389/2000 (M. Vences, 3. Feb. 2000, Ankaratra), ZSM 796/2003, (locality unknown), 2361 (locality unknown), 2365 (27. Jan. 2003, locality unknown).

Distribution. Tsiafajavona Mont (type locality). According to specimens examined in the field, the species is known from Ankaratra.

Habitat. Maximum altitude 2644 m; at Tsiafajavona with variable wheather conditions with strong day-night temperature differences (2º in the night and more than 20ºC during the day) (Pasteur 1962). Rocky habitat, at an altitude of more than 2300 m grasslands with numerous stones.

Lygodactylus intermedius (Pasteur 1995)
Lygodactylus intermedius Pasteur 1995. - *Name-bearing type*: holotype MNHN 1990.50, female, 29 mm SVL (according to the original description) - *Type locality*: "Prairie altimontaine sèche de Manjarivolo à 1800 m, chaîne de l'Andrianony (au sud-est du Pic Boby)", according to the original description.- *Other types*: paratypes adults and juveniles, MHNG 2541.30 (male), MNHN 1990.51-56 (two males), MNHN 1990.57-58-59 (females), MNHN 1990.60 (male), MNHN 1990.104 (young male), MNHN 1990.61-92 (immature), MHNG 2541.31, (immature). - *Etymology*: "intermedius" because of the intermediate size between *L. montanus* and *L. mirabilis*.

Diagnosis. From other species of the *L. mirabilis* group, *L. intermedius* is distinguished as follows: from *L. mirabilis* by the presence of the, but vestigial first finger (versus absent in *L. mirabilis*), by usually the presence of distinct dark spots in the throat (versus absent in *L. mirabilis*).

Description. (1, 2) small sized specimens. Adults specimens are 21.2-30.9 mm snout-vent-length (svl) (mean ± s.d. 27.52 ± 2.63 mm, n = 12); (2) tail length (TL) 26.5-35.6, 26.5 mm (mean ± s.d. 30.7 ± 4.95 mm, n = 4); (3) keeled dorsal scales; (4, 5) first finger present in most of the cases, but reduced; (6) 3-4 pairs lamellae (mean ± s.d. 3.73 ± 0.45, n = 51); (7, 8) mental scale tripartite, usually with broad contact between infralabial scale and mental scale; (9, 10) 2-3 postmental scales (mean ± s.d. 2.98 ± 0.13, n = 55) bisymmetrical; (11) 5-6 postpostmental scales (mean ± s.d. 5.13 ± 0.33, n = 54); (12) 3-6 infralabial scales (mean ± s.d. 4.91 ± 0.61, n = 55); (13) 4-7 supralabial scales (mean ± s.d. 5.22 ± 0.66, n = 54); (14) 1-3 internasal scales (mean ± s.d. 1.31 ± 0.50, n = 55); (15) males with seven preanal pores (mean ± s.d. 7.00 ± 0, n = 4) and with strengthened but not pigmented femoral-preanal scales; (16) tail without verticilles; (17, 18) only two male specimens have dorsolateral tubercles (MNHN 1990.53, 1990.60) and have 4, 5 tubercles with 2-5 scales each one; (19) dorsal colour usually is grey-greenish (20) has a distinct dorsal pattern, striated or ocelated; (21) with several ventral spots, sometimes with faint dark lines and light ventral colouration. (Figure 18).

Material examined. MNHN 1990.1876 (C. P.Blanc, 17. Dec. 1970, Andringitra, Camp Mont Ibory), MNHN 1990.51-56 (C. P. Blanc, 29-30. Oct. 1970, Andringitra, Chaine de l'Andrianony), MNHN 1990.57 (C. P. Blanc 23. Nov. 1970, from Chaine de l'Andrianony, prairie altimontaina seche de manjarivolo, 1800m), MNHN 1990.58 (C. P. Blanc 23. Nov. 1970, from cuvette du Boby 2500-2550m) MNHN 1990.59 (C. P. Blanc,12. Dec. 1970, Andringitra, Chaine de l'Andrianony, 1800m, cours superieur de la Sahatena), MNHN 1990.60 (C. P. Blanc, 17. Dec. 1970, Andringitra, Pic Boby, 2550 m), MNHN 1990.61 (C. P. Blanc, 19. Nov. 1970, Andringitra, Andohariana), MNHN 1990.62-64 (C. P. Blanc, 9. Dec. 1970, Andringitra, Varavarana), MNHN 1990.65-66 (C. P. Blanc, 9. Dec. 1970,

Andringitra), MNHN 1990.67-73 (C. P. Blanc, 5-12. Dec. 1970, Andringitra, Andohariana plateau, 2000-2100m), MNHN 1990.74-75 (C. P. Blanc, Nov. 1970, Andringitra, Cirque Boby, 2550-2600 m), MNHN 1990.76-91 (C. P. Blanc, Nov. 1970, Andringitra, Pic Boby, 2550-2630 m), MNHN 1990.92-102 (C. P. Blanc, 16. Dec. 1970, Andringitra, southern versant of the Ibory, 2500-2600 m), MNHN 1990.103 (C. P. Blanc, 16. Dec. 1970, Andringitra, southern versant of the Ibory), MNHN 1990.104 (C. P. Blanc, 18. Jan.1971, Andringitra, Andohabatomanara), MNHN 1990.50 (C. P. Blanc, 1970, Andringitra).

Distribution. Manjarivolo (type locality) (Pasteur 1995).

Habitat. Rock enviroments and high altitude of 2550-2600 m (Pasteur 1995).

***Lygodactylus montanus* group**
(contains: *Lygodactylus montanus*, *L. blanci*)

Lygodactylus montanus group contains big-sized specimens (22.8-39.2 mm SVL) with pseudokeeled dorsal scales, a first finger that is vestigial in *L. montanus*; mental scale tripartite with three postmental scales and five postpostmental scales, males with 9-11 preanal pores with strengthened preanal-femoral scales tail tends to make colour faint verticiles and with a striated or ocelated dorsal pattern.

Lygodactylus montanus Pasteur 1964
Lygodactylus montanus Pasteur 1964. - *Name-bearing type*: holotype, MNHN 1956.71, female (32.5 + 38 mm) - *Type*

locality: “sommet du mont Ivohibe (Sud-Est central)”, according to the original description. - *Other types*: paratypes MNHN 1956.72-73.- *Etymology*: mountain habits.

Diagnosis. From other species of the *Lygodactylus montanus* group, *L. montanus* is distinguished as follows: from *L. blanci* by the presence of a vestigial first finger without a claw (versus a present fully developed first finger having a claw in *L. blanci*), by the number of usually four lamellae pairs (versus three in *L. blanci*), by the number of 1-2 internasal scales (versus one in *L. blanci*), by the number of 8-11 preanal pores in males (versus 10-12 in *L. blanci*).

Description. (1, 2) Big sized specimens. Adults specimens are 13.1-37.5 mm snout-vent length (SVL) (mean ± SD 33.6 ± 3.36 mm, n = 107); (2) tail length (TL) 29.2-49.1 mm (mean ± SD 38.4 ± 4.39 mm, n = 35); (3) dorsal scales pseudokeeled (different than *L.millotisaurus* group); (4, 5) first finger vestigial without claw; (6) 3-4 pairs lamellae (mean ± SD 3.94 ± 0.24, n = 125); (7, 8) mental scale tripartite, broad contact between infralabial and mental scale can appears but not distinct; (9, 10) 2-3 postmental scales (mean ± SD 2.86 ± 0.35, n = 125) bisymmetrical; (11) 3-7 postpostmental scales (mean ± SD 4.94 ± 0.44, n = 125); (12) 3-7 infralabial scales (mean ± SD 5.46 ± 0.68, n = 125); (13) 4-8 supralabial scales (mean ± SD 6.03 ± 0.74, n = 125); (14) 1-2 internasal scales (mean ± SD 1.31 ± 0.46, n = 125); (15) males with 8-11 preanal pores (mean ± SD 8.68 ± 0.65, n = 5) and distinct femoral-preanal strengthened scales not pigmented; (16) tail not verticillated; (17, 18) usually present dorsolateral tubercles 3-9 with 1-8 scales each one; (19) grey-greenish dorsal colour; (20) dorsal pattern ocelated and sometimes striated; (21) light ventral colour with some dark spots in throat area, like an irregular striation following the body line; (22) 139-153 dorsal scales along the body (mean ± s.d. 144.40 ±

5.36, n = 5); (23) 61-72 dorsal scales around the body (mean ± s.d. 66.20 ± 4.43, n = 5). (Fig. 19).

Hemipenial structure. Based on FGZC 2394, adult male from Ankaratra. Hemipenis subcylindrical with a large pedicel ca. 2 mm. (total length ca. 3 mm.). The truncus and truncus are covered with papillae fields. Sulcus spermaticus formed by one channel, which divides into two subchannels per branch. No distinct sulcal lips and with papillae field around it. The apex is divided in two short arms with ca. 1 mm each (Fig. 19.2).

Material examined. MNHN 1956.71 (Holotype, J. Millot, Ivohibe, 2100 m), MNHN 1956.72-73 (Paratypes, J. Millot, Ivohibe 2100 m), MNHN 1990.1877-1880 (C. P. Blanc, 20. Nov. 1971, Chaines Anosyennes), MNHN 1990.1881-1886 (C. P. Blanc, 25. Nov. 1971, from Chaines Anosyennes, "sommet E"), MNHN 1990.3452.3486 (Betsch, Guillaumet and Blanc, 1971, Chaines Anosyennes, "cuvette"), MNHN 1990.3487-3496 (Betsch, Guillaumet and Blanc, 15-17. Nov. 1971, Chaines Anosyennes, "cuvette et premiers sommets"), MNHN 1990.3497-3511 (Betsch, Guillaumet and Blanc, 21 Nov. 1971, Chaines Anosyennes, "cuvette"), MNHN 1990.3512-3525 (Betsch, Guillaumet and Blanc, 23. Nov. 1971, Chaines Anosyennes, "sommet F"), MNHN 1990.3526-3531 (Betsch, Guillaumet and Blanc, 1971, Chaines Anosyennes, "sommet F"), MNHN 1990.3532-3538 (Betsch, Guillaumet and Blanc, 25 Nov. 1971, Chaines Anosyennes, "sommet D"), MNHN 1990.3539-3549 (Betsch, Guillaumet and Blanc, Nov. 1971, Chaines Anosyennes, "camp du Sommet"), MNHN 1993.907-913 (J. Arnoult, Jan. 1954, Andohahela, 2000 m), FGZC 2394 (F. Glaw, M. Vences, P. Bora, Jan. 2005, Andohahela), FGZC 2521 (F. Glaw, M. Vences, P. Bora, Jan. 2005, Andohahela), FGZC 2522 (F. Glaw, M. Vences, P. Bora, Jan. 2005, Andohahela), FGZC 2523 (F. Glaw, M. Vences, P. Bora, Jan. 2005, Andohahela), FGZC 2524 (F. Glaw, M. Vences, P. Bora, Jan. 2005, Andohahela), FGZC 2525 (F. Glaw, M. Vences, P. Bora, Jan. 2005, Andohahela), FGZC

2526 (F. Glaw, M. Vences, P. Bora, Jan. 2005, Andohahela), FGZC2393 (F. Glaw, M. Vences, P. Bora, Jan. 2005, Andohahela), FGZC2394 (F. Glaw, M. Vences, P. Bora, Jan. 2005, Andohahela).

Distribution. Ivohibe (type locality). According to specimens examined in the field, the species is known from Andohahela. The type locality is Ivohibe summit in South-East Central Madagascar (Pasteur 1964).

Habitat. Mountain, on rocks (observed by Glaw and Vences).

Remark. In the catalogue of the Paris museum, the whole series MNHN 1990.3452-3549 is marked as originating from "Chaines Anosyennes du Massif l'Andringitra" or "Chaines Anosyennes. Massif de l'Andringitra", collected by C. P. Blanc or by the "Mission Betsch-Guillaumet-Blanc". However, we believe that all these specimens originate from the Chaines Anosyennes and not from Andringitra due to an cataloguing error for the following reasons: (1) they are marked as having been collected in November 1971 (some of them more precisely on 21-25 November 1971), which agrees with the dates at which C. P. Blanc had been collecting on the Chaines Anosyennes, as as can be seen in the series of *L. montanus* MNHN 1990.1881-1886, or in numerous series of frogs collected from this massif (e.g., *Mantidactylus spinifer*; Vences & Glaw 2002); (2) C. P. Blanc collected at Andringitra in the period between October 1970 and January 1971, as indicated by specimens of *Lygodactylus pictus* (MNHN 1990.3550-3564) and *L. intermedius* (MNHN 1990.60, MNHN 1990.61, MNHN 1990.62-64, MNHN 1990.65-66, MNHN 1990.67-73, MNHN 1990.74-75, MNHN 1990.76-91, MNHN 1990.92-102, MNHN 1990.103, MNHN 1990.104, MNHN 1990.50).

Variation. There is not a clear difference between the specimes from Ivohibe (Type material) and Chaines Anosyennes. The Ivohibe specimens have two postmental scales asymetricals, and the male with eight preanal pores, versus three postmental scales most of the cases from Chaines Anosyennes, but sometimes we can find specimens with two postmental scales (11 cases). All the characters are common in both cases.

Lygodactylus blanci Pasteur 1967
Lygodactylus blanci Pasteur 1967. - *Name-bearing type*: holotype, MNHN 1966.1003, male with 11 preanal pores.- *Type locality*: "Mont Ibity, en cohabitation avec *L. arnoulti*", according to the original description.- *Other types*: paratypes, six specimens, "dans la série de Ch. BLANC, capturés le 16/v/1964 (n° 69.64 de la collection de l'auteur) et, avec le type, à Noël, 1965 (3.66, 6.66, 9.66, 13.66 et 15.66).", according to the original description. - *Etymology*: Dedicated to Ch. Blanc.

Diagnosis. From other species of the *L. montanus* group, *L. blanci* is distinguished as follows: from *L. montanus* by the presence of the first finger with claw (versus vestigial first finger without claw in *L. montanus*), by the number of three pairs lamellae (versus four in *L. montanus*), by the number of one internasal scales (versus 1-2 in *L. montanus*), by the number of 11 preanal pores in males (versus nine in *L. montanus*).

Description. (1, 2) Big sized specimens. Adults specimens are 22.8-39.2 mm snout-vent length (SVL) (mean ± SD 33.30 ± 4.8 mm, n = 16); (2) tail length 25.6-47.6 mm (mean ± SD 38.4 ± 7.91 mm, n = 7); (3) dorsal scales pseudokeeled (different than *L.mirabilis* group); (4, 5) first finger present with a strong claw; (6) 3-4 pairs lamellae (mean ± s.d. 3.06 ± 0.24, n = 17); (7, 8) tripartite mental scale and sometimes with contact with infralabial scales; (9, 10) three postmental scales (mean ± s.d. 2.88 ± 0.33, n

= 17) usually bisymmetrical; (11) 4-5 postpostmental scales (mean ± s.d. 4.94 ± 0.24, n = 17); (12) five infralabial scales (mean ± s.d. 5.06 ± 0.55, n = 17); (13) 5-7 supralabial scales (mean ± s.d. 6.06 ± 0.65, n = 17); (14) one internasal scale (mean ± s.d. 1.00 ± 0, n = 17); (15) males with 10-12 preanal pores (mean ± s.d. 11.00 ± 0.63, n = 6); (16) tail not verticillated, but sometimes with faintly coloured 11-20 verticilles; (17, 18) 4-5 dorsolateral tubercles, sometimes with 1-4 scales per tubercle; (19) grey-greenish dorsal colouring; (20) dorsal pattern ocelated and sometimes striated; (21) light ventral colouring with some dark spots in throat area, like an irregular striation following the body line; (22) 150-188 dorsal scales along the body; (23) 53-59 dorsal scales around the body. (Fig. 20).

Material examined. MNHN 1990.1892-1900 (C. P. Blanc, Dec. 1965, Mont Ibity), MNHN 1966.1003 (Holotype, C. P. Blanc, Dec. 1965, Mont Ibity), MNHN 1990.3565 (C. P. Blanc and F. Blanc, Dec. 1965, Mont Ibity), MNHN 1990.8 (C. P. Blanc, 16. May 1964, Mont Ibity), MNHN 1990.9-13 (C. P. Blanc, Dec. 1965, Mont Ibity).

Distribution. Mont Ibity north (type locality), 25 km. from Antsirabe.

Habitat. Mountain areas up to 2100 m. Environment with grass and degradated rocks (Blanc & Blanc, 1967).

Remark. Despite of intensive search, M. Vences and D. R. Vieites have not been able to rediscover this species again in the 2000 and 2001 expeditions.
The species occurs on Mont Ibity, in sympatry with *L. arnoulti*, a very common species.

The main differences between both species are: *L. arnoulti* appears to be little smaller (22.8-39.2 mm versus 19.1-36.9 mm in *L. arnoulti* SVL, mean 33.30 versus 30.3 mm respectively); *L*

blanci with pseudokeeled dorsal scales versus granular dorsal scales in *L. arnoulti*; *L. blanci* with 4-5 postpostmental scales versus 5-6 in *L. arnoulti*; *L. blanci* with one internasal scale versus 1-2 in *L. arnoulti*; *L. blanci* with 11 preanal pores and *L. arnoulti* with 9-11, both with strengthened preanal femoral-preanal scales; while *L. arnoulti* has a strong verticillated tail, *L. blanci* has no verticilles; three postmental scales, while two usually appear bisymmetrical in *L. blanci*, in, *L. arnoulty* they are mostly asymmetrical.

They also share some charcaters, like the ocelated dorsal pattern; both have first finger with the claw; three pairs lamellae; tripartite mental scales in both species, and usually contact between mental scale and infralabial in *L. blanci* versus no contact in most cases in *L. arnoulti*; both with 4-6 infralabial scales; 5-7 supralabials; sometimes dorsolateral tubercles in both species.

IV.1.5. - Morphometric and meristic characters

For reexamined specimens from the museum collection as well as for collected specimen in the field we determined 26 morphometric and meristic characters as described in chapter III.2. In Table 3, the mean, standard deviation, maximum, and minimum values for all investigated characters are shown for each species. In order to determine possible dependencies according to sex, these values are given for males and females separately in Table 4.

For the snout-vent length (SVL), one of the two measured morphometric characters, we provide density plots in order to have a better view on the distribution of this character (Figures 25 – 27) (i) among the different *Lygodactylus* lineages, (ii) among species within a lineage, and (iii) among males and females. As can be seen in Table 3 and Figure 23.1, the SVL of most adult *Lygodactylus* specimen varies between approximately 20 and 40 mm, although the smallest SVL value was measured for an adult specimen of *L. mirabilis* with 10.4 mm. Among the four main lineages in *Lygodactylus* differences of the character SVL occur (Figure 24). According to the density plot, SVL for the Oriental and the Meridional lineage are in accordance to each other and both density peaks differ only marginally from each other with 29.2 and 29.5 mm, respectively. However, in the Occidental lineage as well as in the Mountain lineage, a bimodal density curve can be observed with peaks at 23.9 and 31.5 mm as well as at 25.9 and 34.5 mm, respectively. To elucidate this in further detail, we plotted the respective density curves for the four species of the Mountain lineage individually in Figure 25. As can be seen, the bimodal shape of the curves could be resolved. Although the density curves and thus the distribution of SVL is partly overlapping between *L. intermedius* and *L. mirabilis*, the SVL is a discriminative character between *L. mirabilis* and

L. blanci with density curve peaks at 25.4 and 36.1 mm, respectively, and in accordance with the mean values of 24.9 and 33.3 mm as can be seen in Table 3. The distribution of SVL in males and females is not significantly different from each other, as can be seen in Table 4. For instance, Figure 26 shows the distribution of SVL in *L. tuberosus*, for which the highest number of specimens could be investigated. The SVL density curves of males and females are in accordance with each other and peaks are located close to each other with 29.2 mm and 30.1 mm, respectively. This result is in accordance with the estimated mean values for males and females in this species, as can be seen in Table 4 with 27.9 ± 3.8 and 29.0 ± 4.3, respectively.

Table 3. Morphometric measurements (in mm) and meristic characters of Malagasy *Lygodactylus* species (mean ± SD, followed by minimum, maximum values and the number of specimens examined for each species). SVL, snout–vent length; TL, tail length. For SVL and TL only adults were considered.

	SVL (only adults)	**TL (only adults, with entire tails)**	**N° lamellae**	**N° postmental scales**	**N° postpostmental scales**	**N° infralabial scales**	**N° supralabial scales**	**N° internasal scales**	**N° ventral scales**	**N° dorsal scales**	**N° diametral scales**	**N° preanal pores (MALES ONLY)**
L. m. madagascariensis	**30.6** ± 1.99 mm, 26.8-34.5, 32.7 n= 17	**33.37** ± 3.92 mm, 26.6-39.0, 26.6 n= 11	**3.35** ± 0.49, 3-4, 3, n= 17	**2.06** ± 0.24, 2-3, 2, n= 17	**4.35** ± 0.49, 4-5, 4, n= 17	**6.47** ± 0.71, 5-8, 6, n= 17	**6.71** ± 0.84, 5-8, 7, n= 17	**2.12**± 0.69, 1-3, 2, n= 17	**105.25** ± 6.58, 96-117, 96, n= 8	**196.20** ± 13.75, 179-212, 179, n= 5	**91.00** ± 11.31, 83-99, 83, n= 2	**6.60** ± 0.54, 6-7, 7, n= 5
L. m. petteri	**35.1** ± 1.52 mm, 33.2-36.8, 33.2, n= 4	**39.0** ± 0 mm, 39.0-39.0, 39.0, n= 1	**3.43** ± 0.53, 3-4, 3, n= 7	**2.00** ± 0, 2-2, 2, n= 7	**4.00** ± 0, 4-4, 4, n= 7	**6.57** ± 0.53, 6-7, 6, n= 7	**6.57** ± 0.78, 6-8, 6, n= 7	**1.33** ± 0.51, 1-2, 1, n= 6	**97.00** ± 0, 97-97, 97, n= 1	**190.00** ± 0, 190-190, 190, n= 1	**73.00** ± 0, 73-73, 73, n= 1	**7.00** ± 0, 7-7, 7, n= 1
L. miops	**27.9** ± 2.56 mm, 20.5-32.6, 29.0, n= 44	**28.0** ± 4.70 mm, 17.4-36.7, 26.7, n= 23	**3.00** ± 0, 3-3, 3, n= 45	**2.11** ± 0.31, 2-3, 2, n= 45	**4.84** ± 0.56, 4-6, 5, n= 45	**6.29** ± 0.75, 5-8, 6, n= 45	**6.91** ± 0.70, 5-8, 7, n= 45	**2.33** ± 0.60, 1-3, 2, n= 45	**95.82** ± 10.05, 73-113, 96, n= 28	**208.96** ± 20.17, 134-235, 214, n= 23	**90.64** ± 9.82, 70-112, 84, n= 28	**6.30** ± 0.67, 5-7, 6, n= 10
L. guibei	**33.2** ± 3.23 mm, 28.6-38.3, 30.2, n= 15	**40.0** ± 4.10 mm, 31.3-46.5, 41.6, n= 10	**3.13** ± 0.35, 3-4, 3, n= 15	**2.13** ± 0.35, 2-3, 2, n= 15	**4.20** ± 0.56, 4-6, 4, n= 15	**5.80** ± 0.56, 5-7, 6, n= 15	**6.60** ± 0.63, 6-8, 6, n= 15	**1.73** ± 0.45, 1-2, 2, n= 15	**94** ± 0, 94-94, 94, n= 1	**168.00** ± 22.33, 143-186, 143, n= 3	**83.00** ± 4.24, 80-86, 80, n= 2	**6.25** ± 0.50, 6-7, 6, n= 4

L. expectatus	**28.3** ± 1.03 mm, 27.5-29.7, 27.5, n=5	**28.9** ± 5.16 mm, 25.3-29.7, 32.6, n=2	**3.00** ± 0, 3-3, 3, n= 8	**2.00** ± 0, 2-2, 2, n= 8	**4.00** ± 0, 4-4, 4, n= 8	**5.38** ± 0.51, 5-6, 5, n= 8	**6.00** ± 0.53, 5-7, 6, n= 8	**1.13** ± 0.35, 1-2, 1, n= 8	No data	**129.00** ± 22.66, 113-145, 113, n= 2	**60.00** ± 4.24, 57-63, 57, n= 2	**6.33** ± 0.57, 6-7, 6, n= 3
L. rarus	**34.0** ± 2.45 mm, 31.6-36.5, 31.6, n= 3	**37.9** ± 6.12 mm, 31.5-43.7, 31.5, n= 3	**3.20** ± 0.44, 3-4, 3, n= 5	**2.00** ± 0, 2-2, 2, n= 5	**4.20** ± 0.44, 4-5, 4, n= 5	**5.80** ± 0.44, 5-6, 6, n= 5	**6.80** ± 0.83, 6-8, 6, n= 5	**2.00** ± 1.00, 1-3, 1, n= 5	**107.50** ± 12.02, 99-116, 99, n= 2	**174.00** ± 9.89, 167-181, 167, n= 2	**80.00** ± 9.89, 73-87, 99, n= 2	**7.00** ± 0, 7-7, 7, n= 2
L. pictus	**31.34** ± 5.87 mm, 11.9-37.7, 32.5 n = 40	**37.0** ± 6.7 mm, 26.7-52.5, 26.7 n = 15	**3.38** ± 0.49, 3-4, 3, n = 45	**2.24** ± 0.48, 1-3, 2, n = 45	**4.67** ± 0.52, 3-5, 5, n = 45	**5.44** ± 0.58, 4-6, 6, n = 45	**6.40** ± 0.65, 5-8, 6, n = 45	**1.67** ± 0.56, 1-3, 2, n = 45	No data	**175.67** ± 24.95, 143-200, 134, n = 6	**74.17** ± 17.39, 41-87, 41, n = 6	**7.06** ± 0.44, 6-8, 7, n = 16
L. tuberosus	**28.4** ± 4.07 mm, 12.7-38.2, 29.5, n = 225	**29.9** ± 5.05 mm, 8.6-43.0, 33.7, n = 94	**3.01** ± 0.14, 3-5, 3, n = 228	**2.02** ± 0.21, 1-3, 2, n = 230	**4.66** ± 0.63, 3-7, 5, n = 230	**5.64** ± 0.58, 4-8, 6, n = 230	**6.70** ± 0.76, 5-9, 7, n = 230	**1.30** ± 0.47, 0-2, 1, n = 230	**88.00** ± 1.41, 87-89, 87, n = 2	**143.00** ± 0, 143-143, 143, n = 1	**80.00** ± 0, 80-80, 80, n = 1	**6.85** ± 1.14, 1-9, 7, n = 126
***L. sp. nov.* Manantanteli**	**23.6** ± 0 mm, 23.6-23.6, 23.6, n = 1	No data	**4.00** ± 0, 4-4, 4, n = 1	**2.00** ± 0, 2-2, 2, n = 1	**5.00** ± 0, 5-5, 5, n = 1	**7.00** ± 0, 7-7, 7, n = 1	**7.00** ± 0, 7-7, 7, n = 1	**2.00** ± 0, 2-2, 2, n = 1	No data	**185.00** ± 0, 185-185, 185, n = 1	**88.00** ± 0, 88-88, 88, n = 3	**6.00** ± 0, 6-6, 6, n = 1
L. bivittis	**30.6** ± 2.21 mm, 28.3 - 36.1, 29.7, n = 10	**35.26** ± 5.60 mm, 28.3 - 41.5, 28.3, n = 5	**4.83** ± 1.11, 3-6, 5, n = 12	**2.42** ± 0.51, 2-3, 2, n = 12	**4.50** ± 0.52, 4-5, 4, n = 12	**6.58** ± 1.24, 5-9, 7, n = 12	**6.58** ± 0.79, 5-8, 7, n = 12	**1.58** ± 0.66, 1-3, 1, n = 12	**83.67** ± 4.93, 78-87, 78, n = 3	**165.00** ± 0, 165-165, 165, n = 1	**84.33** ± 0.08, 75-89, 89, n = 3	**8.67** ± 0.57, 8-9, 9, n = 3

L. verticillatus	**22.8** ± 3.02 mm, 11.2-34.2, 23.3 n = 169	**20.8** ± 3.42 mm, 12.2-31.3, 23.8 n = 38	**3.00** ± 0, 3-3, 3, n = 189	**2.99** ± 0.10, 2-3, 3, n = 189	**5.09** ± 0.39, 4-7, 5, n = 189	**5.06** ± 0.50, 4-7, 5, n = 189	**5.71** ± 0.84, 5-7, 6, n = 189	**1.26** ± 0.47, 1-3, 1, n = 189	**67.00** ± 0, 67-67, 67, n = 1	**134.50** ± 9.19, 128-141, 128, n = 2	**69.50** ± 16.26, 58-81, 58, n = 2	**8.86** ± 0.68, 6-10, 9, n = 98
L. arnoulti	**30.0** ± 4.00 mm, 19.1-36.9, 26.5, n = 51	**27.23** ± 5.9 mm, 14.8-35.9, 14.8, n = 12	**3.00** ± 0, 3-3, 3, n = 54	**3.00** ± 0, 3-3, 3, n = 54	**5.41** ± 0.59, 5-7, 5, n = 54	**4.87** ± 0.55, 4-6, 5, n = 54	**5.76** ± 0.51, 4-7, 6, n = 54	**1.46** ± 0.53, 1-3, 1, n = 54	No data	**182.00** ± 0, 182-182, 182, n = 1	**75.00** ± 0, 75-75, 75, n = 1	**9.71** ± 0.84, 9-11, 9, n = 21
L. blancae	**30.3** ± 3.65 mm, 24.3-35.0, 31.8, n = 12	**27.0** ± 6.10 mm, 20.2-31.9, 20.2, n = 3	**3.00** ± 0, 3-3, 3, n = 14	**3.07** ± 0.47, 2-4, 3, n = 14	**5.21** ± 0.69, 4-7, 5, n = 14	**5.43** ± 0.64, 4-6, 6, n = 14	**6.00** ± 0.87, 4-7, 6, n = 14	**1.79** ± 0.80, 1-3, 1, n = 14	No data	No data	No data	**10.20** ± 0.83, 9-11, 10, n = 5
L. decaryi	**25.1** ± 2.52 mm, 22.2-26.8, 22.2, n = 3	No data	**3.00** ± 0, 3-3, 3, n = 3	**3.00** ± 0, 3-3, 3, n = 3	**5.00** ± 0, 5-5, 5, n = 3	**4.67** ± 0.57, 4-5, 5, n = 3	**5.33** ± 0.57, 5-6, 6, n = 3	**1.33** ± 0.57, 1-2, 1, n = 3	No data	**190.00** ± 0, 190-190, 90, n = 1	**60.00** ± 0, 60-60, 60, n = 1	**15.00** ± 0, 15-15, 15, n = 1
L. heterurus heterurus	**24.6** ± 0 mm, 24.6-24.6, 24.6, n = 1	No data	**3.00** ± 0, 3-3, 3, n = 1	**3.00** ± 0, 3-3, 3, n = 1	**5.00** ± 0, 5-5, 5, n = 1	**5.00** ± 0, 5-5, 5, n = 1	**6.00** ± 0, 6-6, 6, n = 1	**3.00** ± 0, 3-3, 3, n = 1	No data	No data	No data	No data
L. heterurus trilineigularis	**24.8** ± 1.50 mm, 22.9-27.5, 22.9, n = 7	**24.2** ± 1.38 mm, 22.9-26.0, 22.9, n = 4	**3.00** ± 0, 3-3, 3, n = 7	**3.00** ± 0, 3-3, 3, n = 7	**5.14**± 0.38, 5-6, 5, n = 7	**5.00** ± 0, 5-5, 5, n = 7	**6.14** ± 0.37, 6-7, 6, n = 7	**1.71** ± 0.48, 1-2, 2, n = 7	**90.00** ± 0, 90-90, 90, n = 1	**179.20** ± 11.43, 160-190, 160, n = 5	**73.60** ± 32.50, 17-99, 99, n = 5	**9.75** ± 0.95, 9-11, 10, n = 4

L. klemmeri	**24.5** ± 0.54 mm, 23.9-25.2, 23.9, n = 4	**22.0** ± 0 mm, 22.0-22.0, 22.0, n = 1	**3.00** ± 0, 3-3, 3, n = 4	**3.00** ± 0, 3-3, 3, n = 4	**5.50** ± 0.57, 5-6, 5, n = 4	**5.75** ± 0.95, 5-7, 5, n = 4	**6.75** ± 0.50, 6-7, 6, n = 4	**1.00** ± 0, 1-1, 1, n = 5	No data	No data	No data	**9.00** ± 0, 9-9, 9, n = 1
L. tolampyae	**28.0** ± 0.36 mm, 20.5-35.0, 24.2 n = 29	**29.4** ± 3.31 mm, 24.1-34.0, 24.1 n = 15	**3.00** ± 0, 3-3, 3, n = 29	**2.89** ± 0.31, 2-3, 3, n = 28	**5.00** ± 0.27, 4-6, 5, n = 28	**5.79** ± 0.56, 5-7, 6, n = 28	**6.39** ± 0.56, 5-7, 6, n = 28	**2.25** ± 0.70, 1-3, 2, n = 28	**101.75** ± 4.40, 98-112, 100, n = 8	**227.60** ± 38.76, 200-296, 200, n = 5	**98.38** ± 4.43, 90-104, 98, n = 8	**6.60** ± 0.96, 6-9, 6, n = 10
L.ornatus	**27.7** ± 0 mm, 27.7-27.7, 27.7 n = 1	No data	**3.00** ± 0, 3-3, 3, n = 1	**3.00** ± 0, 3-3, 3, n = 1	**5.00** ± 0, 5-5, 5, n = 1	**4.00** ± 0, 4-4, 4, n = 1	**4.00** ± 0, 4-4, 4, n = 1	**1.00** ± 0, 1-1, 1, n = 1	No data	**184.00** ± 0, 184-18, 184, n = 1	**60.00** ± 0, 60-60, 60, n = 1	**11.00** ± 0, 11-11, 11, n = 1
L. praecox (no adults examined)	**12.0** ± 3.46 mm, 9.6-14.5, 9.6, n = 2	No data	**3.00** ± 0, 3-3, 3, n = 2	**3.00** ± 0, 3-3, 3, n = 2	**4.50** ± 0.70, 5-6, 5, n = 2	**5.50** ± 0.70, 5-6, 5, n = 2	**5.50** ± 0.70, 5-6, 5, n = 2	**1.50** ± 0.70, 1-2, 1, n = 2	No data	**186.50** ± 2.12, 185-188, 185, n = 2	**65.50** ± 4.94, 62-69, 62, n = 2	No data
L. pauliani	**33.32** ± 2.58 mm, 27.9-35.7, 27.9, n= 7	**34.3** ± 0.28 mm, 34.1-34.5, 34.1, n = 2	**3.14** ± 0.37, 3-4, 3, n = 7	**3.00** ± 0, 3-3, 3, n = 7	**5.29** ± 0.48, 5-6, 5, n = 7	**5.29** ± 0.48, 5-6, 5, n = 7	**6.29** ± 0.48, 6-7, 6, n = 7	**1.00** ± 0, 1-1, 1, n = 7	No data	**192.50** ± 3.53, 190-195, 190, n = 2	**64.00** ± 1.41, 63-65, 63, n = 2	No data
L. mirabilis	**24.9** ± 2.9 mm, 10.4-29.3, 22.9 n = 39	**28.1** ± 7.10 mm, 19.9-39.0, 19.9 n = 6	**3.07** ± 0.25, 3-4, 3, n = 73	**2.97** ± 0.37, 2-4, 3, n = 73	**5.42** ± 0.70, 5-8, 5, n = 73	**4.84** ± 0.68, 4-7, 5, n = 73	**5.44** ± 0.62, 4-7, 5, n = 72	**1.15** ± 0.36, 1-2, 1, n = 72	**72.67** ± 2.51, 70-75, 70, n = 3	**113.67** ± 13.31, 99-125, 99, n = 3	**46.33** ± 8.50, 40-56, 40, n = 3	**7.17** ± 0.38, 7-8, 7, n = 24

L. intermedius	**27.5** ± 2.63 mm, 21.2-30.9, 21.2, n = 12	**30.7** ± 4.95 mm, 26.5-35.6, 26.5, n = 4	**3.73** ± 0.45, 3-4, 4, n = 52	**2.98** ± 0.13, 2-3, 3, n = 56	**5.13** ± 0.33, 5-6, 5, n = 55	**4.93** ± 0.62, 3-6, 5, n = 56	**5.22** ± 0.65, 4-7, 5, n = 55	**1.31** ± 0.50, 1-3, 1, n = 56	No data	No data	No data	**7.00** ± 0, 7-7, 7, n = 4
L. montanus	**33.6** ± 3.36 mm, 13.1-37.5, 34.8 n = 107	**38.4** ± 4.39 mm, 29.2-49.1, 36.9 n = 35	**3.94** ± 0.24, 3-4, 4, n = 125	**2.86** ± 0.35, 2-3, 3, n = 125	**4.94** ± 0.44, 3-7, 5, n = 125	**5.46** ± 0.68, 3-7, 5, n = 125	**6.03** ± 0.74, 4-8, 6, n = 125	**1.31** ± 0.46, 1-2, 1, n = 125	No data	**145.50** ± 6.90, 138-158, 138, n = 8	**66.38** ± 3.54, 61-72, 66, n = 8	**8.68** ± 0.65, 8-11, 9, n = 40
L. blanci	**33.3** ± 4.8 mm, 22.8-39.2, 22.8 n = 16	**38.4** ± 7.91 mm, 25.6-47.6, 25.6 n = 7	**3.06** ± 0.24, 3-4, 3, n = 17	**2.88** ± 0.33, 2-3, 3, n = 17	**4.94** ± 0.24, 4-5, 5, n = 17	**5.06** ± 0.55, 4-6, 5, n = 17	**6.06** ± 0.65, 5-7, 6, n = 17	**1.00** ± 0, 1-1, 1, n = 17	No data	**56.00** ± 4.24, 53-59, 53, n = 2	**11.00** ± 0.63, 10-12, 11, n = 6	**11.00** ± 0.63, 10-12, 11, n = 6

Table 4. Morphometric measurements (in mm) and meristic characters of Malagasy *Lygodactylus* species (mean ± SD, followed by minimum and maximum values). SVL, snout–vent length; TL, tail length. Only adults were considered separated by sex.

Oriental lineage. *Lygodactylus madagascariensis* group:

	SVL (only adults)	**TL (only adults, with entire tails)**	**N° lamellae**	**N° postmental scales**	**N° postpostmental scales**	**N° infralabial scales**	**N° supralabial scales**	**N° internasal scales**	**N° ventral scales**	**N° dorsal scales**	**N° diametral scales**	**N° preanal pores (only MALES)**
***L. m. madagascariensis* (MALES)**	**30.7** ± 1.70 mm, 28.2-32.7, 28.2, n = 5	**32.76** ± 6.00 mm, 26.6-38.6, 26.6, n = 5	**3.40** ± 0.54, 3-4, 3, n = 5	**2.00** ± 0, 2-2, 2, n = 5	**4.00** ± 0, 4-4, 4, n = 5	**6.40** ± 0.54, 6-7, 6, n = 5	**7.00** ± 0.70, 6-8, 7, n = 5	**2.20** ± 0.44, 2-3, 2, n = 5	**109.5** ± 10.60, 102-117, 102, n = 2	**188.0** ± 0, 188-188, 188, n = 1	94.00 ± 7.07, 89-99, 89, n = 2	6.60 ± 0.54, 6-7, 7, n = 5
***L. m. madagascariensis* (FEMALES)**	**30.5** ± 2.17 mm, 26.8-34.5, 26.8 n = 12	**33.6** ± 3.38 mm, 28.7-39.0, 28.7 n = 8	**3.33** ± 0.49, 3-4, 3, n = 12	**2.08** ± 0.28, 2-3, 2, n = 12	**4.50** ± 0.52, 4-5, 4, n = 12	**6.50** ± 0.79, 5-8, 6, n = 12	**6.58** ± 0.90, 5-8, 6, n = 12	**2.08** ± 0.79, 1-3, 2, n = 12	**103.83** ± 5.34, 96-111, 96, n = 6	**198.25** ± 13.48, 179-212, 179, n = 4	83.00 ± 0, 83-83, 83, n = 1	
***L. m. petteri* (MALES)**	**33.2** ± 0 mm, 33.2-33.2, 33.2, n = 1	No data	**4.00** ± 0, 4-4, 4, n = 1	**2.00** ± 0, 2-2, 2, n = 1	**4.00** ± 0, 4-4, 4, n = 1	**7.00** ± 0, 7-7, 7, n = 1	**6.00** ± 0, 6-6, 6, n = 1	**1.00** ± 0, 1-1, 1, n = 1	No data	No data	No data	7.00 ± 0, 7-7, 7, n = 1
***L. m. petteri* (FEMALES)**	**35.8** ± 0.9 mm, 35.0-36.8, 35.0, n = 3	**39.0** ± 0 mm, 39.0-39.0, 39.0, n= 1	**3.67** ± 0.57, 3-4, 4, n = 3	**2.00** ± 0, 2-2, 2, n = 3	**4.00** ± 0, 4-4, 4, n = 3	**6.33** ± 0.57, 6-7, 6, n = 3	**6.00** ± 0, 6-6, 6, n = 3	**1.33** ± 0.57, 1-2, 1, n = 3	**97.00** ± 0, 97-97, 97, n = 1	**190.00** ± 0, 190-190, 190, n = 1	73.00 ± 0, 73-73, 73, n = 1	
***L. miops* (MALES)**	**26.2** ± 2.61 mm, 20.5-29.6, 26.4, n = 12	**27.8** ± 3.15 mm, 23.6-32.6, 23.6, n = 6	**3.00** ± 0, 3-3, 3, n = 12	**2.08** ± 0.28, 2-3, 2, n = 12	**4.67** ± 0.49, 4-5, 5, n = 12	**6.17** ± 0.71, 5-7, 6, n = 12	**6.83** ± 0.83, 5-8, 7, n = 12	**2.25** ± 0.62, 1-3, 2, n = 10	**94.13** ± 12.24, 74-112, 97, n = 8	**164.50** ± 33.24, 134-227, 134, n = 6	**88.88** ± 11.92, 70-112, 84, n = 8	**6.30** ± 0.67, 5-7, 6, n = 10
***L. miops* (FEMALES)**	**28.6** ± 2.25 mm, 23.3-32.6, 29.0, n = 32	**28.0** ± 5.22 mm, 17.4-36.7, 32.2, n = 17	**3.00** ± 0, 3-3, 3, n = 32	**2.13** ± 0.33, 2-3, 2, n = 32	**4.91** ± 0.58, 4-6, 5, n = 32	**6.34** ± 0.78, 5-8, 6, n = 32	**6.91** ± 0.64, 6-8, 7, n = 32	**2.34** ± 0.60, 1-3, 2, n = 32	**96.50** ± 9.31, 73-113, 96, n = 20	**212.53** ± 12.73, 180-235, 208, n = 17	91.35 ± 9.11, 73-106, 85, n = 20	

***L. guibei* (MALES)**	**31.26** ± 2.11 mm, 29.1-34.7, 29.1, n = 5	**37.0** ± 1.06 mm, 36.3-37.8, 37.0, n = 2	**3.20** ± 0.44, 3-4, 3, n = 5	**2.20** ± 0.44, 2-3, 2, n = 5	**4.20** ± 0.44, 4-5, 4, n = 5	**6.00** ± 0.70, 5-7, 6, n = 5	**6.20** ± 0.44, 6-7, 6, n = 5	**1.40** ± 0.54, 1-2, 1, n = 5	No data	**175.00** ± 0, 175-175, 175, n = 1	**86** ± 0, 86-86, 86, n = 1	**6.20** ± 0.44, 6-7, 6, n = 5
***L. guibei* (FEMALES)**	**34.1** ± 3.30 mm, 28.6-38.3, 37.2, n = 10	**40.7** ± 4.28 mm, 31.3-46.5, 41.6, n = 8	**3.10** ± 0.31, 3-4, 3, n = 10	**2.10** ± 0.31, 2-3, 2, n = 10	**4.20** ± 0.63, 4-6, 4, n = 10	**5.70** ± 0.48, 5-6, 6, n = 10	**6.80** ± 0.63, 6-8, 7, n = 10	**1.90** ± 0.31, 1-2, 2, n = 10	**94** ± 0, 94-94, 94, n = 1	**164.50** ± 30.40, 143-186, 143, n = 2	**80.00** ± 0, 80-80, 80, n = 1	
***L. expectatus* (MALES)**	**28.8** ± 1.15 mm, 27.5-29.7, 27.5, n = 3	**32.6** ± 0 mm, 32.6-32.6, 32.6, n = 1	**3.00** ± 0, 3-3, 3, n = 3	**2.00** ± 0, 2-2, 2, n = 3	**4.00** ± 0, 4-4, 4, n = 3	**5.33** ± 0.57, 5-6, 5, n = 3	**6.00** ± 1.00, 5-7, 5, n = 3	**1.00** ± 0, 1-1, 1, n = 3	No data	**129.00** ± 22.62, 113-145, 113, n = 2	60 ± 4.24, 57-63, 57, n = 2	6.33 ± 0.57, 6-7, 6, n = 3
***L. expectatus* (FEMALES)**	**27.6** ± 0.21 mm, 27.5-27.8, 27.5, n = 2	**25.3** ± 0 mm, 25.3-25.3, 25.3, n = 1	**3.00** ± 0, 3-3, 3, n = 2	**2.00** ± 0, 2-2, 2, n = 2	**4.00** ± 0, 4-4, 4, n = 2	**5.50** ± 0.70, 5-6, 5, n = 2	**6.00** ± 0, 6-6, 6, n = 2	**1.50** ± 0.70, 1-2, 1, n = 2	No data	No data	No data	
***L. rarus* (MALES)**	**35.2** ± 1.83 mm, 33.9-36.5, 33.9, n = 2	**41.1** ± 3.67 mm, 38.5-43.7, 38.5, n = 2	**3.50** ± 0.70, 3-4, 3, n = 2	**2.00** ± 0, 2-2, 2, n = 2	**4.50** ± 0.70, 4-5, 4, n = 2	**6.00** ± 0, 6-6, 6, n = 2	**7.50** ± 0.70, 7-8, 7, n = 2	**1.50** ± 0.701-2, 1, n = 2	**107.50** ± 12.02, 99-116, 99, n = 2	**174.00** ± 9.89, 167-181, 167, n = 2	80.00 ± 9.89, 73-87, 99, n = 2	7.00 ± 0, 7-7, 7, n = 2
***L. rarus* (FEMALES)**	**31.6** ± 0 mm, 31.6-31.6, 33.9, n = 1	**31.5** ± 0 mm, 31.5-31.5, 31.5, n = 1	**3.00** ± 0, 3-3, 3, n = 0	**2.00** ± 0, 2-2, 2, n = 1	**4.00** ± 0, 4-4, 4, n = 1	**6.00** ± 0, 6-6, 6, n = 1	**6.00** ± 0, 6-6, 6, n = 1	**3.00** ± 0, 3-3, 3, n = 2	No data	No data	No data	

Meridional lineage. *Lygodactylus pictus* group and *Lygodactylus bivittis* group:

Characters mean, ± SD, min.-Max., Modal, n (MALES)	**SVL (mm)**	**TL (only adults, with entire tails)**	**N° lamellae**	**N° postmental scales**	**N° postpostmental scales**	**N° infralabial scales**	**N° supralabial scales**	**N° internasal scales**	**N° ventral scales**	**N° dorsal scales**	**N° diametral scales**	**N° preanal pores**
***L. pictus* (MALES)**	**32.1** ± 5.68 mm, 15.5-37.7, 33.1, n = 17	**38.2** ± 8.92 mm, 26.7-52.5, 26.7, n = 7	**3.18** ± 0.39, 3-4, 3, n = 17	**2.12** ± 0.48, 1-3, 2, n = 17	**4.59** ± 0.61, 3-5, 5, n = 17	**5.41** ± 0.61, 4-6, 5, n = 17	**6.41** ± 0.71, 5-8, 6, n = 17	**1.59** ± 0.50, 1-2, 2, n = 17	No data	**196.00** ± 0, 196-196, 196, n = 1	**81.00** ± 0, 81-81, 81, n = 1	**7.06** ± 0.44, 6-8, 7, n = 16
***L. pictus* (FEMALES)**	**30.76** ± 6.07 mm, 11.9-36.9, 33.4 n = 23	**35.9** ± 4.33 mm, 28.3-42.7, 35.9 n = 8	**3.52** ± 0.51, 3-4, 4, n = 23	**2.30** ± 0.47, 2-3, 2, n = 23	**4.70** ± 0.47, 4-5, 5, n = 23	**5.48** ± 0.59, 4-6, 6, n = 23	**6.43** ± 0.66, 5-8, 6, n = 23	**1.70** ± 0.63, 1-3, 2, n = 23	No data	**171.60** ± 25.57, 134-200, 134, n = 5	**72.80** ± 19.08, 41-87, 41, n = 5	
***L. tuberosus* (MALES)**	**27.9** ± 3.75 mm, 12.7-38.2, 29.5, n = 126	**30.32** ± 5.46 mm, 8.6-43.0, 33.7, n = 69	**3.00** ± 0, 3-3, 3, n = 126	**2.04** ± 0.23, 1-3, 2, n = 126	**4.67** ± 0.64, 3-6, 5, n = 126	**5.66** ± 0.58, 4-7, 6, n = 126	**6.70** ± 0.75, 5-8, 7, n = 126	**1.28** ± 0.48, 0-2, 1, n = 126	No data	No data	No data	**6.85** ± 1.14, 1-9, 7, n = 126
***L. tuberosus* (FEMALES)**	**29.0** ± 4.32 mm, 13.0-35.6, 33.1, n = 99	**29.0** ± 3.62 mm, 17.3-33.7, 31.2, n = 25	**3.03** ± 0.22, 3-5, 3, n = 97	**2.00** ± 0.20, 1-3, 2, n = 99	**4.62** ± 0.62, 3-7, 5, n = 99	**5.64** ± 0.59, 5-8, 6, n = 99	**6.69** ± 0.79, 5-9, 7, n = 99	**1.31** ± 0.46, 1-2, 1, n = 99	**88.00** ± 1.41, 87-89, 87, n = 2	**143.00** ± 0, 143-143, 143, n = 1	**80.00** ± 0, 80-80, 80, n = 1	
***L. sp. nov.* (MALES)**	**23.6** ± 0 mm, 23.6-23.6, 23.6, n = 1	No data	**4.00** ± 0, 4-4, 4, n = 1	**2.00** ± 0, 2-2, 2, n = 1	**5.00** ± 0, 5-5, 5, n = 1	**7.00** ± 0, 7-7, 7, n = 1	**7.00** ± 0, 7-7, 7, n = 1	**2.00** ± 0, 2-2, 2, n = 1	No data	**185.00** ± 0, 185-185, 185, n = 1	**88.00** ± 0, 88-88, 88, n = 3	**6.00** ± 0, 6-6, 6, n = 1
***L. sp. nov.* (FEMALES)**	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
***L. bivittis* (MALES)**	**30.8** ± 1.06 mm, 29.7-31.8, 29.7, n = 3	**36.9** ± 0 mm, 36.9-36.9, 36.9, n = 1	**6.00** ± 0, 6-6, 6, n = 3	**3.00** ± 0, 3-3, 3, n = 3	**4.33** ± 0.57, 4-5, 4, n = 3	**6.67** ± 0, 6-7, 7, n = 3	**6.00** ± 1.00, 5-7, 5, n = 3	**2.00** ± 0, 2-2, 2, n = 3	**82.00** ± 5.65, 78-86, 78, n = 2	**165.00** ± 0, 165-165, 165, n = 1	**82.00** ± 9.8, 75-89, 75, n = 2	**8.67** ± 0.57, 8-9, 9, n = 3

L. bivittis **(FEMALES)**	**30.5** ± 2.63 mm, 28.3-36.1, 28.3, n = 7	**34.8** ± 6.38 mm, 28.3-41.5, 28.3, n = 4	**4.71** ± 0.95, 3-6, 5, n = 7	**2.29** ± 0.48, 2-3, 2, n = 7	**4.57** ± 0.53, 4-5, 5, n = 7	**7.00** ± 1.29, 5-9, 7, n = 7	**7.00** ± 0.57, 6-8, 7, n = 7	**1.43** ± 0.78, 1-3, 1, n = 7	**87.00** ± 0, 87-87, 87, n = 1	No data	**89.00** ± 0, 89-89, 89, n = 1	

Occidental lineage. *Lygodactyls verticillatus* group, *L. tolampyae* group, *L. ornatus* group, *L. pauliani* group.

Characters mean, ± SD, min.-Max., Modal, n	**SVL (mm)**	**TL (only adults, with entire tails)**	**N° lamellae**	**N° postmental scales**	**N° postpostmental scales**	**N° infralabial scales**	**N° supralabial scales**	**N° internasal scales**	**N° ventral scales**	**N° dorsal scales**	**N° diametral scales**	**N° preanal pores**
***L. verticillatus* (MALES)**	**22.8** ± 2.93 mm, 11.2-34.2, 22.9, n = 100	**20.9** ± 2.87 mm, 15.8-24.1, 16.6, n = 19	**3.00** ± 0, 3-3, 3, n = 101	**2.99** ± 0.10, 2-3, 3, n = 101	**5.11** ± 0.39, 5-7, 5, n = 101	**5.14** ± 0.47, 4-6, 5, n = 100	**5.70** ± 0.52, 5-7, 6, n = 100	**1.18** ± 0.43, 1-3, 1, n = 100	No data	No data	No data	**8.86** ± 0.68, 6-10, 9, n = 98
***L. verticillatus* (FEMALES)**	**22.7** ± 3.17 mm, 11.4-27.5, 23.6 n = 69	**20.7** ± 3.97 mm, 12.2-31.3, 20.1 n = 19	**3.00** ± 0, 3-3, 3, n = 69	**2.99** ± 0.12, 2-3, 3, n = 69	**5.04** ± 0.40, 4-7, 5, n = 69	**4.99** ± 0.50, 4-7, 5, n = 69	**5.74** ± 0.66, 5-7, 6, n = 69	**1.32** ± 0.50, 1-3, 1, n = 69	**67.00** ± 0, 67-67, 67, n = 1	**134.50** ± 9.19, 128-141, 128, n = 2	**69.50** ± 16.26, 58-81, 58, n = 2	
***L. arnoulti* (MALES)**	**31.0** ± 2.13 mm, 26.5-34.1, 31.7, n = 22	**31.3** ± 4.23 mm, 27.5-35.9, 27.5, n = 3	**3.00** ± 0, 3-3, 3, n = 22	**3.00** ± 0, 3-3, 3, n = 22	**5.55** ± 0.67, 5-7, 5, n = 22	**4.82** ± 0.58, 4-6, 5, n = 22	**5.77** ± 0.42, 5-6, 6, n = 22	**1.41** ± 0.50, 1-2, 1, n = 22	No data	**182.00** ± 0, 182-182, 182, n = 1	**75.00** ± 0, 75-75, 75, n = 1	**9.73** ± 0.82, 9-11, 9, n = 22
***L. arnoulti* (FEMALES)**	**29.2** ± 4.87 mm, 19.1-36.9, 30.1, n = 29	**25.8**± 6.02 mm, 14.8-33.9, 14.8, n = 9	**3.00** ± 0, 3-3, 3, n = 29	**3.00** ± 0, 3-3, 3, n = 29	**5.28** ± 0.45, 5-6, 5, n = 29	**4.86** ± 0.44, 4-6, 5, n = 29	**5.79** ± 0.49, 5-7, 6, n = 29	**1.45** ± 057, 1-3, 1, n = 29	No data	No data	No data	
***L. blancae* (MALES)**	**31.9** ± 3.12 mm, 26.5-35.0, 26.5, n = 6	**29.1** ± 0 mm, 29.1-29.1, 29.1, n = 1	**3.00** ± 0, 3-3, 3, n = 6	**3.00** ± 0.63, 2-4, 3, n = 6	**5.00** ± 0.63, 4-6, 5, n = 6	**5.33** ± 0.51, 5-6, 5, n = 6	**6.17** ± 0.75, 5-7, 6, n = 6	**1.67** ± 0.81, 1-3, 1, n = 6	No data	No data	No data	**10.20** ± 0.83, 9-11, 10, n = 5

***L. blancae* (FEMALES)**	**28.8** ± 3.72 mm, 24.3-33.7, 24.3, n = 6	**26.0** ± 8.27 mm, 20.2-31.9, 20.2, n = 2	**3.00** ± 0, 3-3, 3, n = 6	**3.17** ± 0.40, 3-4, 3, n = 6	**5.50** ± 0.83, 5-7, 5, n = 6	**5.50** ± 0.83, 4-6, 6, n = 6	**5.83** ± 0.98, 4-7, 6, n = 6	**2.00** ± 0.89, 1-3, 1, n = 6	No data	No data	No data	
***L. decaryi* (MALES)**	**26.8** ± 0 mm, 26.8-26.8, 26.8, n = 1	No data	**3.00** ± 0, 3-3, 3, n = 1	**3.00** ± 0, 3-3, 3, n = 1	**5.00** ± 0, 5-5, 5, n = 1	**5.00** ± 0, 5-5, 5, n = 1	**6.00** ± 0, 6-6, 6, n = 1	**2.00** ± 0, 2-2, 2, n = 1	No data	No data	No data	**15.00** ± 0, 15-15, 15, n = 1
***L. decaryi* (FEMALES)**	**24.2** ± 2.89 mm, 22.2-26.3, 22.2, n = 2	No data	**3.00** ± 0, 3-3, 3, n = 2	**3.00** ± 0, 3-3, 3, n = 2	**5.00** ± 0, 5-5, 5, n = 2	**4.50** ± 0.70, 4-5, 4, n = 2	**5.00** ± 0, 5-5, 5, n = 2	**1.00** ± 0, 1-1, 1, n = 2	No data	**190.00** ± 0, 190-190, 90, n = 1	**60.00** ± 0, 60-60, 60, n = 1	
***L. heterurus heterurus* (MALES)**	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
***L. heterurus heterurus* (FEMALES)**	**24.6** ± 0 mm, 24.6-24.6, 24.6, n = 1	No data	**3.00** ± 0, 3-3, 3, n = 1	**3.00** ± 0, 3-3, 3, n = 1	**5.00** ± 0, 5-5, 5, n = 1	**5.00** ± 0, 5-5, 5, n = 1	**6.00** ± 0, 6-6, 6, n = 1	**3.00** ± 0, 3-3, 3, n = 1	No data	No data	No data	
***L. heterurus trilineigularis* (MALES)**	**24.72** ± 0.92 mm, 23.6-25.7, 23.6, n = 4	**24.66** ± 1.30 mm, 23.4-26.0, 23.4, n = 3	**3.00** ± 0, 3-3, 3, n = 4	**3.00** ± 0, 3-3, 3, n = 4	**5.25** ± 0.50, 5-6, 5, n = 4	**5.00** ± 0, 5-5, 5, n = 4	**6.25** ± 0.50, 6-7, 6, n = 4	**1.75** ± 0.50, 1-2, 2, n = 4	**90.00** ± 0, 90-90, 90, n = 1	**182.00** ± 2.64, 180-185, 180, n = 3	**91.00** ± 0.69, 87-99, 87, n = 3	**9.75** ± 0.95, 9-11, 10, n = 4
***L. heterurus trilineigularis* (FEMALES)**	**24.9** ± 2.33 mm, 22.9-27.5, 27.5, n = 3	**22.9** ± 0 mm, 22.9-22.9, 22.9, n = 1	**3.00** ± 0, 3-3, 3, n = 3	**3.00** ± 0, 3-3, 3, n = 3	**5.00** ± 0, 5-5, 5, n = 3	**5.00** ± 0, 5-5, 5, n = 3	**6.00** ± 0, 6-6, 6, n = 3	**1.67** ± 0.57, 1-2, 2, n = 3	No data	**175.00** ± 21.21, 160-190, 160, n = 2	**82.50** ± 6.36, 78-87, 78, n = 2	

***L. klemmeri* (MALES)**	**25.2** ± 0 mm, 25.2-25.2, 25.2, n = 1	No data	**3.00** ± 0, 3-3, 3, n = 1	**3.00** ± 0, 3-3, 3, n = 1	**5.00** ± 0, 5-5, 5, n = 1	**5.00** ± 0, 5-5, 5, n = 1	**7.00** ± 0, 7-7, 7, n = 1	**1.00** ± 0, 1-1, 1, n = 1	No data	No data	No data	**9.00** ± 0, 9-9, 9, n = 1
***L. klemmeri* (FEMALES)**	**24.2** ± 0.35 mm, 23.9-24.6, 23.9, n = 3	**22.0** ± 0 mm, 22.0-22.0, 22.0, n = 1	**3.00** ± 0, 3-3, 3, n = 3	**3.00** ± 0, 3-3, 3, n = 3	**5.67** ± 0.57, 5-6, 6, n = 3	**6.00** ± 1.00, 5-7, 5, n = 3	**6.67** ± 0.57, 6-7, 7, n = 3	**1.00** ± 0 1-1, 1, n = 3	No data	No data	No data	
***L. tolampyae* (MALES)**	**27.1** ± 3.96 mm, 20.5-31.8, 20.5 n = 10	**30.8** ± 3.51 mm, 24.1-34.0, 24.1 n = 6	**3.00** ± 0, 3-3, 3, n = 10	**3.00** ± 0, 3-3, 3, n = 10	**5.10** ± 0.31, 5-6, 5, n = 10	**5.80** ± 0.63, 5-7, 6, n = 10	**6.50** ± 0.70, 5-7, 7, n = 10	**2.40** ± 0.69, 1-3, 3, n = 10	**103.00** ± 5.24, 99-112, 99, n = 5	**230.75** ± 44.01, 200-296, 200, n = 4	**97.00** ± 4.00, 90-100, 98, n = 5	**6.60** ± 0.96, 6-9, 6, n = 10
***L. tolampyae* (FEMALES)**	**28.5** ± 3.51 mm, 23.0-35.0, 24.2 n = 19	**28.5** ± 3.04 mm, 24.4-33.5, 24.4 n = 9	**3.00** ± 0, 3-3, 3, n = 19	**2.83** ± 0.38, 2-3, 3, n = 18	**4.94** ± 0.23, 4-5, 5, n = 18	**5.78** ± 0.54, 5-7, 6, n = 18	**6.33** ± 0.48, 6-7, 6, n = 18	**2.17** ± 0.70, 1-3, 2, n = 18	**99.67** ± 1.52, 98-101, 98, n = 3	**215.00** ± 0, 215-215, 215, n = 1	**100.67** ± 4.9, 95-104, 95, n = 3	
***L.ornatus* (MALES)**	**27.7** ± 0 mm, 27.7-27.7, 27.7 n = 1	No data	**3.00** ± 0, 3-3, 3, n = 1	**3.00** ± 0, 3-3, 3, n = 1	**5.00** ± 0, 5-5, 5, n = 1	**4.00** ± 0, 4-4, 4, n = 1	**4.00** ± 0, 4-4, 4, n = 1	**1.00** ± 0, 1-1, 1, n = 1	No data	**184.00** ± 0, 184-18, 184, n = 1	**60.00** ± 0, 60-60, 60, n = 1	**11.00** ± 0, 11-11, 11, n = 1
***L.ornatus* (FEMALES)**	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	
***L. pauliani* (MALES)**	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
***L. pauliani* (FEMALES)**	**33.32** ± 2.58 mm, 27.9-35.7, 27.9, n = 7	**34.3** ± 0.28 mm, 34.1-34.5, 34.1, n = 2	**3.14** ± 0.37, 3-4, 3, n = 7	**3.00** ± 0, 3-3, 3, n = 7	**5.29** ± 0.48, 5-6, 5, n = 7	**5.29** ± 0.48, 5-6, 5, n = 7	**6.29** ± 0.48, 6-7, 6, n = 7	**1.00** ± 0, 1-1, 1, n = 7	No data	**192.50** ± 3.53, 190-195, 190, n = 2	**64.00** ± 1.41, 63-65, 63, n = 2	

***L. praecox* (MALES)**	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
***L. praecox* (FEMALES)**	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data	

Mountain lineage. *Lygodactylus mirabilis* group, *Lygodactylus montanus* group:

Characters mean, ± SD, min.-Max., Modal, n (MALES)	**SVL (mm)**	**TL (only adults, with entire tails)**	**N° lamellae**	**N° postmental scales**	**N° postpostmental scales**	**N° infralabial scales**	**N° supralabial scales**	**N° internasal scales**	**N° ventral scales**	**N° dorsal scales**	**N° diametral scales**	**N° preanal pores**
***L. mirabilis* (MALES)**	**24.5** ± 3.4 mm, 10.4-28.2, 22.9, n = 24	**27.5** ± 5.67 mm, 22.7-33.8, 22.7, n = 3	**3.13** ± 0.33, 3-4, 3, n = 24	**2.92** ± 0.50, 2-4, 3, n = 24	**5.67** ± 0.81, 5-8, 5, n = 24	**4.50** ± 0.59, 4-6, 4, n = 24	**5.29** ± 0.62, 4-7, 5, n = 24	**1.17** ± 0.38, 1-2, 1, n = 24	**71.50** ± 2.12, 70-73, 70, n = 2	**112.00** ± 18.38, 99-125, 99, n = 2	**48.00** ± 11.31, 40-56, 40, n = 2	**7.17** ± 0.38, 7-8, 7, n = 24
***L. mirabilis* (FEMALES)**	**16.9** ± 1.62 mm, 22.9-29.3, 25.7 n = 15	**28.6** ± 9.64 mm, 19.9-39.0, 19.9 n = 3	**3.07** ± 0.25, 3-4, 3, n = 15	**3.07** ± 0.25, 3-4, 3, n = 15	**5.47** ± 0.74, 5-7, 5, n = 15	**5.00** ± 0.65, 4-6, 5, n = 15	**5.40** ± 0.63, 4-6, 5, n = 15	**1.20** ± 0.41, 1-2, 1, n = 15	**75.00** ± 0, 75-75, 75, n = 1	**117.00** ± 0, 117-117, 117, n = 1	**43.00** ± 0, 43-43, 43, n = 1	
***L. intermedius* (MALES)**	**27.5** ± 4.21 mm, 21.2-30.9, 21.2, n = 5	**26.5** ± 0 mm, 26.5-26.5, 26.5, n = 1	**3.20** ± 0.44, 3-4, 3, n = 5	**3.00** ± 0, 3-3, 3, n = 5	**5.20** ± 0.44, 5-6, 5, n = 5	**5.00** ± 0.70, 4-6, 5, n = 5	**5.20** ± 0.44, 5-6, 5, n = 5	**1.40** ± 0.54, 1-2, 1, n = 5	No data	No data	No data	**7.00** ± 0, 7-7, 7, n = 4
***L. intermedius* (FEMALES)**	**27.5** ± 1.41 mm, 25.6-30.2, 25.6, n = 7	**32.2** ± 4.96 mm, 26.5-35.6, 26.5, n = 3	**3.00** ± 0, 3-3, 3, n = 7	**3.00** ± 0, 3-3, 3, n = 7	**5.00** ± 0, 5-5, 5, n = 7	**4.86** ± 0.69, 4-6, 5, n = 7	**5.57** ± 0.78, 5-7, 5, n = 7	**1.57** ± 0.78, 1-3, 1, n = 7	No data	No data	No data	
***L. montanus* (MALES)**	**33.3** ± 4.04 mm, 13.1-37.5, 35.2, n = 40	**40.9** ± 4.15 mm, 33.8-49.1, 45.5, n = 13	**3.95** ± 0.22, 3-4, 4, n = 40	**2.85** ± 0.36, 2-3, 3, n = 40	**4.83** ± 0.44, 3-5, 5, n = 40	**5.48** ± 0.81, 3-7, 5, n = 40	**5.83** ± 0.67, 4-7, 6, n = 40	**1.38** ± 0.49, 1-2, 1, n = 40	No data	**144.40** ± 5.36, 139-153, 1, n = 5	**66.20** ± 4.43, 61-72, 61, n = 5	**8.68** ± 0.65, 8-11, 9, n = 40
***L. montanus* (FEMALES)**	**33.8** ± 2.89 mm, 15.4-37.0, 34.8 n = 67	**37.0** ± 3.94 mm, 29.2-43.9, 29.2 n = 22	**3.91** ± 0.28, 3-4, 4, n = 67	**2.84** ± 0.37, 2-3, 3, n = 67	**4.97** ± 0.34, 4-6, 5, n = 67	**5.40** ± 0.60, 4-6, 5, n = 67	**5.96** ± 0.61, 4-7, 6, n = 67	**1.21** ± 0.41, 1-2, 1, n = 67	No data	**147.33** ± 10.06, 138-158, 1, n = 3	**66.67** ± 2.08, 65-69, 1, n = 65	

***L. blanci* (MALES)**	**30.9** ± 6.06 mm, 22.8-38.7, 22.8, n = 6	**39.9** ± 12.39 mm, 25.6-47.6, 25.6, n = 3	**3.00** ± 0, 3-3, 3, n = 6	**2.83** ± 0, 2-3, 3, n = 6	**4.83** ± 0.40, 4-5, 5, n = 6	**5.00** ± 0.63, 4-6, 5, n = 6	**6.00** ± 0.63, 5-7, 6, n = 6	**1.00** ± 0, 1-1, 1, n = 6	No data	**56.00** ± 4.24, 53-59, 53, n = 2	**11.00** ± 0.63, 10-12, 11, n = 6	**11.00** ± 0.63, 10-12, 11, n = 6
***L. blanci* (FEMALES)**	**34.7** ± 3.60 mm, 29.3-39.2, 29.3, n = 10	**37.4** ± 4.40 mm, 31.8-42.2, 31.8, n = 4	**3.10** ± 0.31, 3-4, 3, n = 10	**3.00** ± 0, 3-3, 3, n = 10	**5.00** ± 0, 5-5, 5, n = 10	**5.20** ± 0.42, 5-6, 5, n = 10	**6.20** ± 0.63, 5-7, 6, n = 10	**1.00** ± 0, 1-1, 1, n = 10	No data	No data	No data	

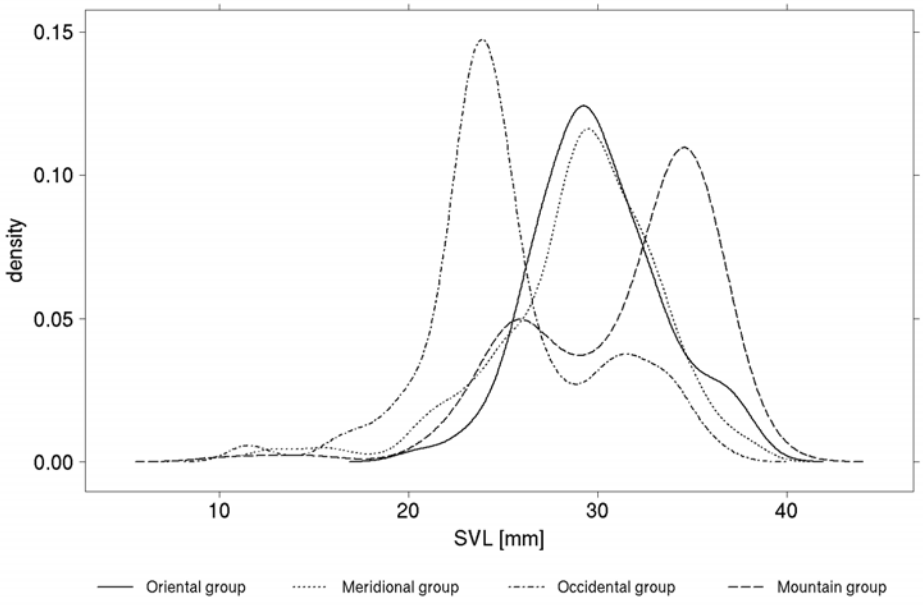


Figure 24. Density plot of SVL (snout-vent length, in mm) of *Lygodactylus* according to the four main lineages (Oriental, Meridional, Occidental and Mountain lineage). Only SVL of measured adult specimen were considered.

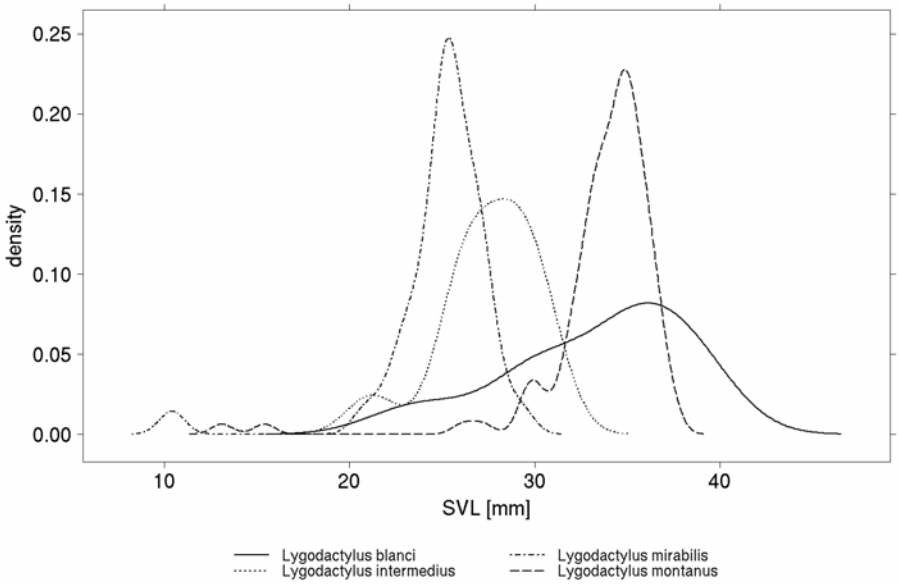


Figure 25. Density plot of SVL (snout-vent length, in mm) of measured adult specimens of the Mountain lineage of *Lygodactylus*. Shown are curves for the four species of this lineage, *L. mirabilis* (39), *L. intermedius* (12), *L. montanus* (107), and *L blanci* (16).

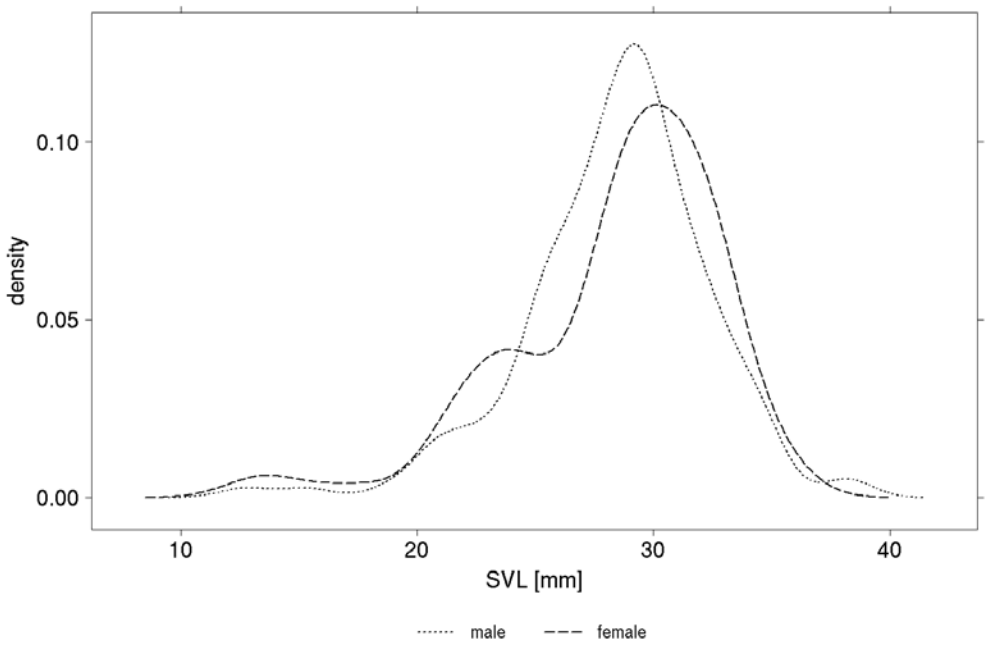


Figure 26. Density plot of SVL (snout-vent length, in mm) of adult males (126) and females (99) of *Lygodactylus tuberosus.*

IV.2. - Identification key

The following key is based on the data examined. It should be kept in mind that exceptions to the described characters can occur. If possible, is useful to examine more than one specimen for determination.

Malagasy *Lygodactylu*s

1.- a) Keeled or pseudokeeled dorsal scales, mountain habitudes (usually habitats up to 2000 m above sea level), 10.4-39.2 mm SVL, distinct dorsal pattern striated or ocelated, divided mental scale and three postmentals, males with 7-12 preanal pores, divided lamellae in fingers……..……**Mountain lineage, I**

b) Granular dorsal scales, 2-3 postmental scales, males with 5-15 preanal pores, habits under 2000 m above sea level…….…….**2**

2.- a) Granular dorsal scales, undivided mental scale with two postmentals, 20.5-38.3 mm SVL, first finger present but without the claw, divided lamellae in fingers, present postanal sacs in males and 5-7 preanal pores, typical habitat, rainforest from the East Madagascar……..……...**Oriental lineage, II**

b) Granular dorsal scales, divided mental scales with 2-3 postmentals, absent postanal sacs in males and with usually 7-15 preanal pores…..……..…..**3**

3.- a) Granular dorsal scales, 11.9-38.2 mm SVL, divided mental scales with two postmentals, males with 6-9 preanal pores,

distributed on dry areas from the South and Central South of Madagascar……...**Meridional lineage, III**

b) Granular dorsal scales, 11.2-35.7 mm SVL, always first finger present bearing the claw, divided lamellae in the fingers, divided mental scale with three postmentals, males with usually 9-15 preanal pores, distributed in the West dry forest of Madagascar ……...…….…**Occidental lineage, IV**

I. - Mountain lineage

1. - a) Keeled dorsal scales, 10.4-30.9 mm SVL, finger I absent or vestigial, never present the claw on the finger I, distinct dorsal pattern, striated or ocelated. Males with 7-8 preanal pores.……***Lygodactylus mirabilis* group 2**

b) Pseudokeeled dorsal scales and always first finger present, 13.1-39.2 mm SVL. Distinct dorsal pattern striated or ocelated, males with 9-12 preanal pores…….……***Lygodactylus montanus* group 3**

***Lygodactylus mirabilis* group**

2.- a) Keeled dorsal scales, absent finger I, distinct dorsal pattern, striated or ocelated. Males with seven preanal pores……..……***Lygodactylus mirabilis*** (Figure 17)

b) Keeled dorsal scales, present a vestigial first finger without bearing the claw, distinct occelated or striated pattern, males with 7-8 preanal pores……....***Lygodactylus intermedius*** (Figure 18)

***Lygodactylus montanus* group**

3.- a) Present well developed first finger bearing the claw, distinct dorsal pattern. Males with 9-11 preanal pores…….……....***Lygodactylus montanus*** (Figure 19)

b) Present first finger without bearing the claw, distinct dorsal pattern. Males with 10-12 preanal pores……..……***Lygodactylus blanci*** (Figure 20)

II.- Oriental lineage

1.- a) Five postpostmental scales, 20.5-32.6 mm SVL, three pairs lamellae in the IV finger, 5-8 infralabial and supralabial scales, males with 5-7 preanal pores, small tubercles in the base of the tail, 1-3 internasal scales, three pairs lamellae……..…***Lygodactylus miops*** (Figure 2)

b) Four postpostmental scales, 3-4 pairs lamellae in the IV finger, males with usually 6-7 preanal pores….....…….**2**

2.- a) 1-3 internasal scales, *L. m. madagascariensis* smaller (26.8-34.5 mm SVL) than *L. madagascariensis petteri* (33.2-36.8 mm SVL), without any patern structure like distinct tail tubercles, colour rings in the tail or dark spots in the neck……..…***Lygodactylus madagascariensis*** (Figure 1)

b) Other……**3**

3.- a) Four postpostmental scales, 28.6-38.3 mm SVL, big distinct tubercles in the base of the tail, 1-2 internasal scales, found in Andasibe……***Lygodactylus guibei*** (Figure 3)

b) Small sized specimens (25.3-29.7 mm SVL), three pairs lamellae in the IV finger, 1-2 internasal scales, two distinct dark spots in the neck, found in Karst d'Ambilobé (Ankarana)……...…***Lygodactylus expectatus*** (Figure 4)

c) Big sized specimens (31.6-36.5 mm SVL), 1-3 internasal scales, big sized specimens (31.6-36.5 mm SVL), males with seven preanal pores, tail with distinct coloured rings, found in Karst d'Ambilobé (Ankarana)……***Lygodactylus rarus*** (Figure 5)

III.- Meridional lineage

1.- a) Divided mental scale with two postmental scales, tail not verticillated, 3-6 undivided finger lamellae, quite often with two longitudinal light stripes, paralel along the body…….***Lygodactylus bivittis* group (*Lygodactylus bivittis*)**

b) 12.7-38.2 mm SVL, divided mental scale with two postmental scales, tail not verticillated, without a distinct dorsal pattern, divided finger lamellae in a number of 3-4, males with 6-9 preanal pores ……***Lygodactylus pictus* group, 2**

2.- a) Present first finger without bearing the claw, four pairs lamellae in the IV finger, 7 infra and supralabial scales, 2 internasal scales, two big dark spots (ocelles) in both sides of the neck, males with six preanal pores, yellow ventral colouration in alive specimens,……..……***L. sp. nov*. Manantantely (South Madagascar)** (Figure 21)

b) Present first finger bearing the claw, 3 three pairs lamellae in the IV finger, males with 7-9 preanal pores……....**3**

3.- a) Present yellow ventral colouration in alive specimens, 1-3 internasal scales, 4-6 infralabial scales, grey-dark dorsal colouration, present gular spots……..….***Lygodactylus pictus*** (Figure 6)

b) Absent yellow ventral pattern in alive specimens, 0-2 internasal scales, 4-8 infralabial scales, beige- brown dorsal

colouration, usually absent gular spots……..……....***Lygodactylus tuberosus*** (Figure 7)

IV.- Occidental lineage

1.- a) Tail distinct verticillated, 13.2-36.2 mm SVL, granular dorsal scales, present first finger with claw, mental scale tripartite with three postmental scales, males with 7-11 and 15 preanal pores. All the species from this lineage have a western distribution with arboreal habitudes.....……....***Lygodactylus verticillatus*** **group, 2**

b) Three postmental scales with five postpostmental scales and a very distinct broadcontact with infralabial scales, 20.5-35.0 mm SVL, 3 three pairs lamellae in the IV finger, tail not verticillated, males with 6-9 preanal pores, 1-3 internasal scales……..... ***Lygodactylus tolampyae*** **group (*Lygodactylus tolampyae*)** (Figure 13)

c) Tail not verticillated and special gular patern formed by dark distinct stripes……. ***Lygodactylus ornatus*** **group, 5**

d) Three postmental scales, 27.9-35.7 mm SVL, tail not verticillated and ocelated dorsal pattern, only females found ……..……..…… ***Lygodactylus pauliani*** **group (*Lygodactylus pauliani*)** (Figure 15)

2.- a) Without a clear colour pattern…….……**3**

b) With a distinct colour pattern, males with 9-11 preanal pores….……..…..**4**

3.- a) Without a clear colour pattern, 1-2 internasal scales, males with 15 preanal pores, from Angavo Massif……..…… ***Lygodactylus decaryi*** (Figure 10)

b) Without a distinct dorsal pattern, males with usually 9 preanal pores, 11.2-34.2 mm SVL, 1-3 internasal scales, 4-7 infralabial scales, 5-7 supralabial scales, light ventral colour..…….…… ***Lygodactylus verticillatus*** (Figure 8)

c) Without a distinct dorsal pattern, 24.3-35.0 mm SVL, 1-3 internasal scales, ventral side without dark spots, specially in the head, sometimes with a distinct spot in the mental scale…….…… ***Lygodactylus blancae*** (Figure 12)

4) a) Distinct gular pattern with three black lines (*L. heterurus trilineigularis*) or five black gular lines (*L. heterurus heterurus*), pigmented preanal pores in a number of usually 11…….....… ***Lygodactylus heterurus*** (Figure 9)

b) With a distinct gular pattern formed by black gular stripes with yellow colour, head with greenish colouration, one internasal scale, males with nine preanal pores……..……..***Lygodactylus klemmeri***

c) With a dorsal pattern, striated or ocelated and no distinct gular pattern, 1-3 internasal scale, big size 19.1-36.9 mm SVL (mean 30.0mm)……..……..***Lygodactylus arnoulti*** (Figure 11)

5) a) Perpendicular dark gular stripes making waves, small size (27.7 mm SVL), one internasal scale, four infra and supralabial scales, males with 11 preanal pores……...***Lygodactylus ornatus*** (Figure 14)

b) Gular pattern in dark lines making a “V”, 1-2 internasal scales, 5-6 infra and supralabial scales….……...***Lygodactylus praecox*** (Figure 16)

IV.3.- Illustrations of Malagasy *Lygodactylus* main characters

Figure 1. *Lygodactylus madagascariensis madagascariensis*
Figure 2. *Lygodactylus miops*
Figure 3. *Lygodactylus guibei*
Figure 4. *Lygodactylus expectatus*
Figure 5. *Lygodactylus rarus*
Figure 6. *Lygodactylus pictus*
Figure 7. *Lygodactylus tuberosus*
Figure 8. *Lygodactylus verticillatus*
Figure 9. *Lygodactylus heterurus*
Figure10.*Lygodactylus decaryi*
Figure11.*Lygodactylus arnoulti*
Figure12.*Lygodactylus blancae*
Figure13.*Lygodactylus tolampyae*
Figure14.*Lygodactylus ornatus*
Figure15.*Lygodactylus pauliani*
Figure16.*Lygodactylus praecox*
Figure17.*Lygodactylus mirabilis*
Figure18.*Lygodactylus intermedius*
Figure19.*Lygodactylus montanus*
Figure20.*Lygodactylus blanci*
Figure21.*Lygodactylus sp. nov.*
Figure22.hemipenial structures of *Lygodactylus bivittis*

Figure1.1. *Lygodactylus madagascariensis madagascariensis*, male specimen MNHN 1990.5 (G.532-1 - 1347/L). A, head in lateral view (scale bar = 2 mm); B, lamella of fourth toe in ventral view (scale bar = 1 mm); C, head in dorsal view (scale bar = 2 mm); D, ventral view of throat with mental scales (scale bar = 2 mm); E, preanal pores (scale bar = 5 mm).

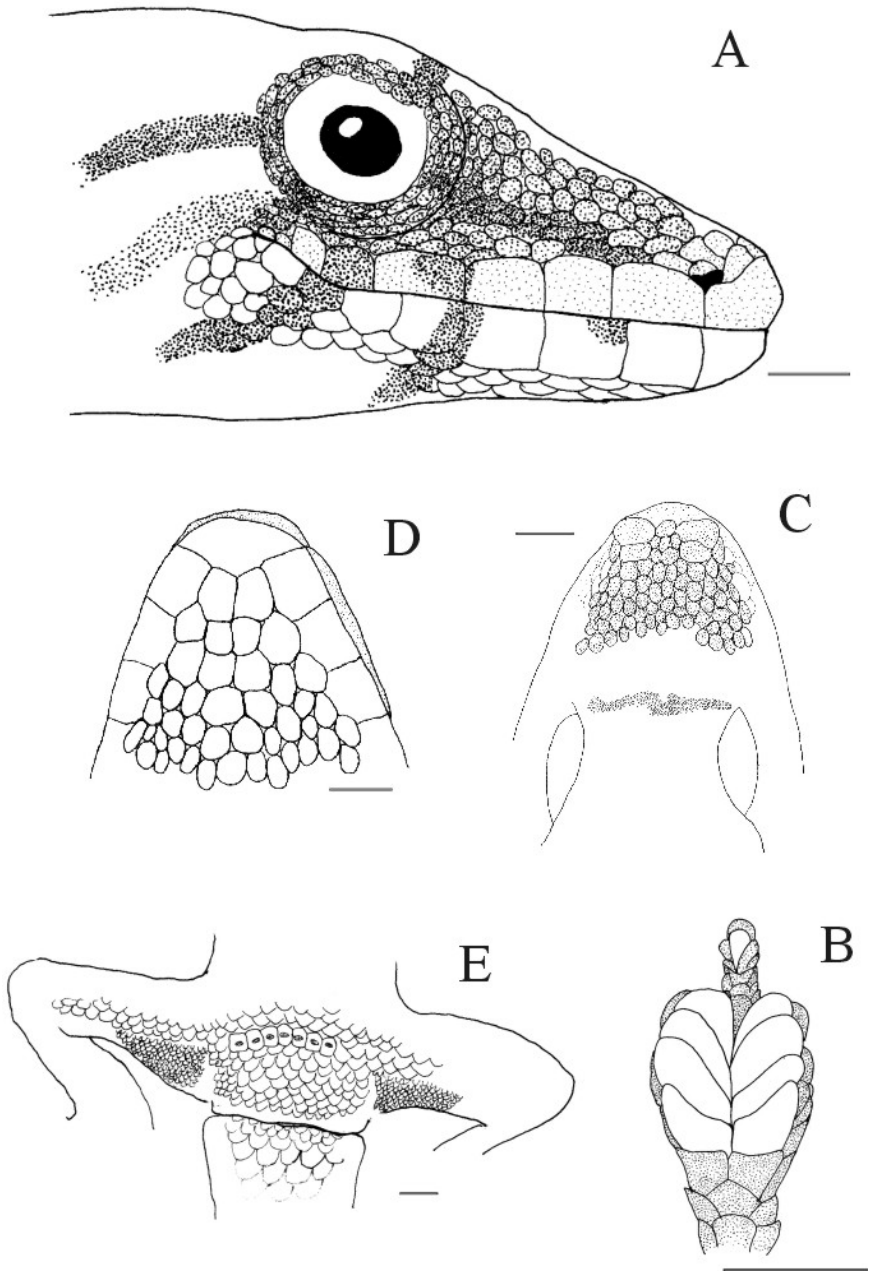
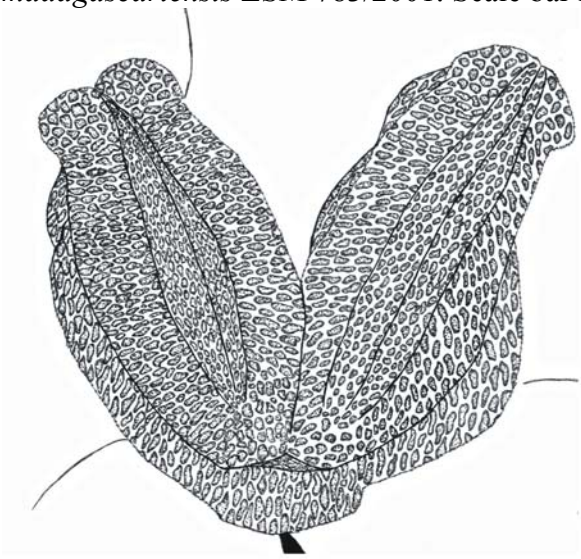


Fig 1. 2. Asulcal and sulcal view of the hemipenis of *Lygodactylus madagascariensis* ZSM 783/2001. Scale bar represents 2 mm.



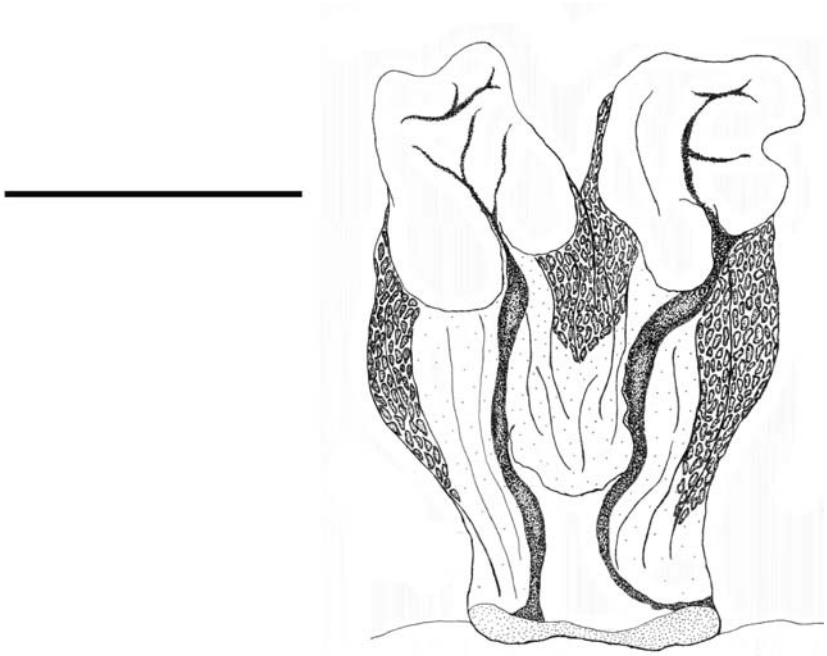


Figure 2.1. *Lygodactylus miops*, A, head in lateral view (scale bar = 5 mm); B, lamellae of fourth toe in ventral view (scale bar = 1 mm); C, head in dorsal view (scale bar = 3 mm); D, throat in ventral view with mental scales (scale bar = 5 m); E, preanal pores in ventral view (scale bar = 1 mm). Drawing 2A of female specimen MNHN 1921.252 (G.509-2); 2B of female specimen MNHN 1938.195 (G.509-2); 2C, 2D of male specimen MNHN 1935.122 (G.509-2); 2E of male specimen MNHN 1990.1857 (G.509-4).

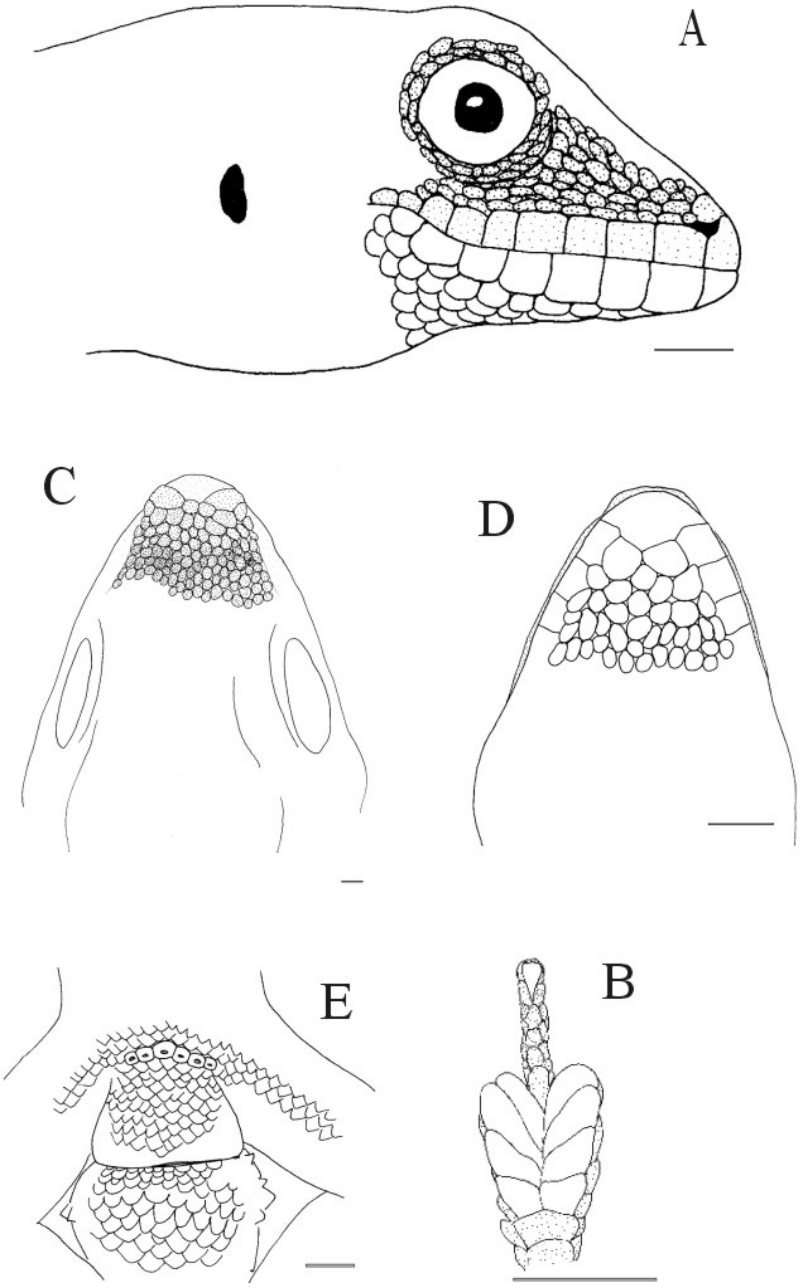


Figure 2.2. Asulcal and sulcal view of the hemipenis of *Lygodactylus miops* (MRSN) R-1893. Scale bar represents 2 mm.

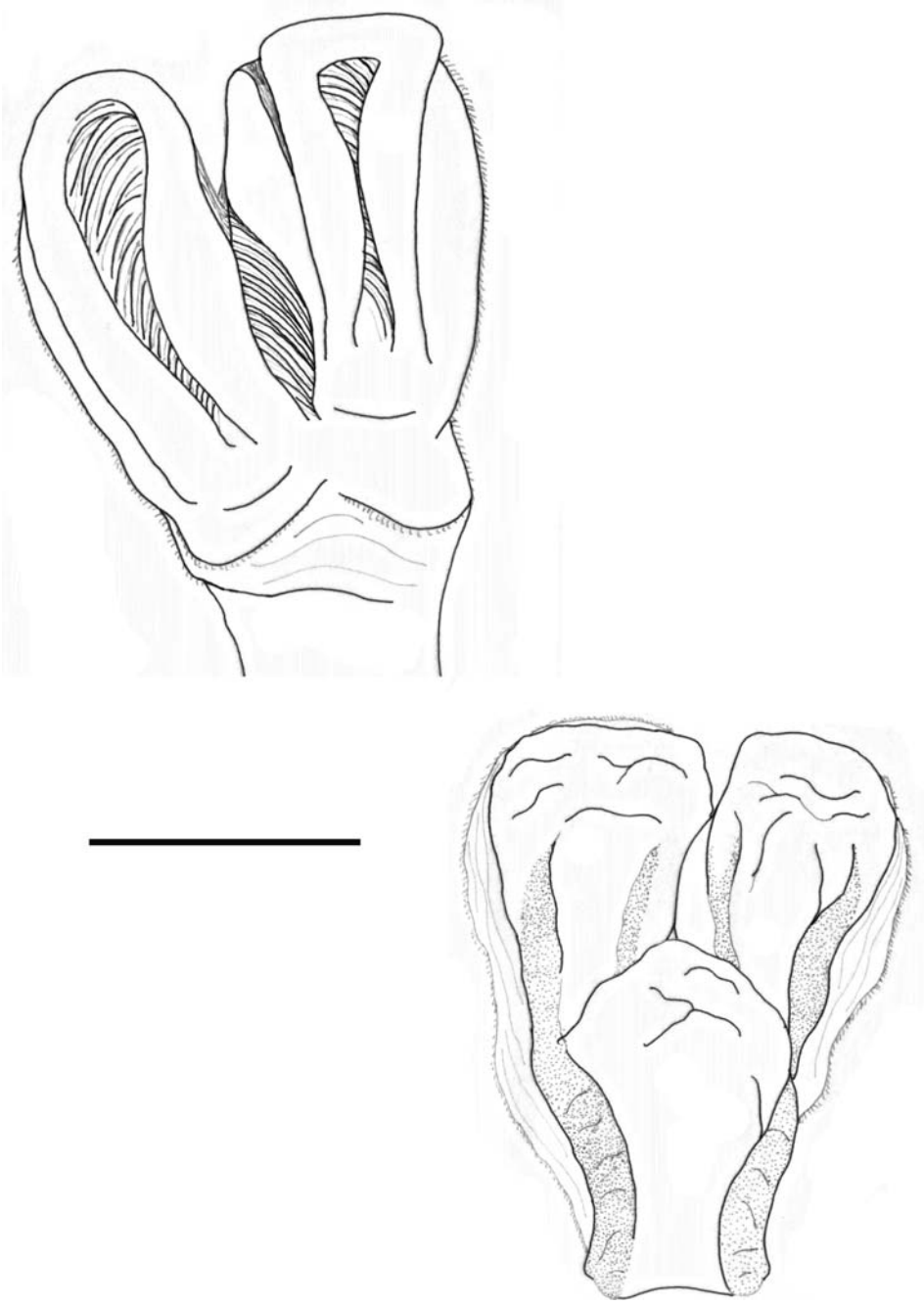


Figure 3. *Lygodactylus guibei*, A, head in lateral view (scale bar = 5 mm); B, lamellae of fourth toe in ventral view (scale bar = 2 mm); C, head dorsal view (scale bar = 5 mm); D, throat in ventral view with mental scales (scale bar = 5 mm). Drawing 3A, 3B of female specimen MNHN (G.505-4) R 012 (1990 3568); 3C of female specimen MNHN (G.505-4) R 002 (1990 3567); 3D of female specimen MNHN (G.505-4) R 012 (1990 3568).

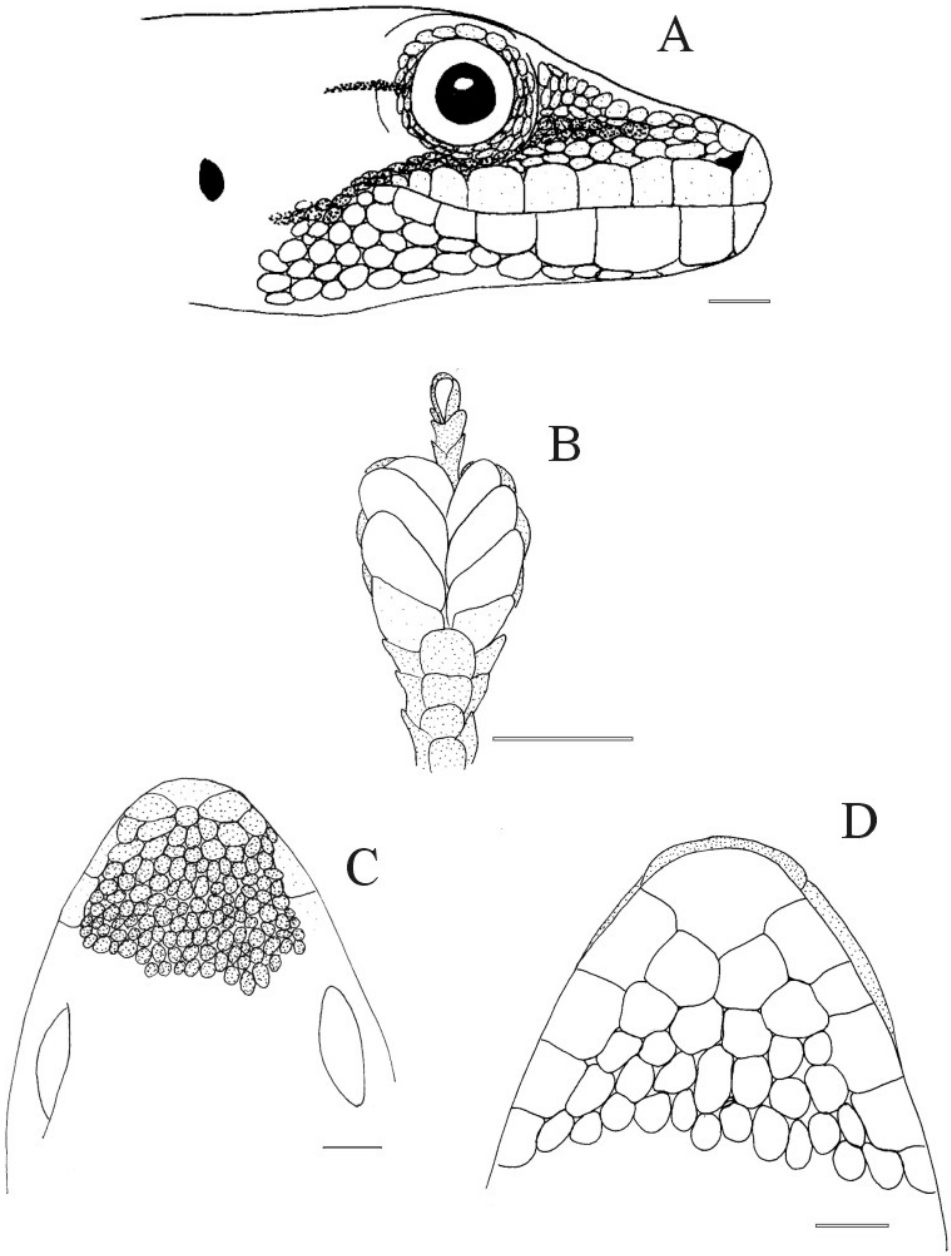


Figure 4. *Lygodactylus expectatus*, A, head in lateral view (scale bar = 2 mm); B, lamellae of fourth toe in ventral view (scale bar = 1 mm); C, head dorsal view (scale bar = 5 mm); D, throat in ventral view with mental scales (scale bar = 5 mm), E, preanal pores in ventral view (scale bar = 1 mm). Drawing 4A, 4C, 4D of female specimen MNHN (G.530-2) 641 (1990 2); 4B, 4E of male specimen MNHN (G.530-2) 640 (1990 1).

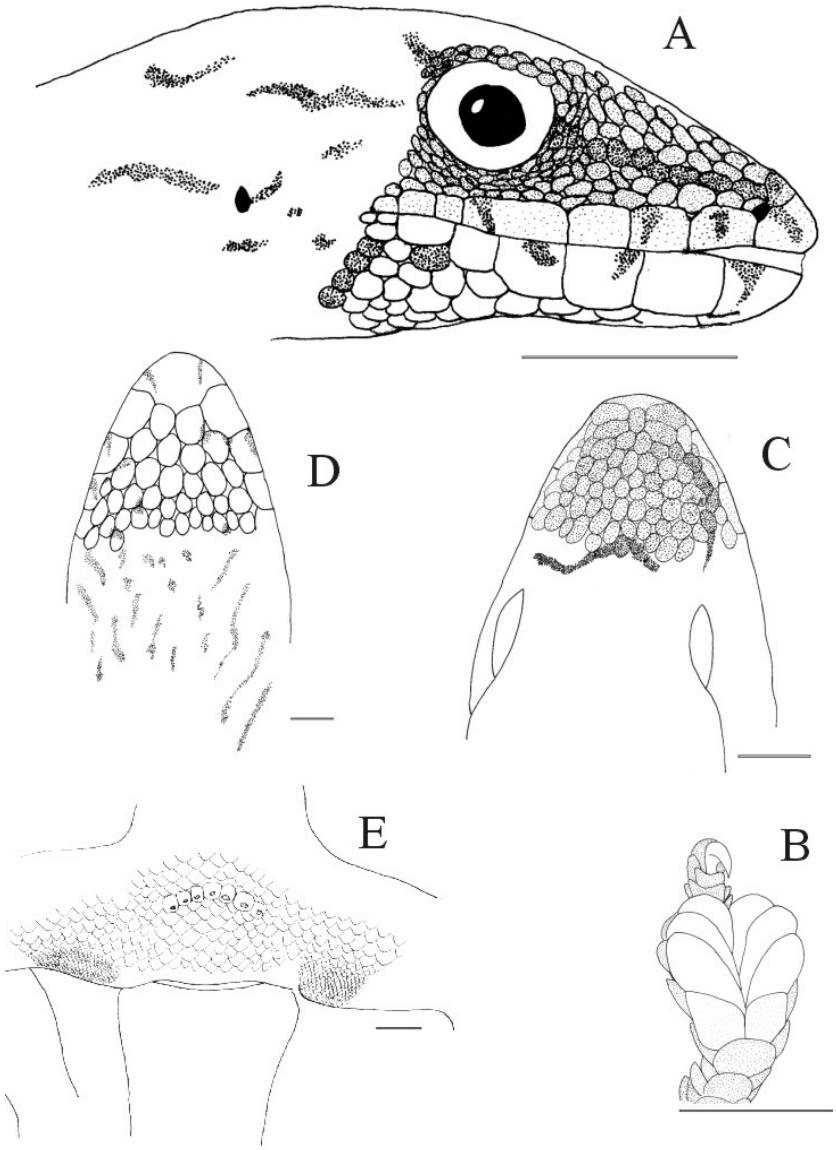


Figure 5.1. *Lygodactylus rarus*, female specimen MNHN (G.532-2) (1990 6). A, head in lateral view (scale bar = 5 mm); B, lamellae of fourth toe in ventral view (scale bar = 1 mm); C, head dorsal view (scale bar = 5 mm); D, throat in ventral view with mental scales (scale bar = 2 mm).

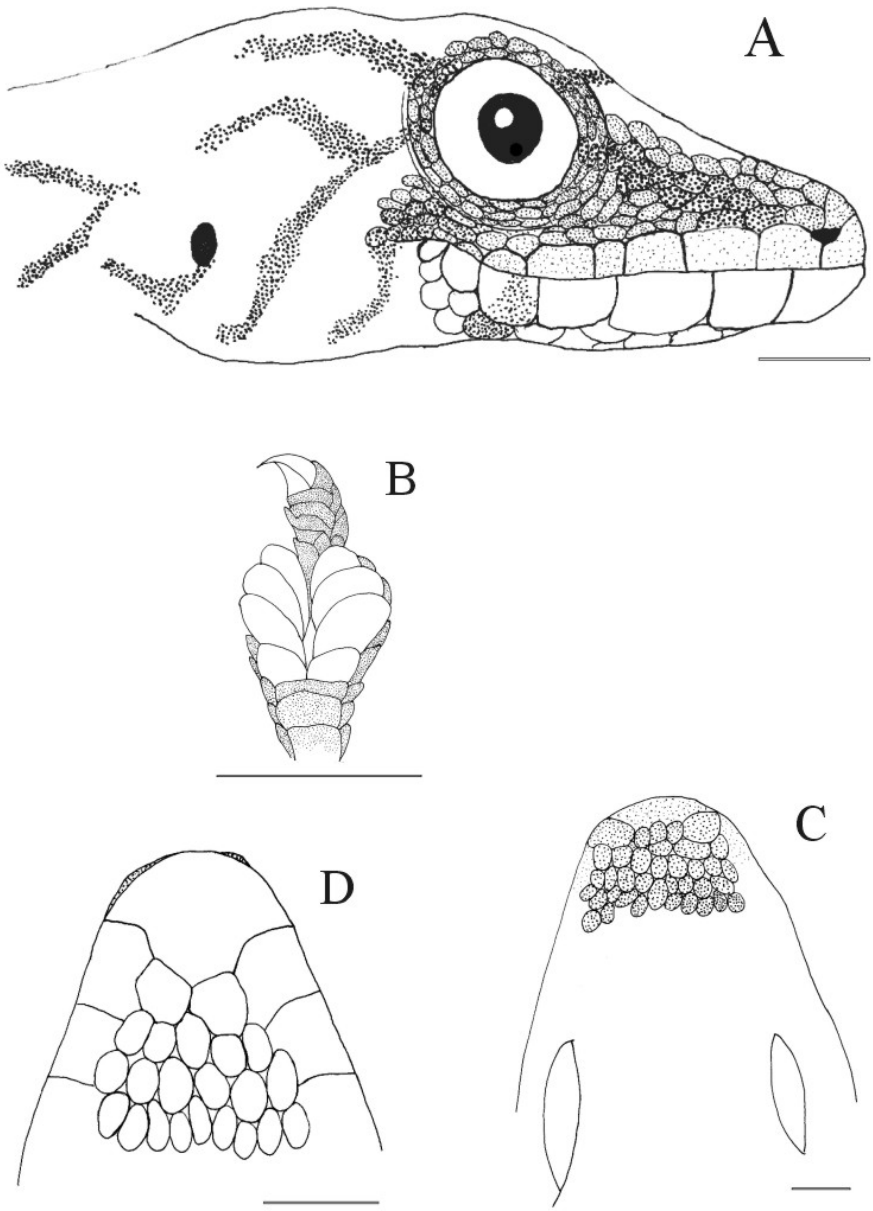


Figure 5.2. Asulcal and sulcal view of the hemipenis of *Lygodactylus rarus* (ZSM 913/2003). Scale bar represents 1 mm.

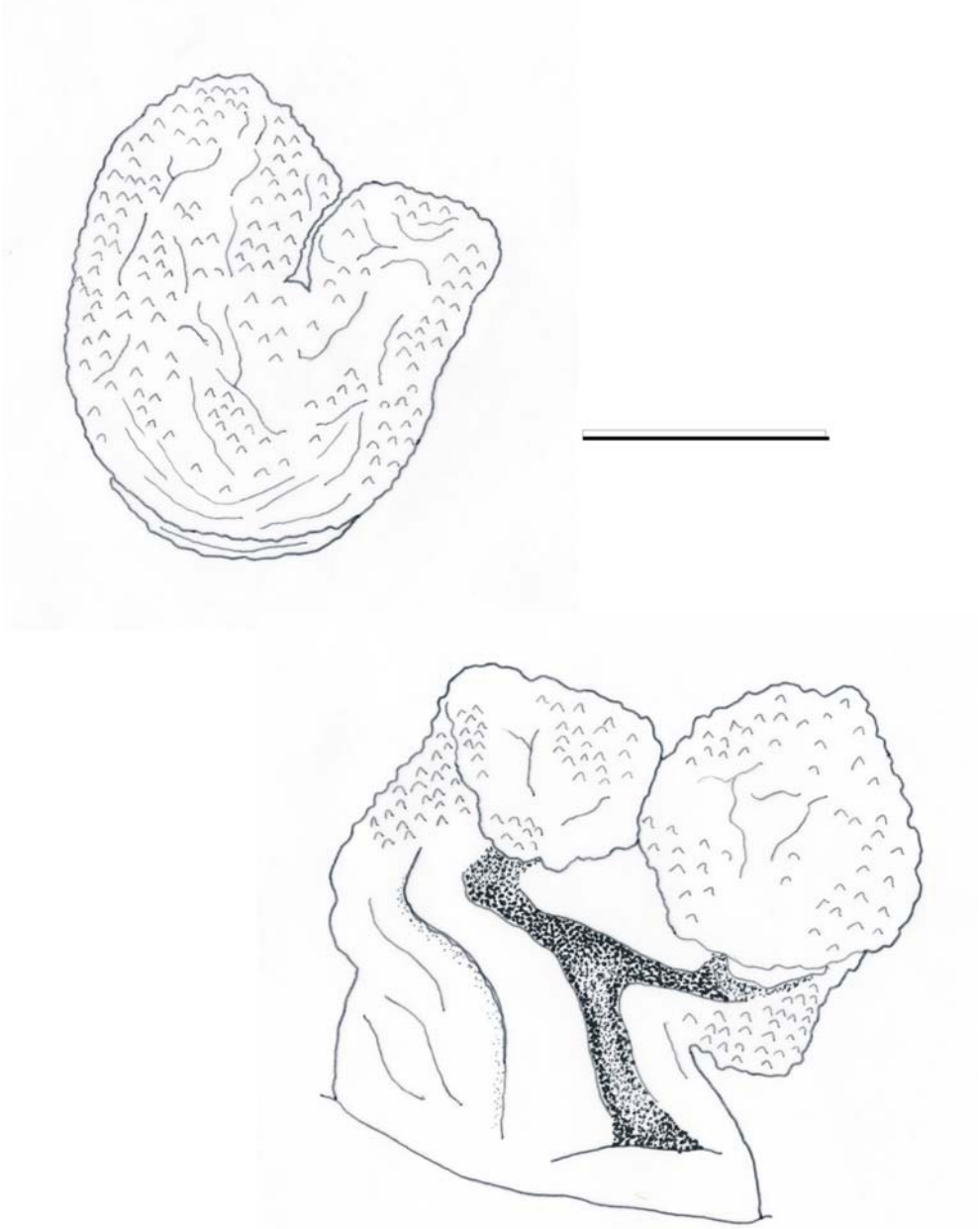


Figure 6. *Lygodactylus pictus*, A, head in lateral view (scale bar = 5 mm); B, lamellae of fourth toe in ventral view (scale bar = 1 mm); C, head dorsal view (scale bar = 5 mm); D, throat in ventral view with mental scales (scale bar = 5 mm), E, preanal pores in ventral view (scale bar = 5 mm). Drawing 6A, 6B, 6C, 6D of male specimen MNHN (G.514-5) By 424 (1990 1859); 6E of male specimen MNHN (G.514-8) 104.72 (1990 3550).

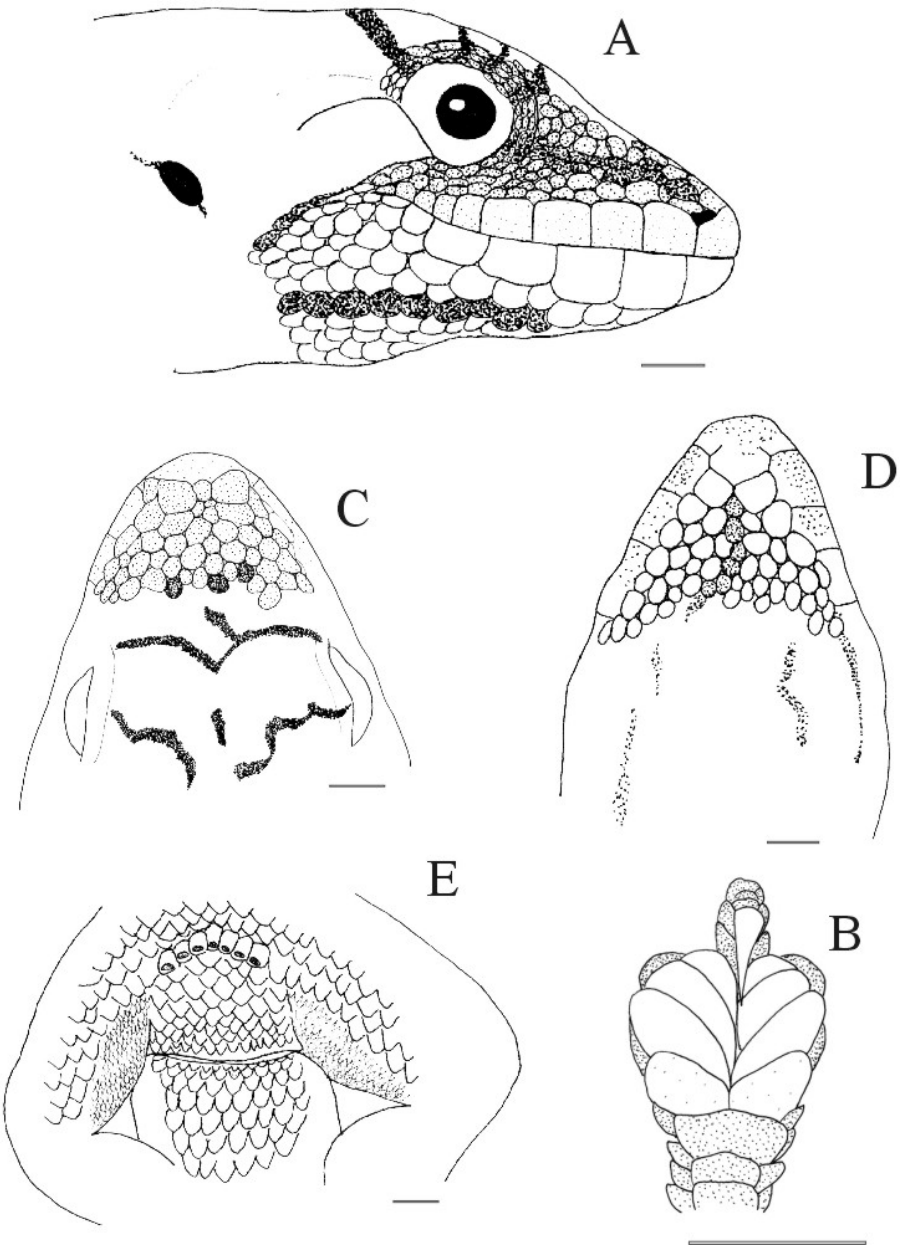


Figure 7.1. *Lygodactylus tuberosus*, A, head in lateral view (scale bar = 5 mm); B, lamellae of fourth toe in ventral view (scale bar = 2 mm); C, head dorsal view (scale bar = 5 mm); D, throat in ventral view with mental scales (scale bar = 5 mm), E, preanal pores in ventral view (scale bar = 5 mm). Drawing 7A, 7B of male specimen MNHN (G.535-25) 139.75 (1990 535); 7C of male specimen MNHN (G.535-27) 59.81 (1990 605); 7D of male specimen MNHN (G.535-25) 130.75 (1990 541); 7E of male specimen MNHN (G.535-19) 1014.75 (1990 524).

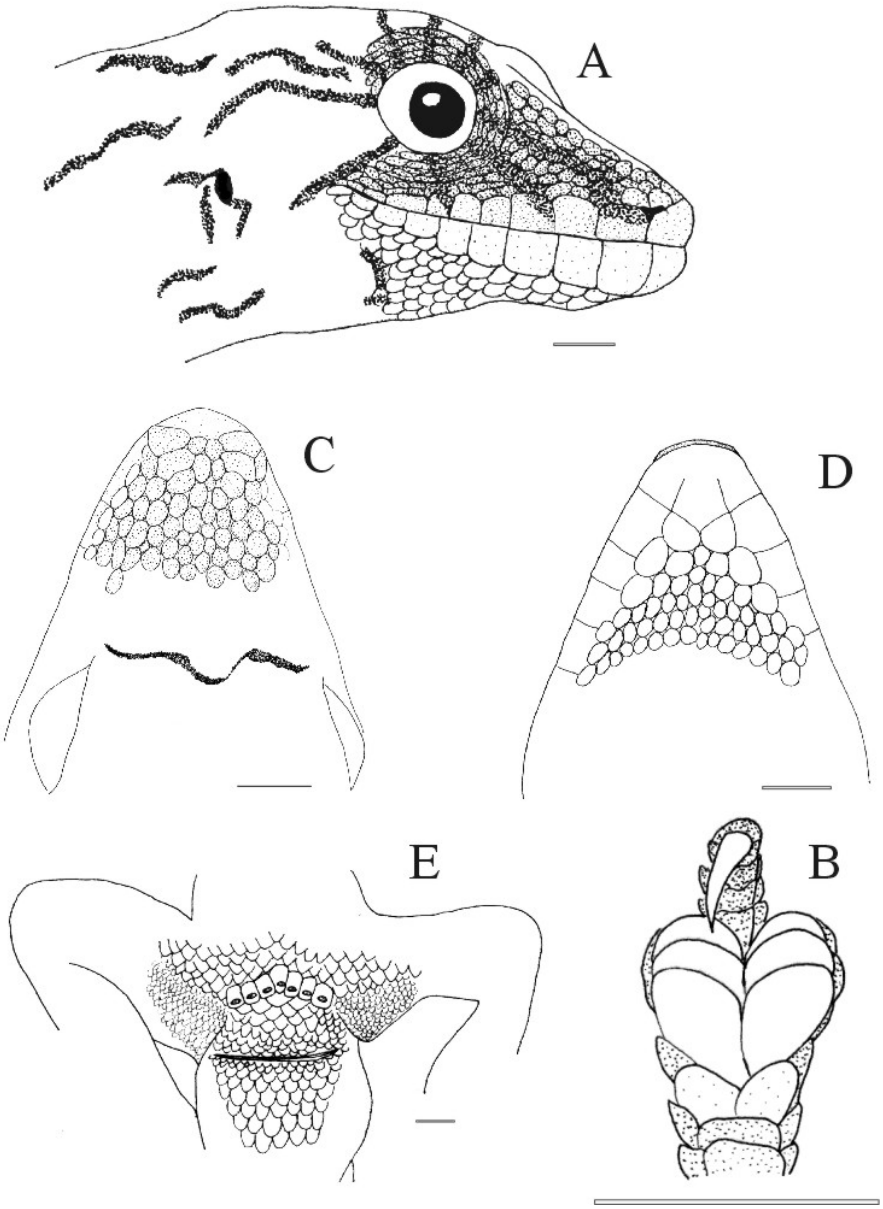


Figure 7.2. Asulcal and sulcal view of the hemipenis of *Lygodactylus tuberosus* ZSM 583/2000. Scale bar represents 1 mm.

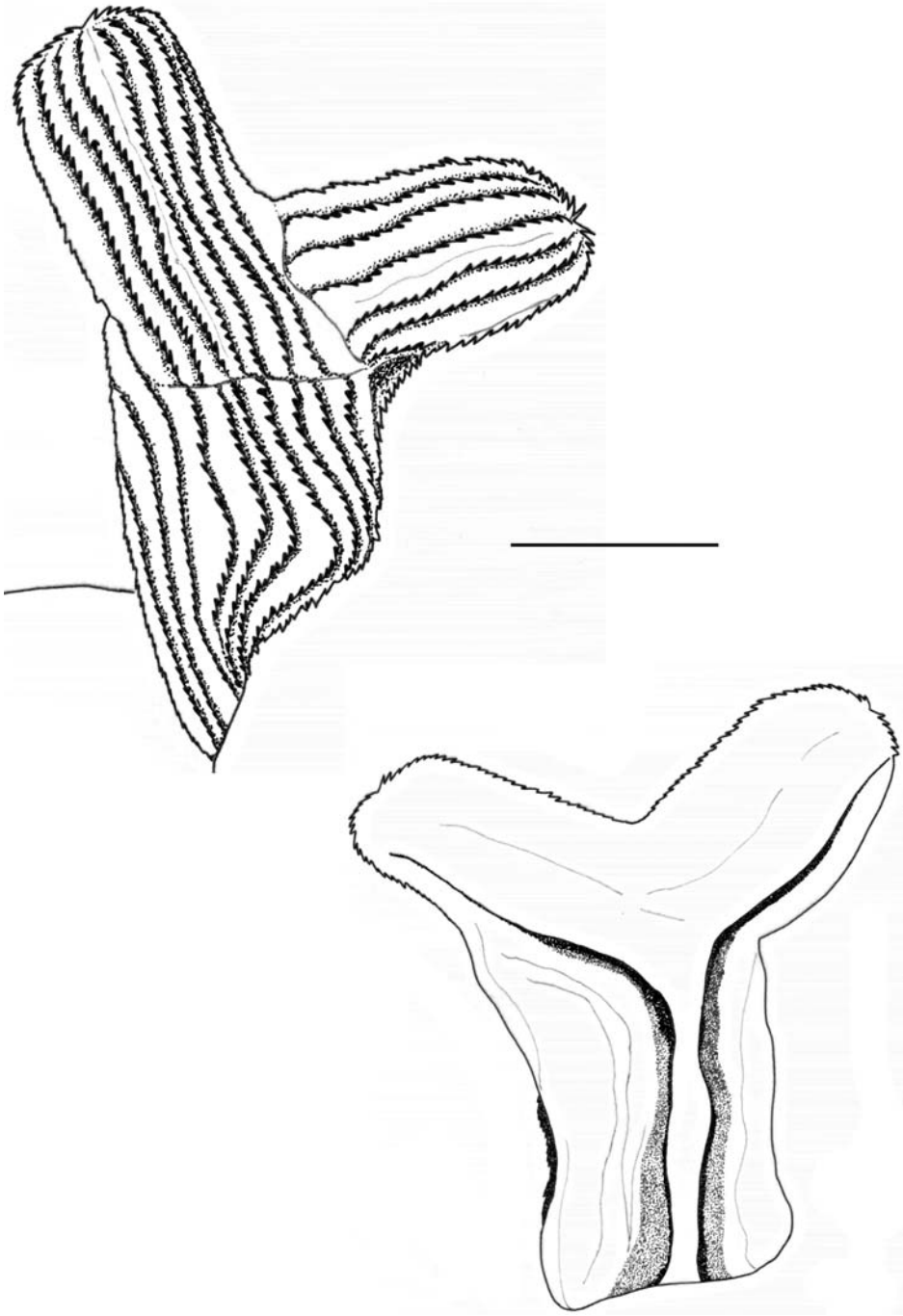


Figure 8. *Lygodactylus verticillatus*, A, head in lateral view (scale bar = 1 mm); B, lamellae of fourth toe in ventral view (scale bar = 1 mm); C, head dorsal view (scale bar = 1 mm); D, throat in ventral view with mental scales (scale bar = 1 mm), E, preanal pores in ventral view (scale bar = 5 mm). Drawing 8A, 8B, 8C, 8D of female specimen MNHN (G.520-3) (1982 1246); 8E of male specimen MNHN (G.520-3) (1982 1245).

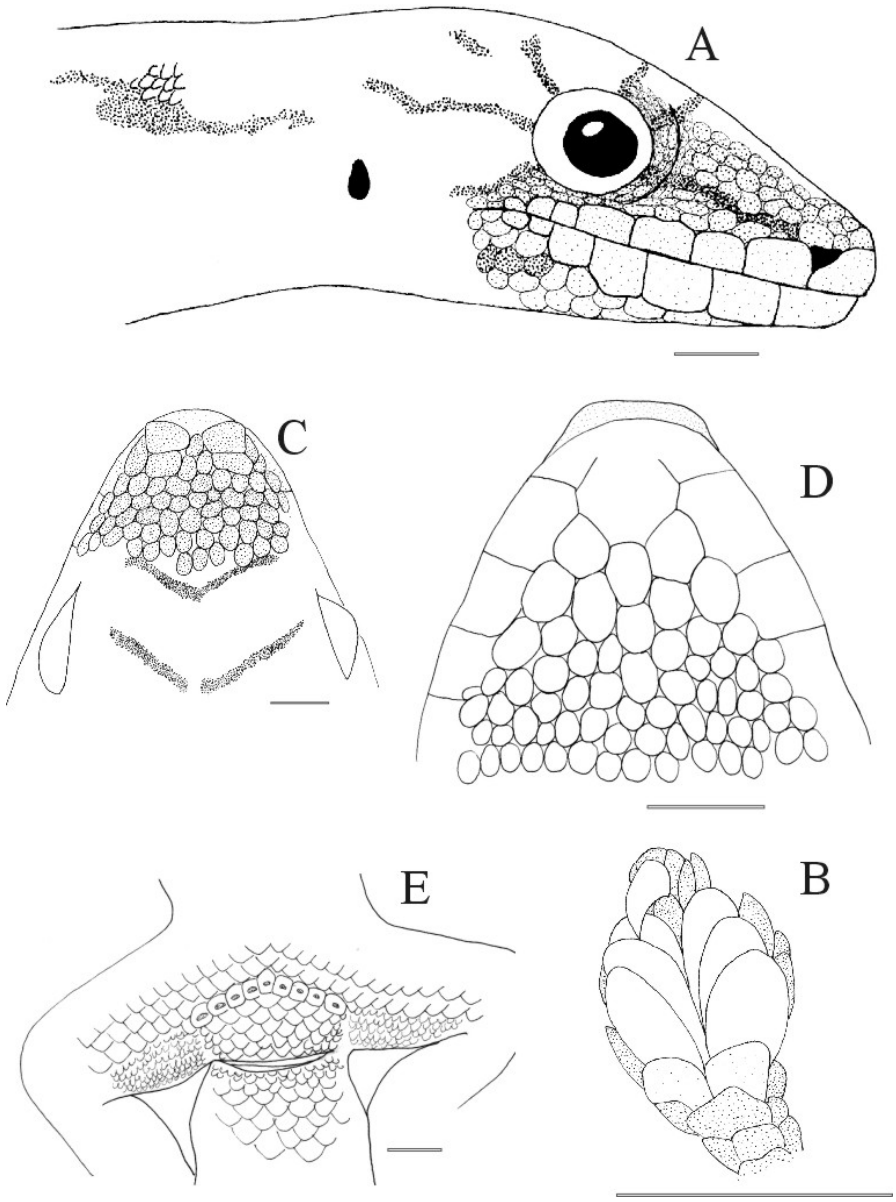


Figure 9.1. *Lygodactylus heterurus trilineigularis*, male specimen 561/2000 FG/MV 2000-387. A, head in lateral view (scale bar = 5 mm); B, lamellae of fourth toe in ventral view (scale bar = 2 mm); C, head dorsal view (scale bar = 5 mm); D, throat in ventral view with mental scales (scale bar = 5 mm), E, preanal pores in ventral view (scale bar = 1 mm).

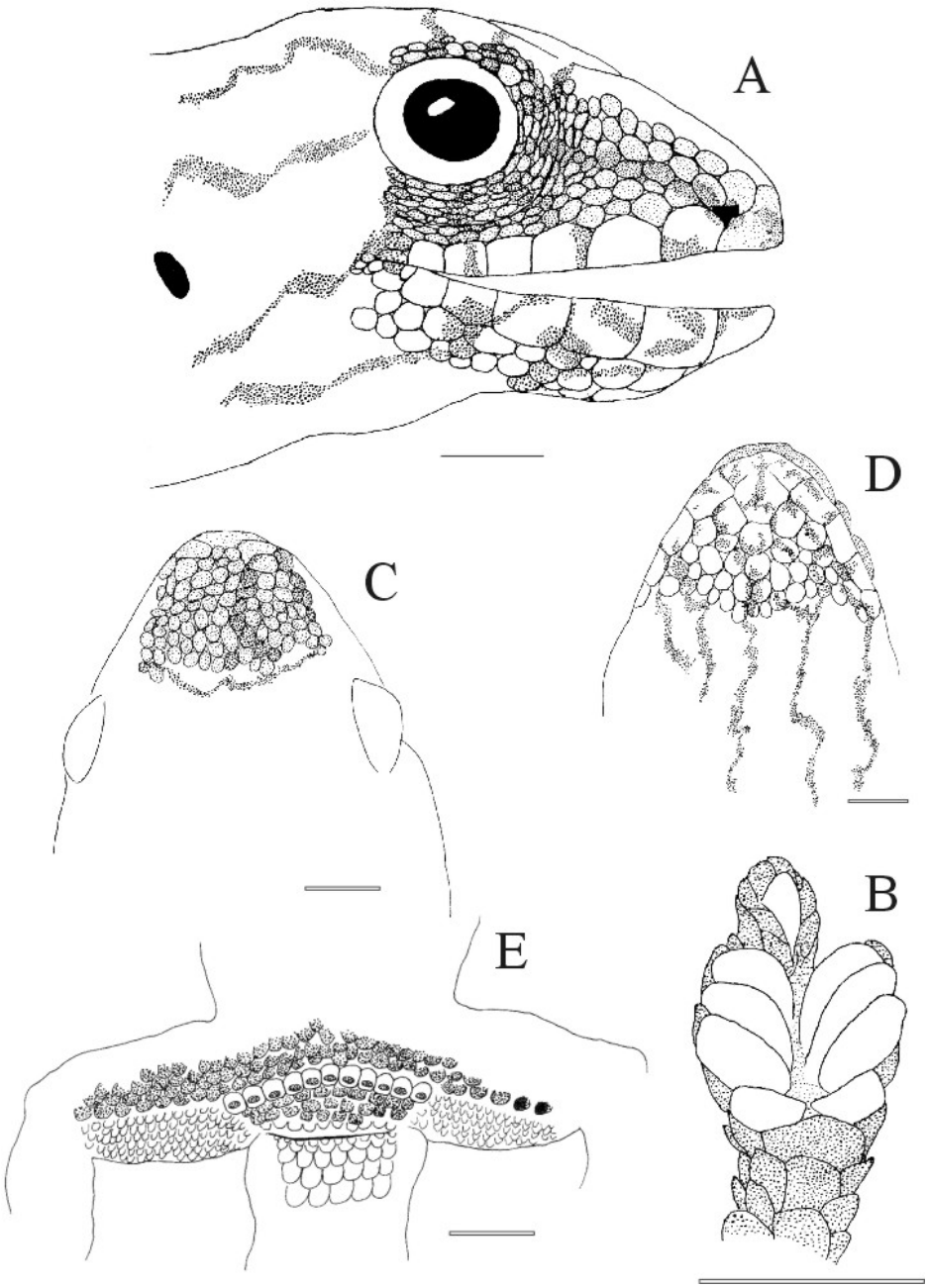


Figure 9.2. Asulcal and sulcal view of the hemipenis of *Lygodactylus heterurus* trilineigularis FG/MV 2000-387. Scale bar represents 1 mm.

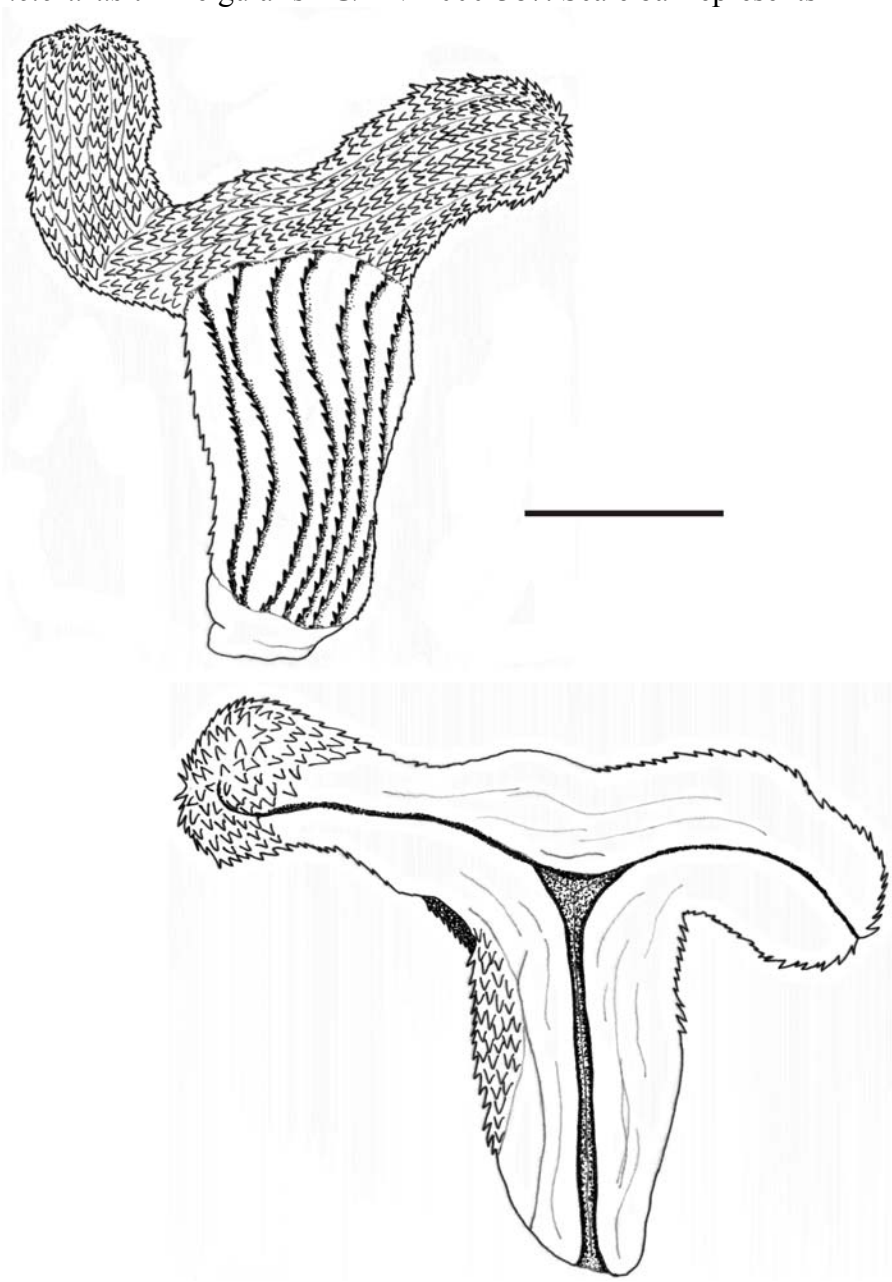


Figure 10. *Lygodactylus decaryi*, A, head in lateral view (scale bar = 5 mm); B, lamellae of fourth toe in ventral view (scale bar = 2 mm); C, head dorsal view (scale bar = 5 mm); D, throat in ventral view with mental scales (scale bar = 5 mm); E, preanal pores in ventral view (scale bar = 5 mm). Drawing 10A, 10C, 10D, 10E of male specimen MNHN (G.503-3) 30.27 (1930 271); 10B of male specimen MNHN (G.503-1) 50.262 (1950 262).

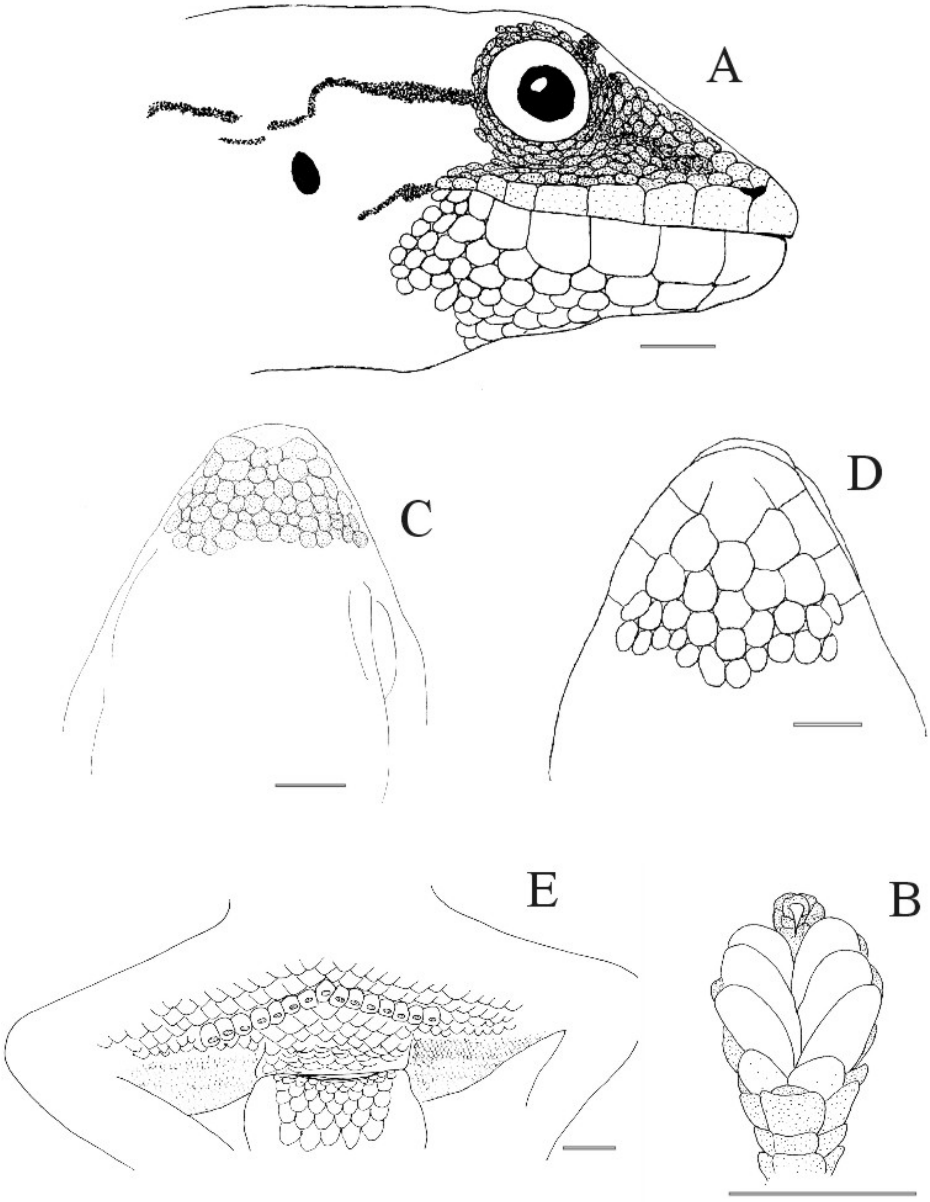


Figure 11. *Lygodactylus arnoulti*, male specimen MNHN (G.515-5) 1170.75 (1990 3420). A, head in lateral view (scale bar = 5 mm); B, lamellae of fourth toe in ventral view (scale bar = 2 mm); C, head dorsal view (scale bar = 5 mm); D, throat in ventral view with mental scales (scale bar = 5 mm), E, preanal pores in ventral view (scale bar = 5 mm).

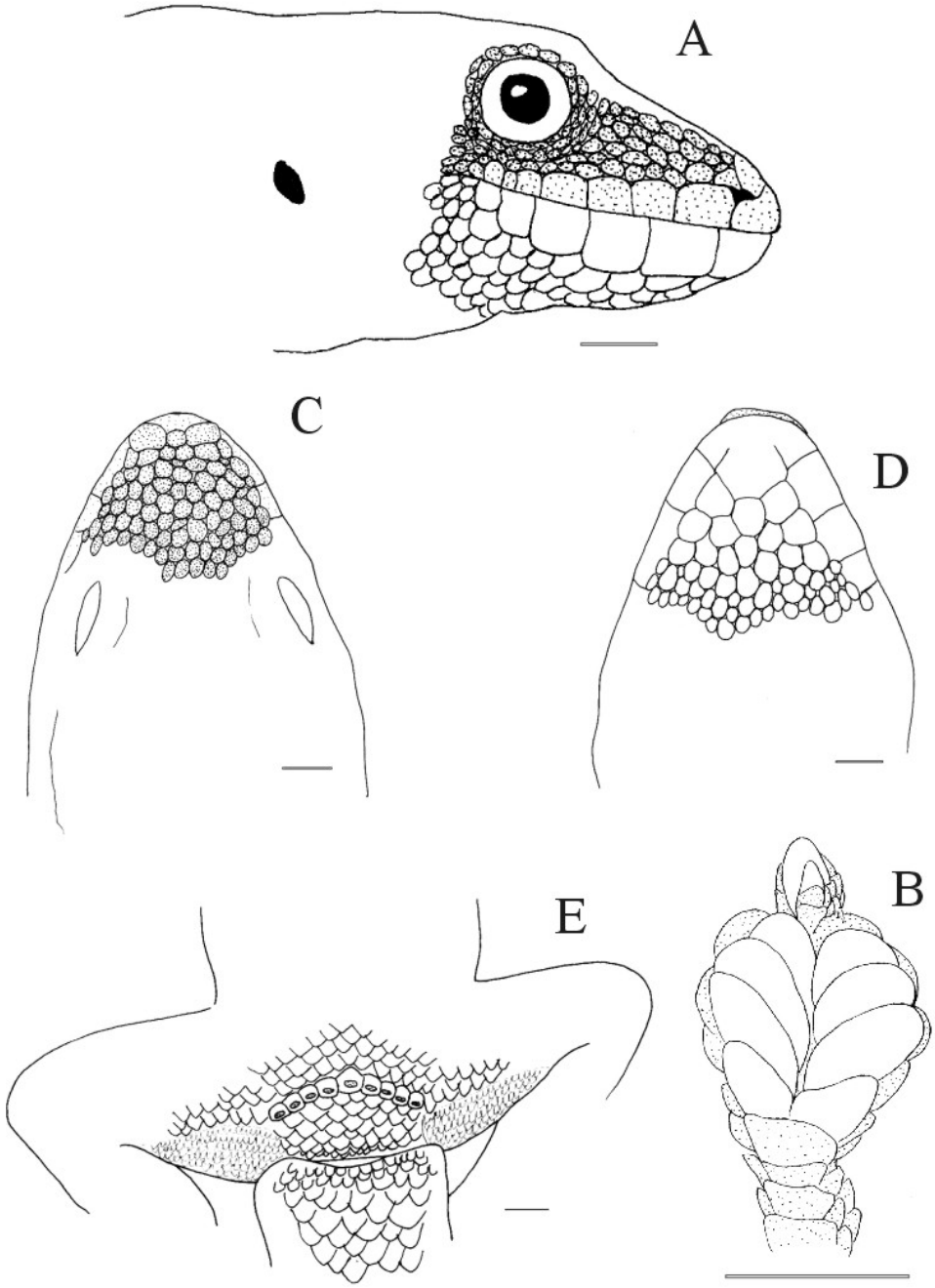


Figure 12.1. *Lygodactylus blancae*, male specimen MNHN (G.540-2) 134.72 (1990 38). A, head in lateral view (scale bar = 5 mm); B, lamellae of fourth toe in ventral view (scale bar = 1 mm); C, head dorsal view (scale bar = 5 mm); D, throat in ventral view with mental scales (scale bar = 5 mm), E, preanal pores in ventral view (scale bar = 5 mm).

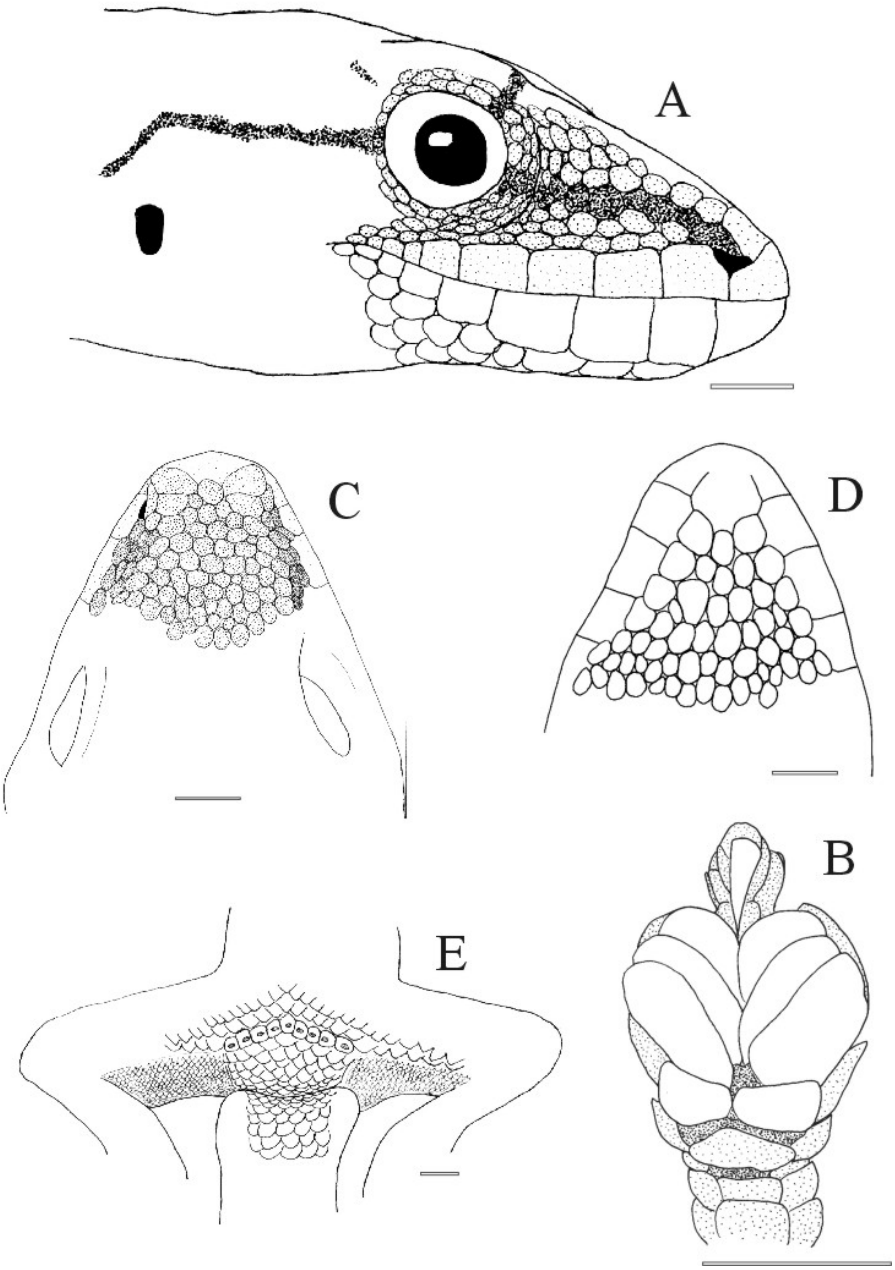


Figure 12.2. Asulcal and sulcal view of the hemipenis of *Lygodactylus blancae* ZSM 498/2001. Scale bar represents 1.mm.

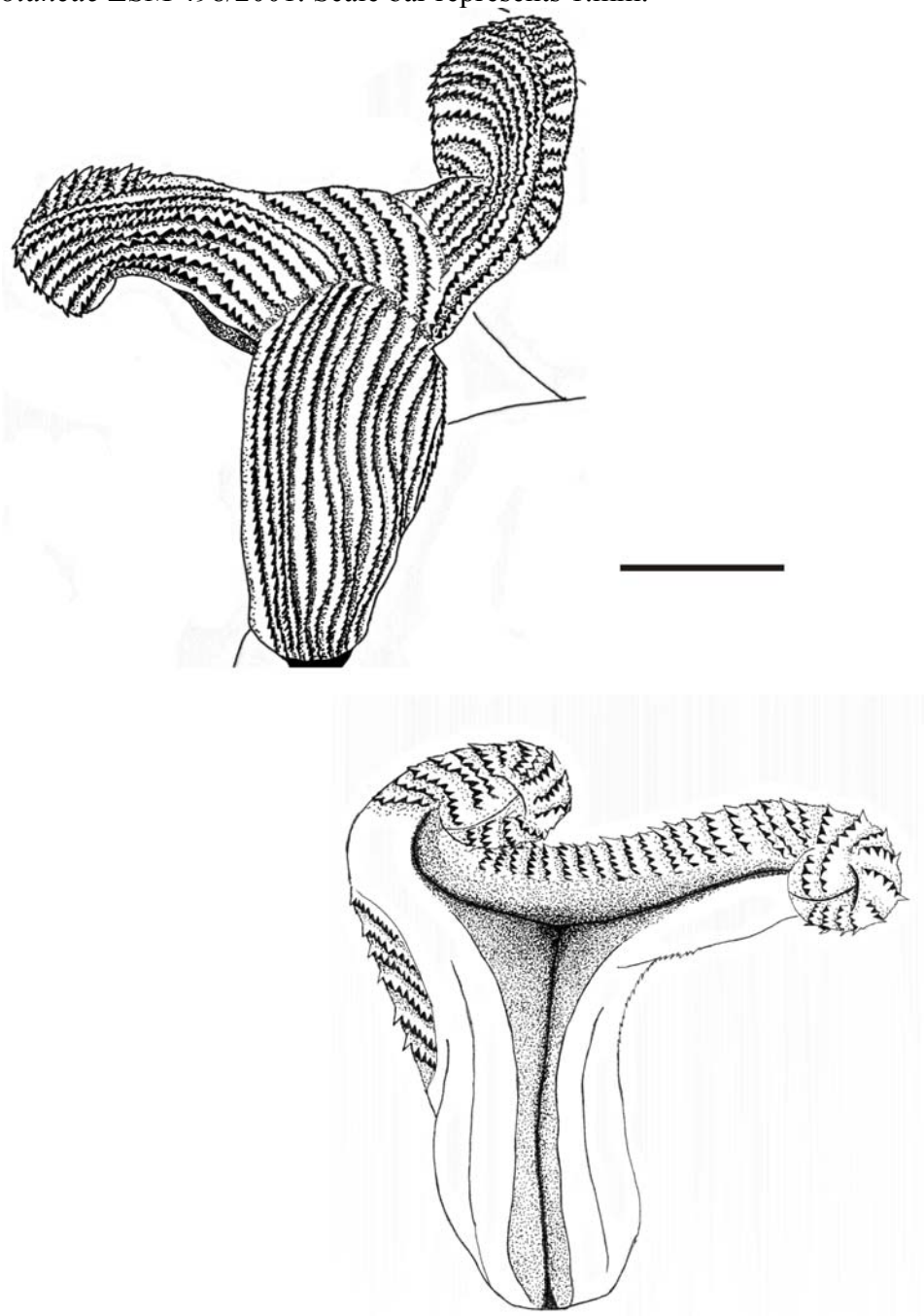


Figure 13.1. *Lygodactylus tolampyae*, A, head in lateral view (scale bar = 2 mm); B, lamellae of fourth toe in ventral view (scale bar = 1 mm); C, head dorsal view (scale bar = 5 mm); D, throat in ventral view with mental scales (scale bar = 5 mm), E, preanal pores in ventral view (scale bar = 5 mm). Drawing 13A, 13B, 13C, 13D of female specimen (G.518-7) (1990 3443); 13E of male specimen MNHN (G.518-5) 45.57 (1990 3441).

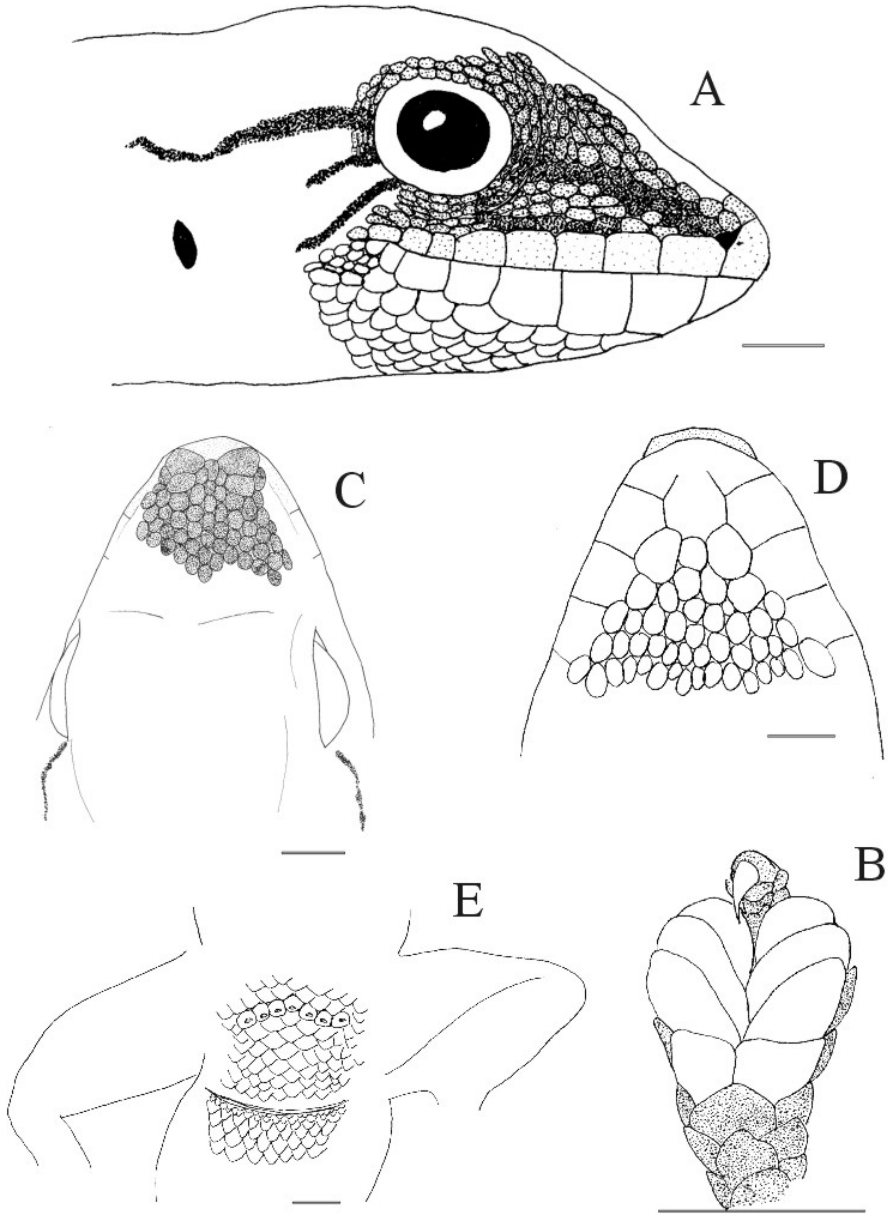


Figure 13.2. Asulcal and sulcal view of the hemipenis of *Lygodactylus tolampyae* ZSM 502/2001. Scale bar represents 1 mm.

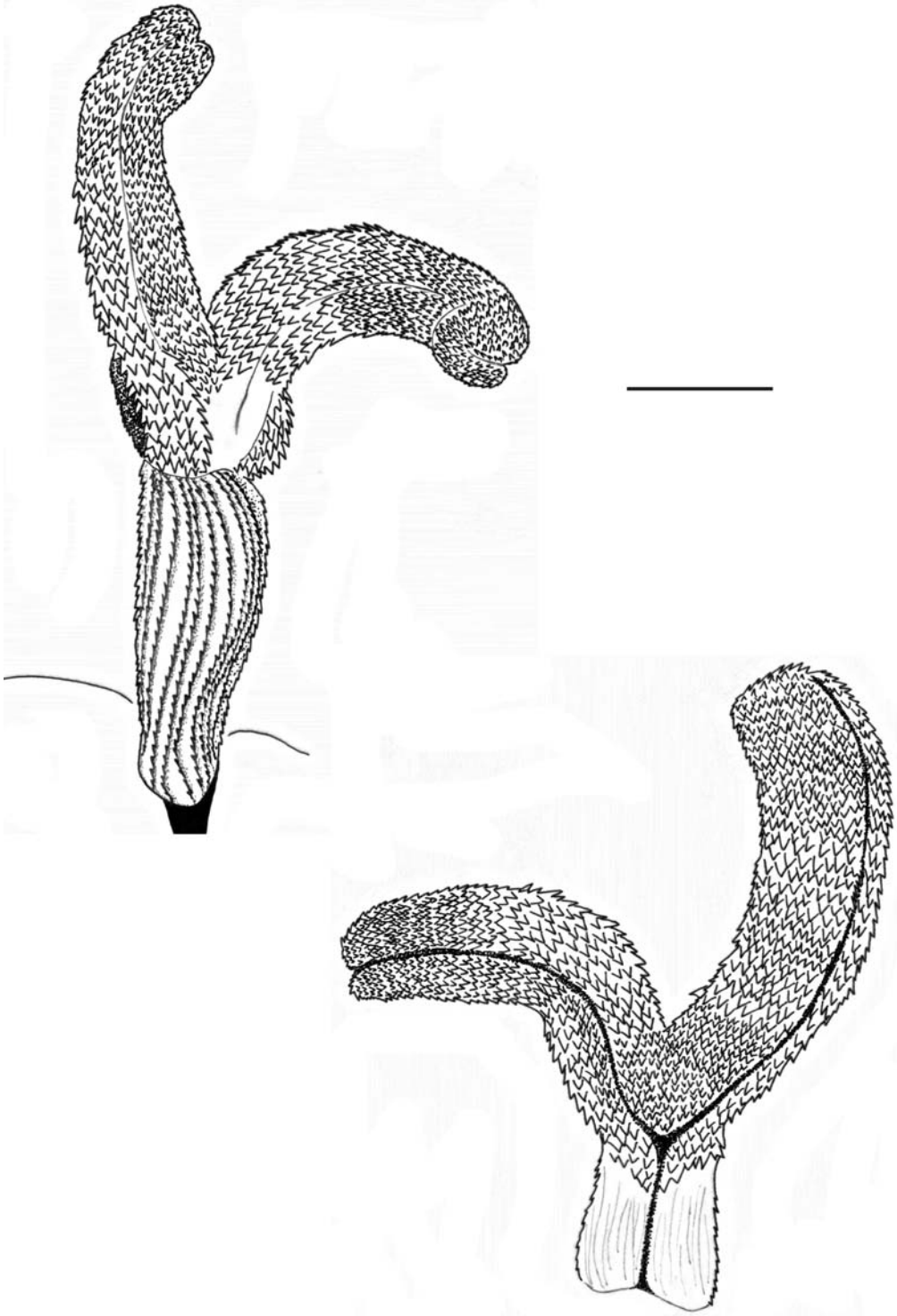


Figure 14. *Lygodactylus ornatus*, male specimen MNHN (G.510-1) 39.48 (1939 48). A, head in lateral view (scale bar = 3 mm); B, lamellae of fourth toe in ventral view (scale bar = 1 mm); D, throat in ventral view with mental scales (scale bar = 5 mm), E, preanal pores in ventral view (scale bar = 5 mm).

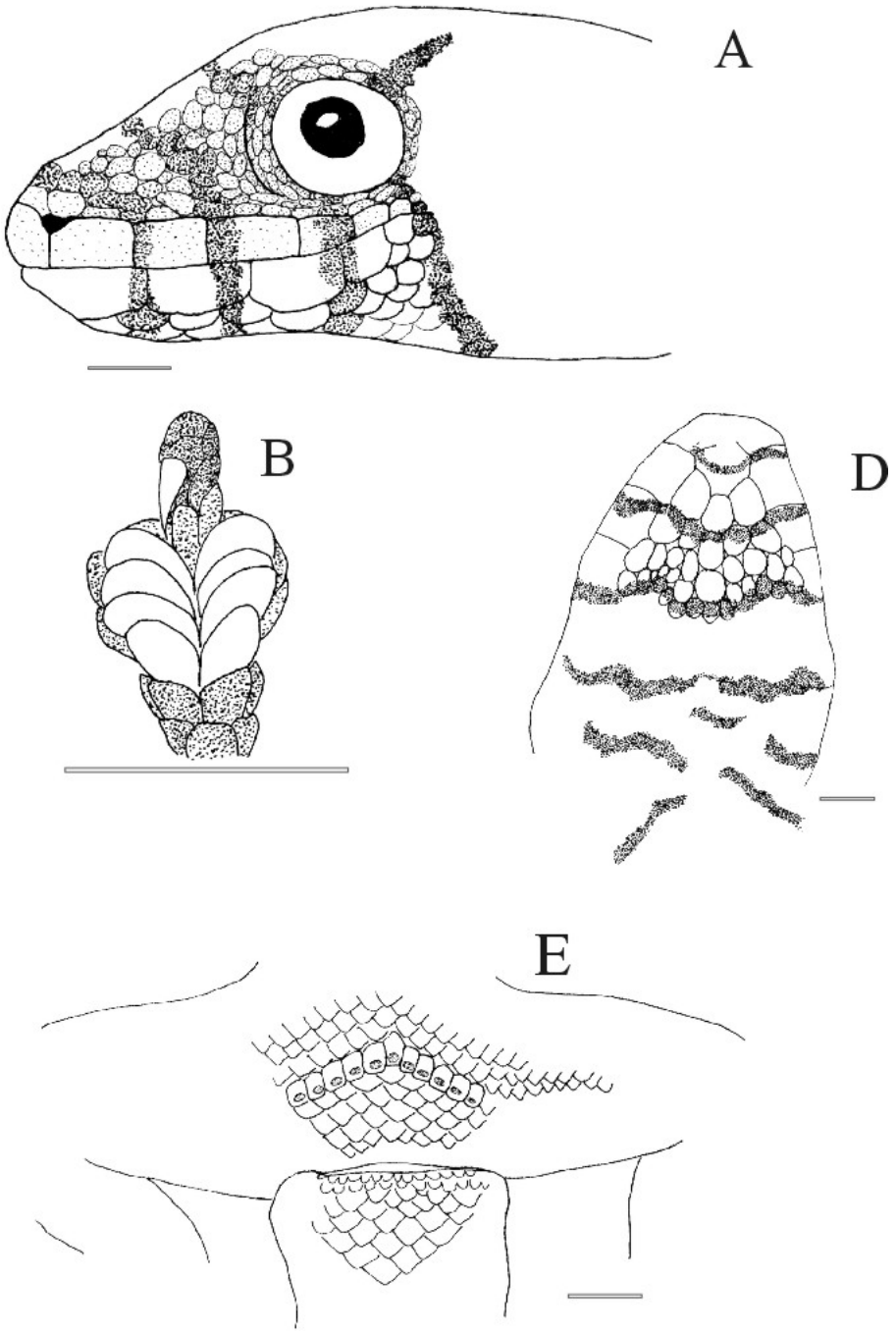


Figure 15. *Lygodactylus pauliani*, A, head in lateral view (scale bar = 2 mm); B, lamellae of fourth toe in ventral view (scale bar = 1 mm); C, head dorsal view (scale bar = 2 mm); D, throat in ventral view with mental scales (scale bar = 2 mm). Drawing 15A, 15B, 15D of female specimen MNHN (G.534-3) 28.81 (1990 7); 15C of female specimen MNHN (G.534-2) 14.81 (1990 202).

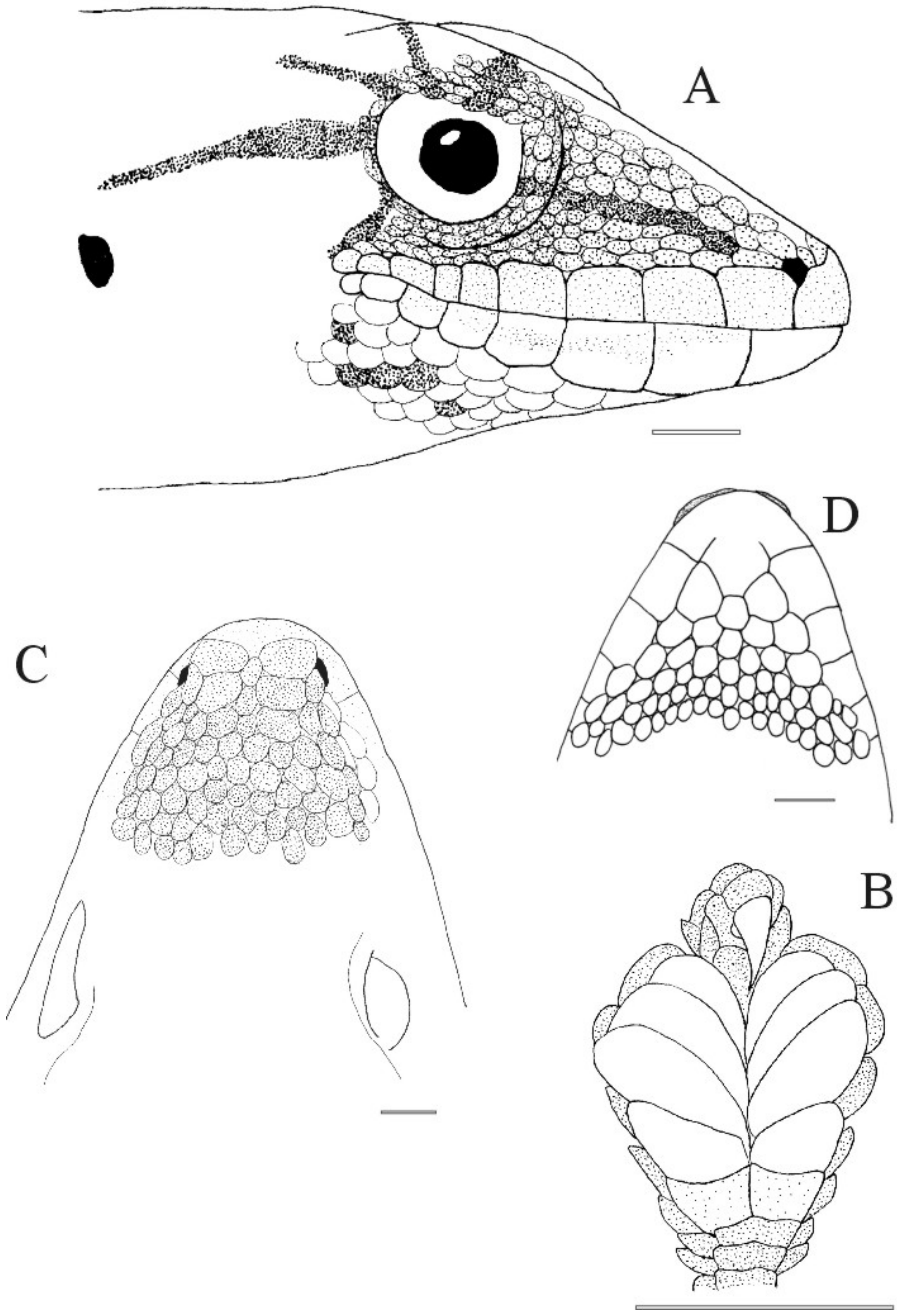


Figure 16. *Lygodactylus praecox*, A, head in lateral view (scale bar = 3 mm); B, lamellae of fourth toe in ventral view (scale bar = 1 mm); C, head dorsal view (scale bar = 2 mm); D, throat in ventral view with mental scales (scale bar = 3 mm). Drawing 16A, 16D of recently born specimen MNHN (G.539-1) 33.81 (1990 48); 16B, 16C of recently born specimen MNHN (G.539-2) 32.81 (1990 49).

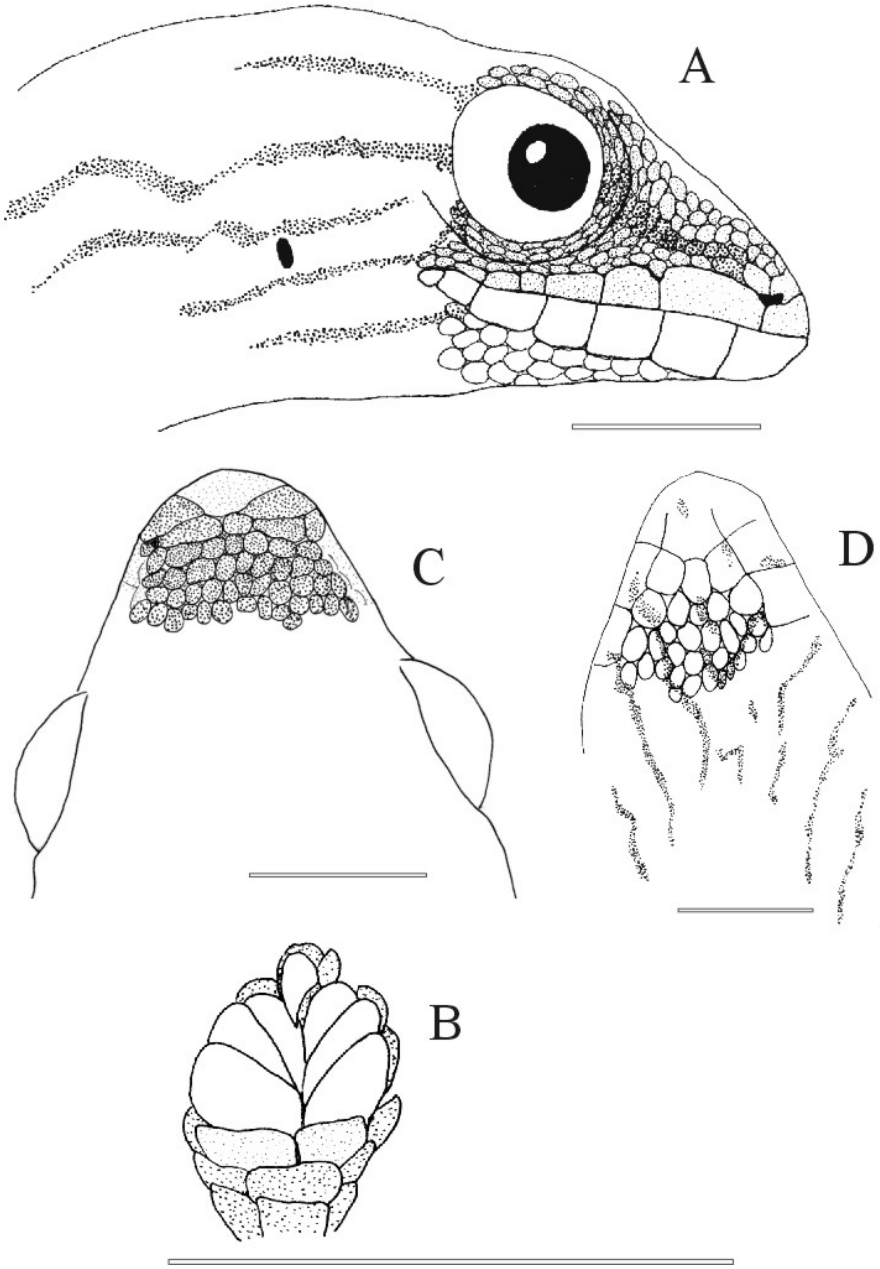


Figure 17.1. *Lygodactylus mirabilis*, A, head in lateral view (scale bar = 5 mm); B, lamellae of fourth toe in ventral view (scale bar = 2 mm); C, head dorsal view (scale bar = 2 mm); D, throat in ventral view with mental scales (scale bar = 2 mm); E, preanal pores in ventral view (scale bar = 5 mm). Drawing 17A, 17B, 17D, 17E of male specimen MNHN (G.571-6) 110.72 (1990 3605); 17C of male specimen MNHN (G.571-10) 145.59P (1990 3582).

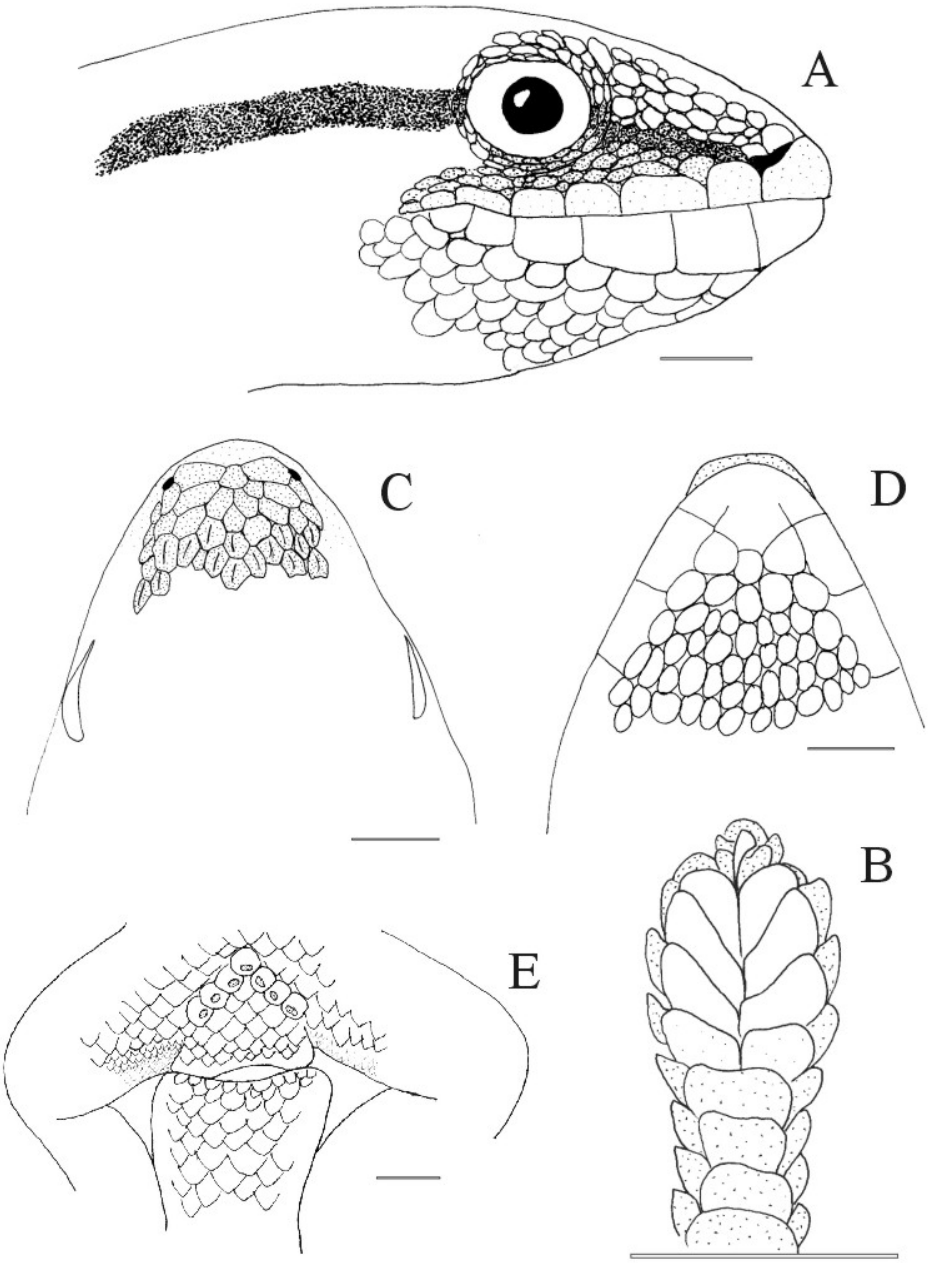


Figure 17.2. Asulcal and sulcal view of the hemipenis of *Lygodactylus mirabilis* ZSM 389/2000 (FG/MV 2000-428). Scale bar represents 1 mm.

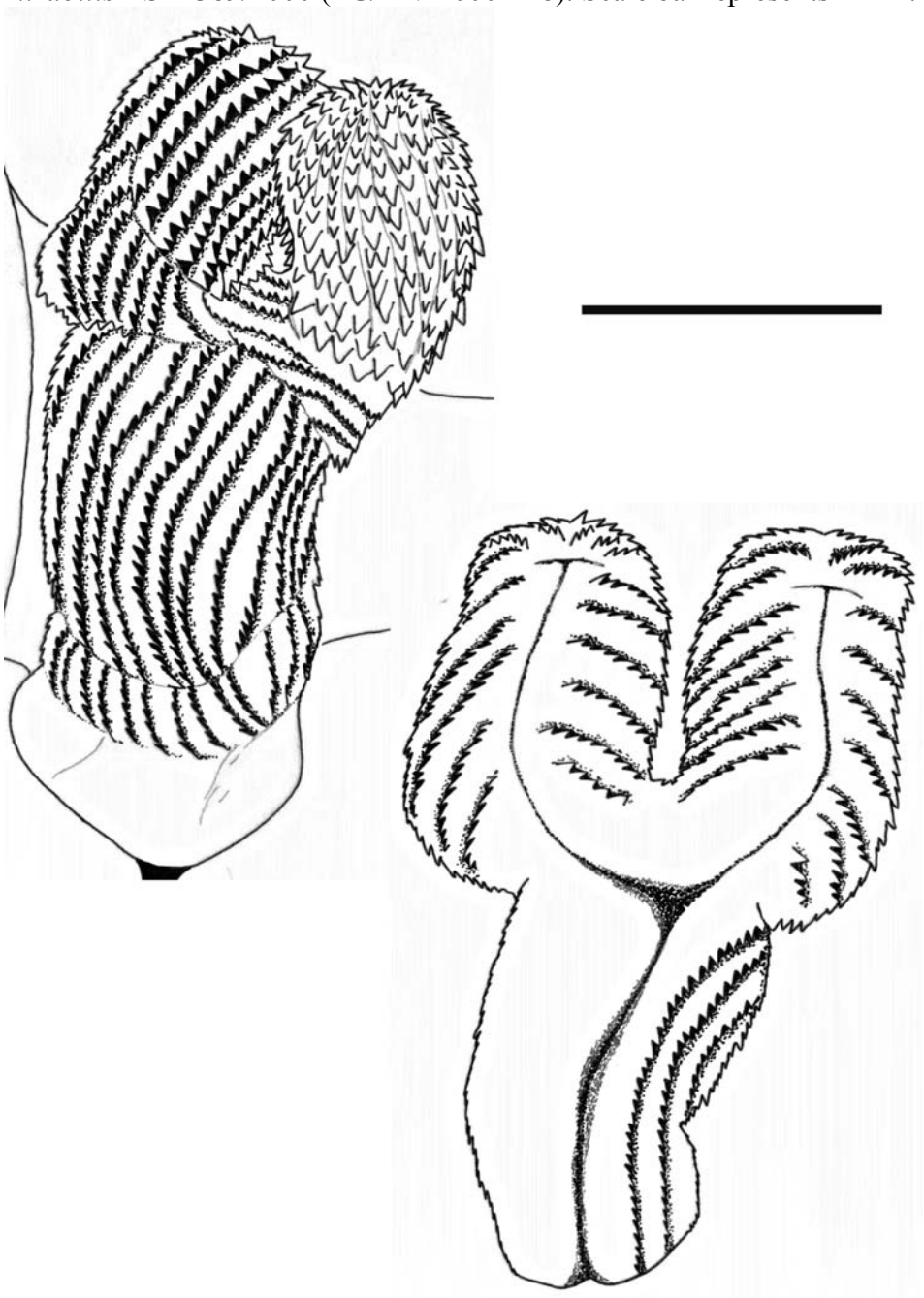


Figure 18. *Lygodactylus intermedius*, A, head in lateral view (scale bar = 2 mm); B, lamellae of fourth toe in ventral view (scale bar = 2 mm); C, head dorsal view (scale bar = 5 mm); D, throat in ventral view with mental scales (scale bar = 5 mm); E, preanal pores in ventral view (scale bar = 5 mm). Drawing 18A, 18C, 18D, 18E of male specimen MNHN (G.537-2) 1114.75 (1990 52); 18B of female specimen MNHN (G.537-2) 99.72 (1990 54).

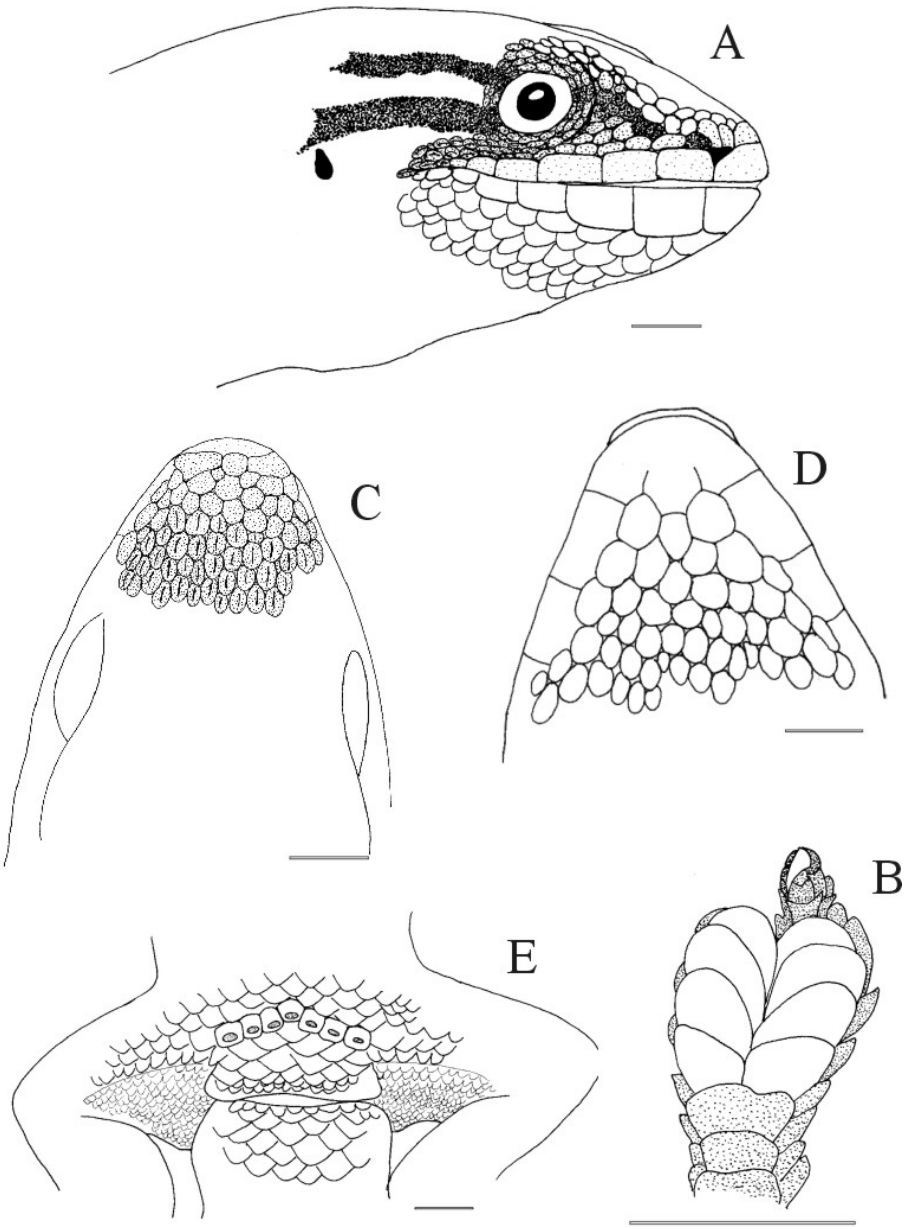


Figure 19.1. *Lygodactylus montanus*, male specimen MNHN (G.521-7) 52.72 (1990 3499). A, head in lateral view (scale bar = 5 mm); B, lamellae of fourth toe in ventral view (scale bar = 1 mm); C, head dorsal view (scale bar = 1 mm); D, throat in ventral view with mental scales (scale bar = 5 mm); E, preanal pores in ventral view (scale bar = 2 mm).

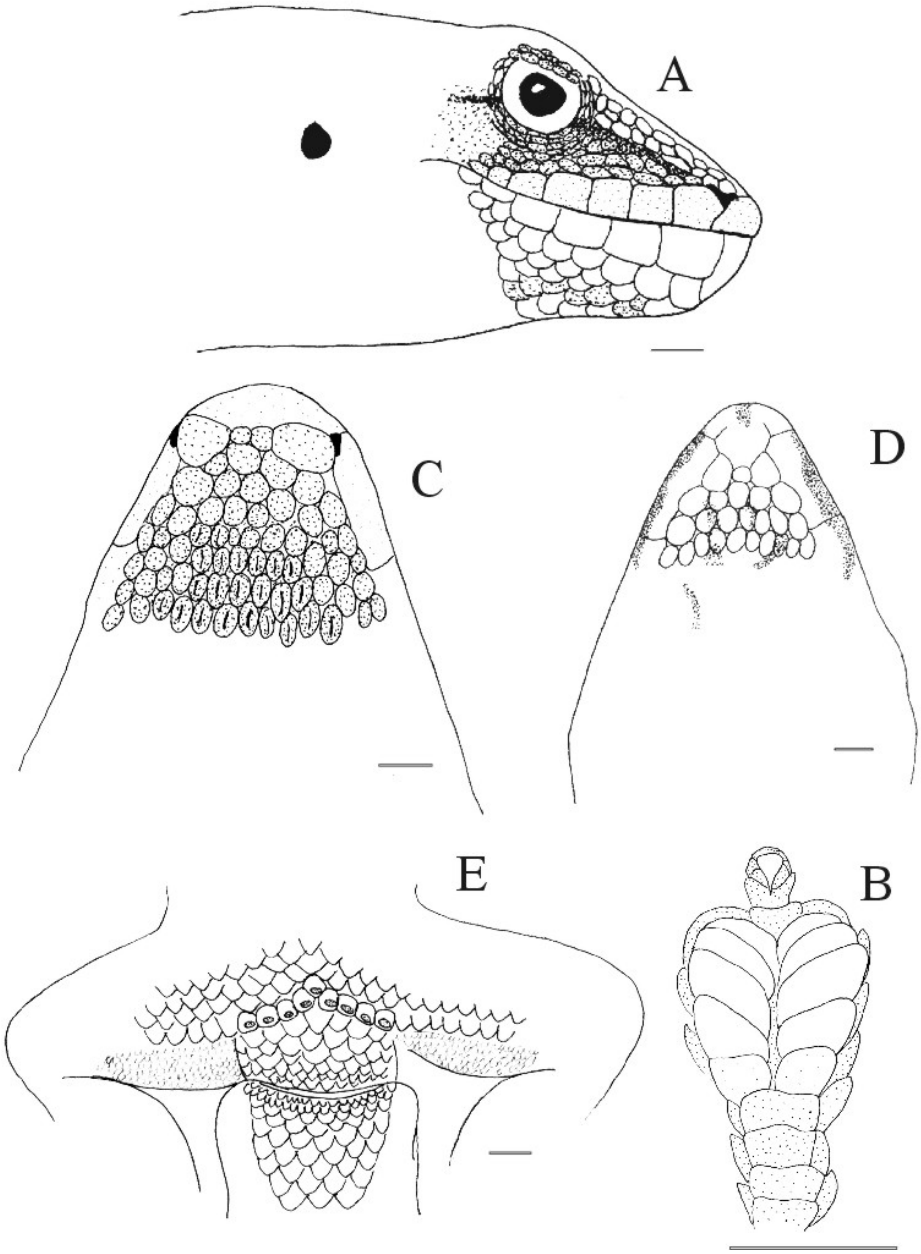


Figure 19.2. Sulcal and asulcal view of the hemipenis of *Lygodactylus montanus* (FGZC 2394). Scale bar represents 1 mm.

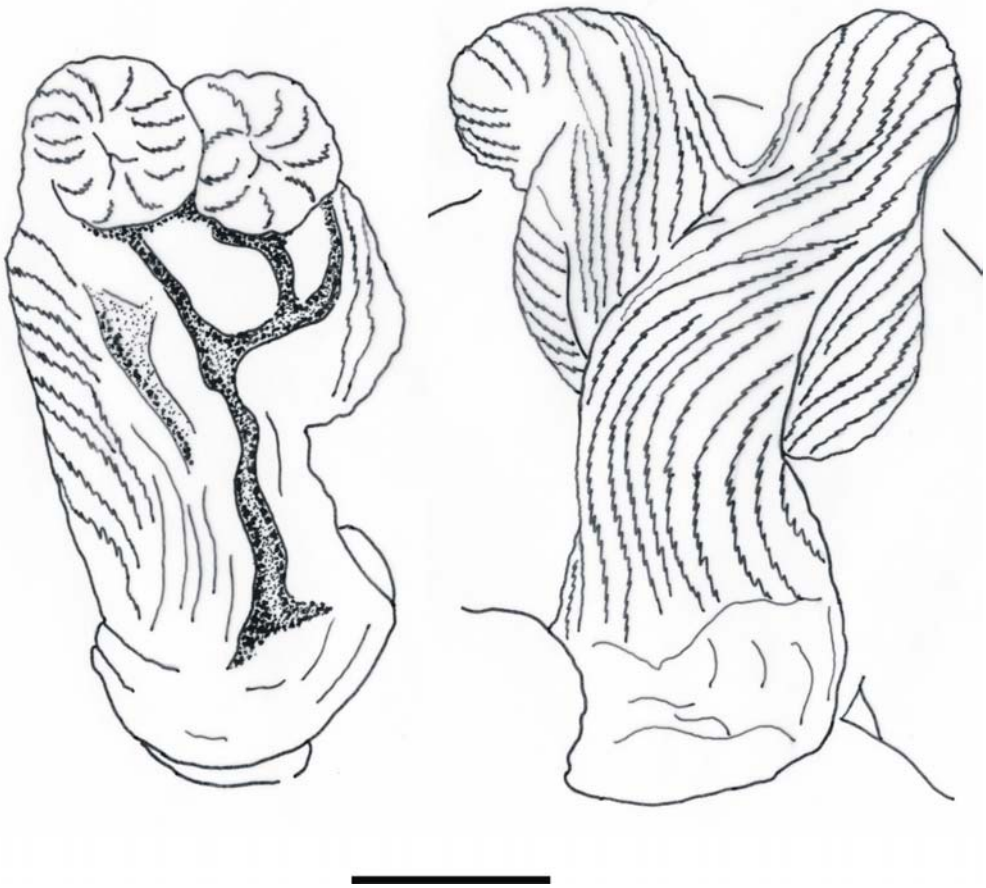


Figure 20. *Lygodactylus blanci*, A, head in lateral view (scale bar = 5 mm); B, lamellae of fourth toe in ventral view (scale bar = 2 mm); C, head dorsal view (scale bar = 5 mm); D, throat in ventral view with mental scales (scale bar = 5 mm); E, preanal pores in ventral view (scale bar = 5 mm). Drawing 20A, 20C, 20D of female specimen MNHN (G.523-3) 171.72 (1990 1897); 20B of female specimen MNHN (G.523-3) 167.72 (1990 1895); 20E of male specimen MNHN (G.523-2) 6.66 (1990 10).

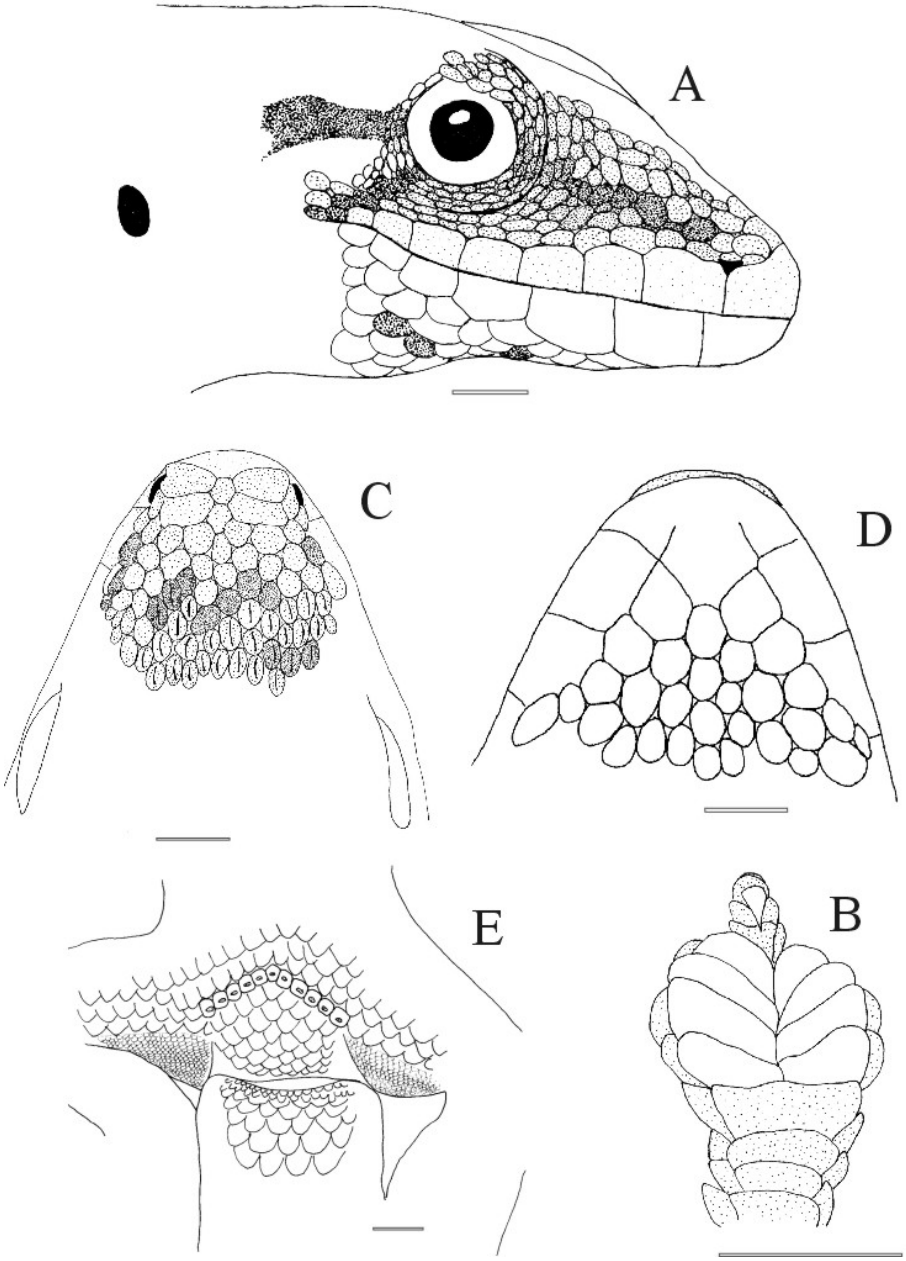


Figure 21.1. *Lygodactylus sp. nov.*, A, head in lateral view (scale bar = 5 mm); B, lamellae of fourth toe in ventral view (scale bar = 2 mm); C, head dorsal view (scale bar = 5 mm); D, throat in ventral view with mental scales (scale bar = 5 mm), E, preanal pores in ventral view (scale bar = 5 mm). Male specimen FGZC 2324.

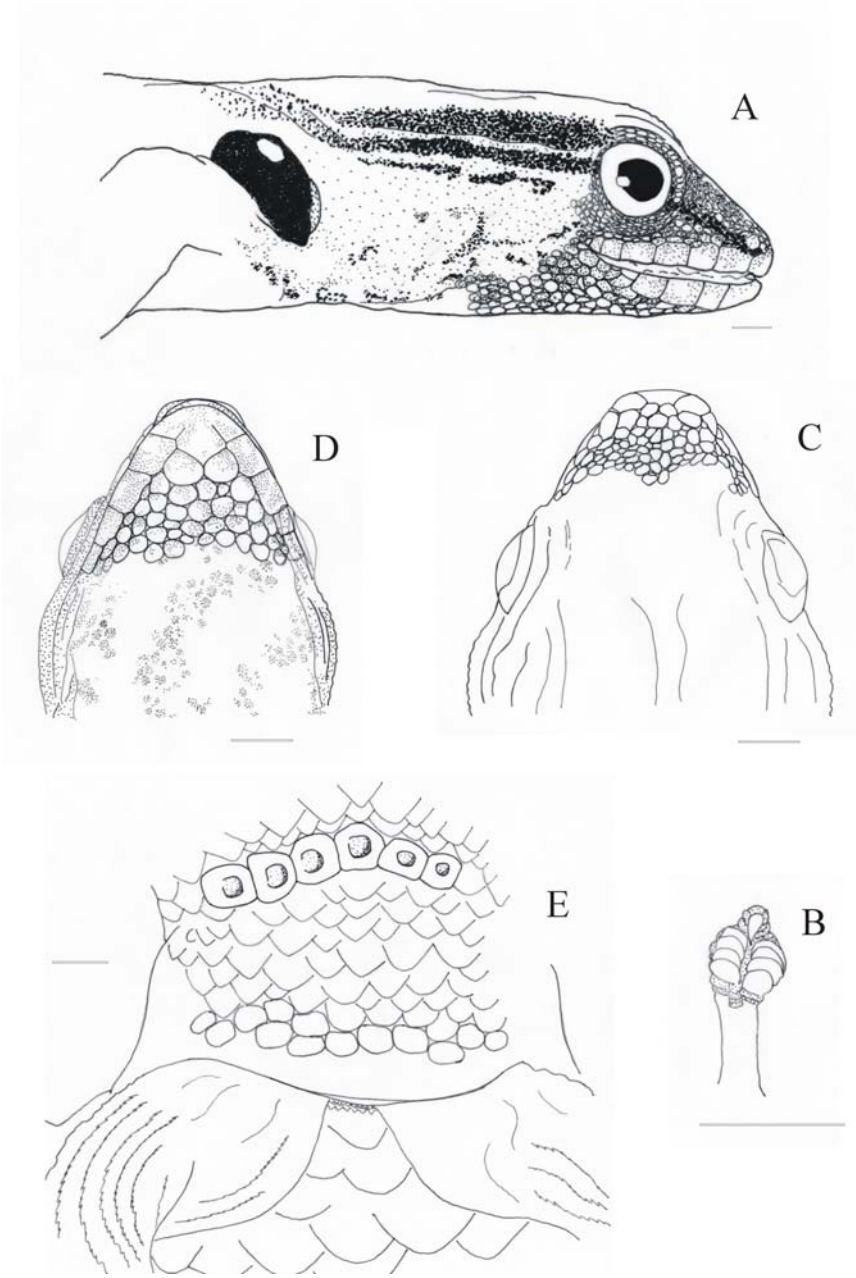


Figure 21.2. Sulcal and asulcal view of the hemipenis of *Lygodactylus sp. nov.* (FGZC 2324). Scale bar represents 1 mm.

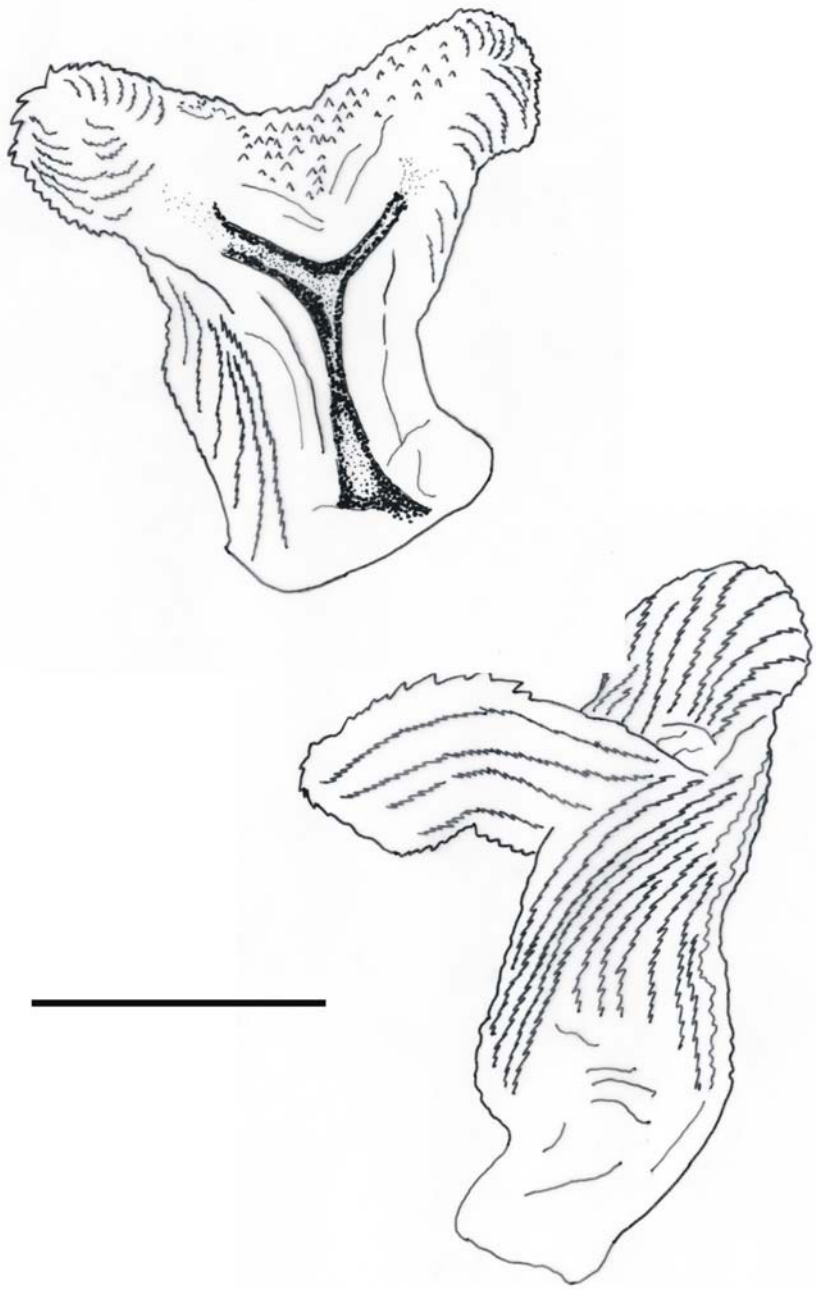
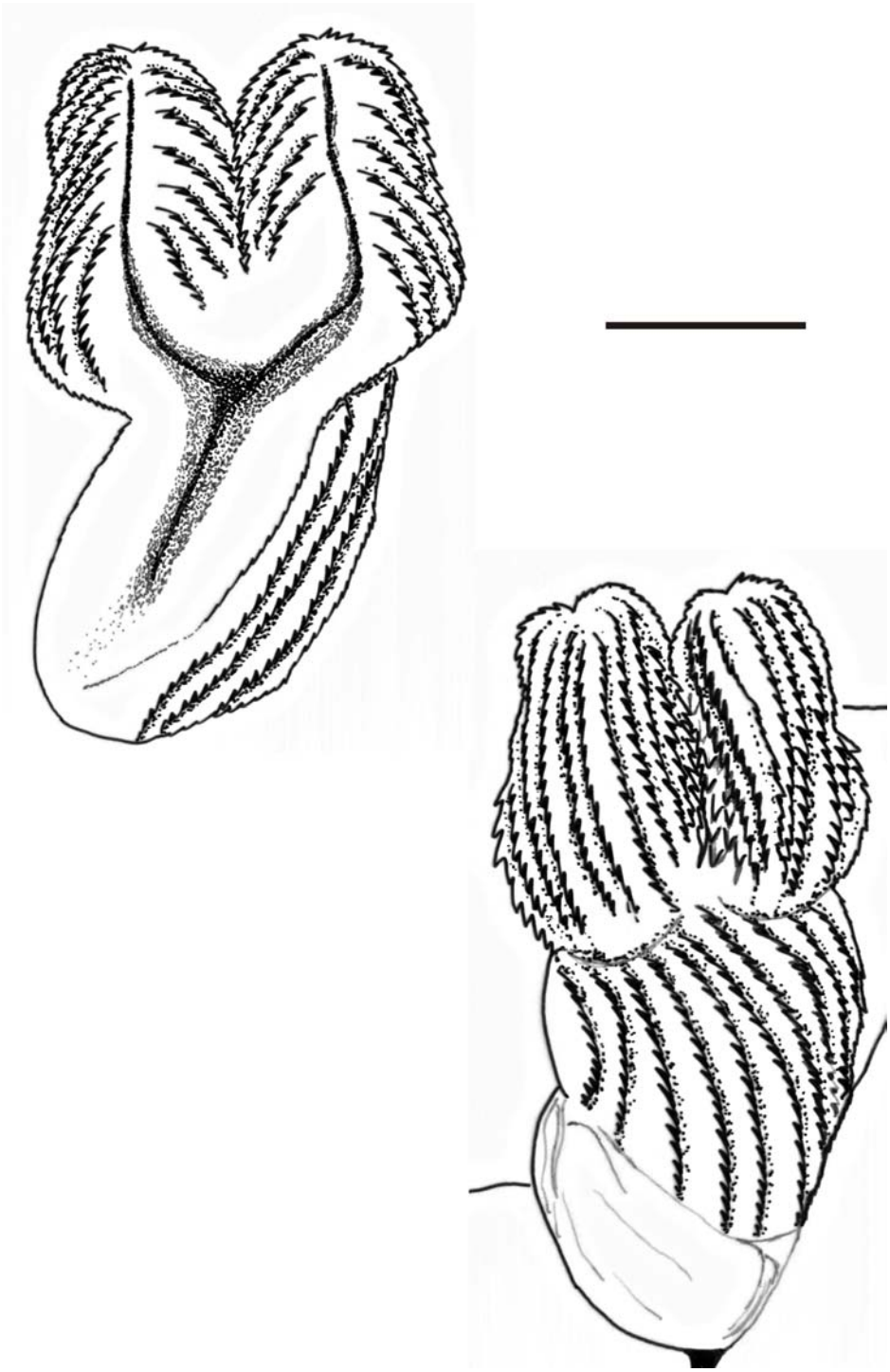


Figure 22. 2. Asulcal view of the hemipenis of *Lygodactylus. bivittis*. ZSM 496/2000. Scale bar represents 1 mm.



IV.4. - *Lygodactylus* systematics based on 16S rRNA mitochondrial gene

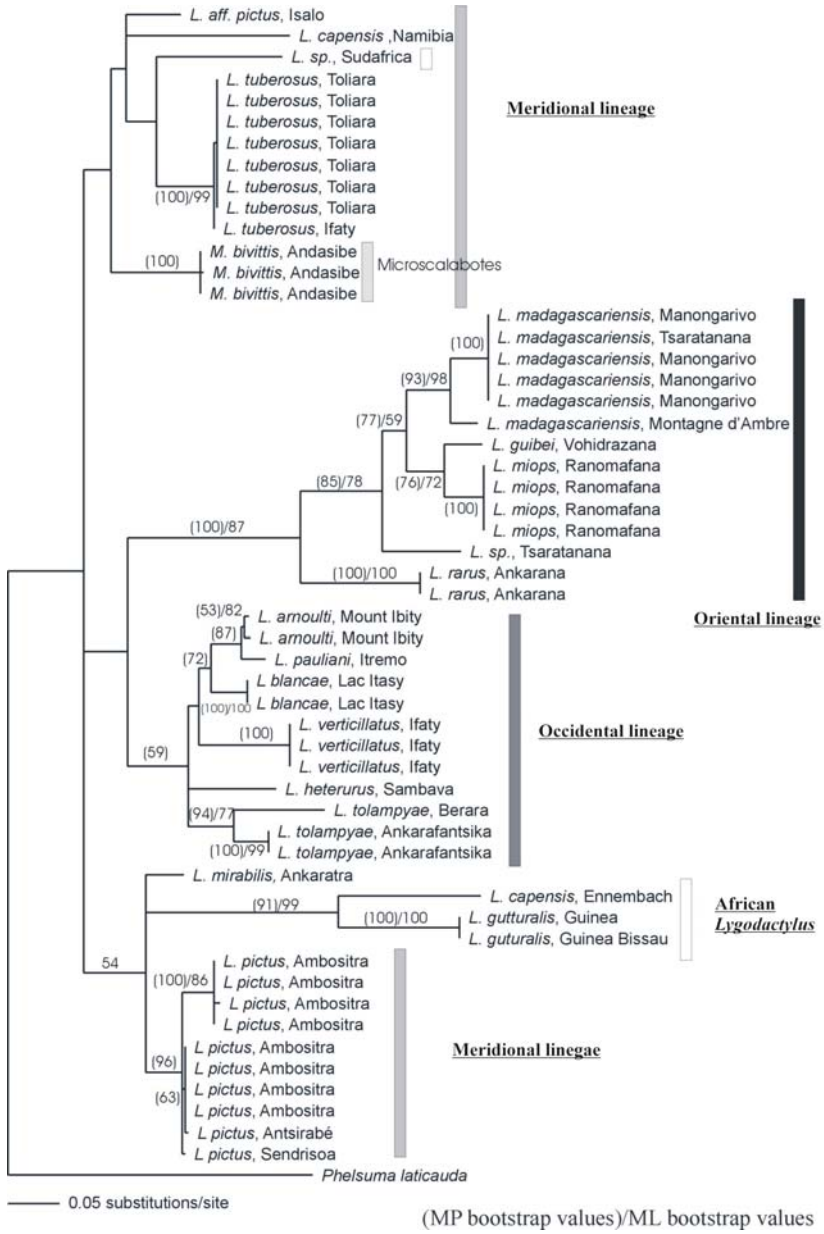
In order to infer genetic relationships among the Malagasy species of *Lygodactylus*, a fragment of the mitochondrial 16S rRNA gene was sequenced from 49 specimens that belong to 15 out of the 22 known Malagasy species (Table 1). Four species of *Lygodactylus* from Africa were included as well as a close related diurnal Malagasy gecko *Phelsuma laticauda* as an outgroup. After removing hypervariable regions and gapped sites, a sequence alignment of 412 bp length was obtained comprising 92 polymorphisms. The calculated maximum likelihood phylogram can be seen in Figure 23.

In all cases, specimens that belong to the same Malagasy species in the maximum likelihood phylogram were placed together at the same branch with supportive maximum parsimony bootstrap values, for instance *L. tuberosus* (100), *L. bivittis* (100), *L. madagascariensis* (98), *L. miops* (100), *L. verticillatus* (100), *L. tolampyae* (100), and *L. pictus* (96). Within several species, divergences among conspecific individuals were observed. For instance, among individuals of *L. tolampyae* from Berara and Ankarafantsika (12% pairwise sequence divergence) and among *L. madagascariensis* from Montagne d'Ambre and Manongarivo/Tsaratanana (1-12% pairwise sequence divergence). Within the *L. pictus* population of Ambositra, two divergent haplotypes were found to coexist. One individual from Isalo tentatively assigned to *L. pictus* was placed at a large distance from all other included haplotypes of this and other species.

The phylogenetic tree reflects as well the grouping of the Malagasy species into three *Lygodactylus* lineages (species of the Mountain lineage were not included) as shown in Figure 23.

However, only the monophyly of the Oriental lineage was supported by sufficiently high bootstrap values (100% MP or 87% ML bootstrapping). *Lygodactylus bivittis* (former *Microscalabotes bivittis*) is placed within species of the Meridional lineage. The African *Lygodactylus* species included in the study are placed at very different positions within the phylogram, in both cases nested among the Malagasy taxa and not as a sister group to the Malagasy *Lygodactylus* species. *Phelsuma laticauda* served as an outgroup to all *Lygodactylus* species and was placed according to its highest genetic distance within the tree.

Figure23. Maximum likelihood phylogram of Malagasy *Lygodactylus*, based on 505 nucleotides of the mitochondrial 16S rRNA gene (hypervariable regions and gapped sites excluded). Numbers at nodes are bootstrap values in percent from a maximum likelihood analysis (100 replicates of a reduced set of taxa, with only single representatives of each species) and maximum parsimony (1000 replicates; in italics). *M. bivittis* (*Microscalabotes*) is referred in the text as *L. bivittis*.



V.-DISCUSSION

The species of the genus *Lygodactylus* are difficult to distinguish because of their small size and their cryptical colour pattern. Reliable determination and identification within this genus is hardly possible in the field and requires the use of optical tools. Most discriminative characters are related to scale features, which show a high interspecific variability. However, sometimes such features show as well variability among individuals of one species and thus exceptions may occur. In these cases, a combination of several characters has to be taken into consideration. In our actualized identification key we describe the characters needed for determination of the main Malagasy lineages of the genus *Lygodactylus* first and subsequently the relevant characters for species determination. Additionally, for each species we provide illustrations showing a schematic overview of the principal characters (see chapter IV.2).

V.1.- Morphological systematics in Malagasy *Lygodactylus*

Mountain lineage

The Malagasy species within the *Lygodactylus* genus were grouped by Pasteur (1965) into three main lineages, the Occidental, the Meridional, and the Oriental lineage. Although our studies supported Pasteur's classification of the Malagassy species with newly collected specimens, we suggest the extension with the Mountain lineage as an additional main group.

The Mountain lineage includes four species with habitats up to 2000 m above sea level and sharing common morphological characters. On the one hand dorsal scales are non-granular, but keeled or pseudokeeled and on the other hand, the dorsal pattern is distinct striated or ocelated, also the hemipenial structures in

males are formed by short arms. We group into this new lineage *L. mirabilis* and *L. intermedius*, which were not assigned by Pasteur to any of the *Lygodactylus* lineages before, and in addition *L. montanus* and *L. blanci*, which were originally assigned by Pasteur to the Meridional lineage.

Oriental lineage

The Oriental lineage shows several characters that, occurring in combination, clearly distinguish this lineage from the remaining known Malagasy species of *Lygodactylus* as well as from examined species of *Lygodactylus* from Africa (*L. thomensis*, *L. somalicus*, *L. rex*, *L. picturatus*, *L. ocellatus*, *L. grotei*, *L. grandisonae*, *L. fischeri*, *L. chobiensis*, *L. capensis*, *L. bradfieldi*, *L. bonsi*, *L. angularis*, *L. angolensis*) and South America (*Lygodactylus klugei*). The species of this lineage have undivided mental scales, which are followed by two postmental scales. The first finger is present, but lacking the claw. Throughout the Oriental lineage there is sexual dimorphism in contrast to the other Malagasy lineages. The males have postanal sacs, 5-7 preanal pores, and characteristic hemipenial structures with lobuls instead arms and lacking papillae fields.

In the area of north Madagascar (including Nosy Be, Ankarana, Montagne d'Ambre, Tsaratanana regions) a high number species can be found with overlapping habitats (at least four species: *L. expectatus, L. madagascariensis, L. rarus, L. sp*. Tsaratanana) . This indicates that the initial diversification of the Oriental lineage may have occurred in the north of Madagascar, which also today is the center of diversity of the genus. Both, the two most basal taxa *L. rarus* and *L. sp*. from Tsaratanana, which occur in the north and north-west of Madagascar, as well as *L. miops* and *L. guibei* from the north-eastern rainforest belt form a well supported monophyletic group. Reports in the literature strengthen this hypothesis, for instance Andreone *et al.* (2000) suggest that north-eastern Madagascar is an important area of

biodiversity and exhibits a high degree of habitat specialisation and endemicity in the herpetofauna and in north-western part of Madagascar important biodiversity areas can be found , for instance the island Nosy Be is the type locality of several amphibian and approximately 60 reptile species, including *Lygodactylus madagascariensis* (Andreone *et al.* 2003).

Meridional lineage

Pasteur (1964) describes the Meridional lineage as a group formed by the species *Lygodactylus robustus*, *L. tuberifer* and *L. montanus* based on the geographical distribution. Later Pasteur adds *L. blanci* (1967) to the same group due to its morphological similarities with *L. montanus*.

We reconsidered this lineage according to morphology and the southern distribution. We suggest regrouping the species such that two groups belong to this lineage. The *L. pictus* group contains *L. pictus* (former *L. robustus*) and *L. tuberosus* and the *L. bivittis* group contains *L. bivittis*. We also include the descriptions of a new species from Manantantely (South Madagascar), and we suggest assigning it to the *L. pictus* group of the Meridional lineage.
The common characteristics of this lineage are their southern distribution and as morphological characters, the divided mental scale, two postmental scales, no distinct dorsal pattern with beige-brownish colouration, and males having 6-9 preanal pores.

Because of their morphology and distribution we assign *L. montanus* and *L. blanci* to the Mountain lineage and *L. tolampyae* (former *L. tuberifer*) to the Occidental group.

Occidental lineage

There are several species of *Lygodactylus* that have been described on the basis of a relatively low number of individuals. Because, in general, these lizards are morphologically rather

uniform, some minute scale characters are often crucial to distinguish between closely related species. However, the intra- and interpopulational variation of these characters has often not been properly assessed.

The Occidental lineage was divided by Pasteur (1965) into three main groups. Our data supports many of Pasteur's findings, for instance the assignment of *L. verticillatus*, *L. heterurus*, *L. decaryi*, *L. arnoulti*, *L. blancae* and *L. klemmeri* the *Lygodactylus verticillatus* group as well as *L. tolampyae* forming the *Lygodactylus tolampyae* group.

Pasteur refers *L. praecox* to the *L. verticillatus* group (Pasteur, 1995). However, after reinspecting the two immature specimens Pasteur's observations were based on, we believe that *L. praecox* belongs undoubtedly to the Occidental lineage, but not to the *L. verticillatus* group. The main reason for this reassignment is the absence of verticilles in the tail compared to the *L. verticillatus* group with distinct verticillated tails. We therefore assign *L. praecox* together with *L. ornatus* to a new group named *Lygodactylus ornatus* group, whose main characters are the absence of verticillated tail and a distinct gular pattern.

L. pauliani was considered as an intermediate species between the *L. tolampyae* and *L. verticillatus* group (Pasteur & Blanc, 1991). As such, we include this species in its own group *L. pauliani*. No males of this species are known, but to confirm the parthenogenetic hypothesis of this species, further biological and reproductive studies would be needed.

We decided not to include *L. pauliani* within the *L. verticillatus* group, because of the 3-4 adhesive lamellae in the fourth finger (versus three in all the members of *L. verticillatus* group) and because the tail is not verticillated. *L. pauliani* is not placed within the *L. ornatus* group, because of the absence of distinct gular stripes and because of the ocelated dorsal pattern, a

character which cannot be found in the *L. ornatus* group. *L. pauliani* as well shows differences to the *L. tolampyae* group, such as the the missing broad contact between the mental and the infralabial scales (a stable character in the *L. tolampyae* group) and the distinct ocelated pattern (absent in the *L. tolampyae* group).

Lygodactylus klemmeri Pasteur 1964, has been described on the basis of an adult male specimen from Antsingy forest in western Madagascar. This specimen could not be retrieved during recent years in the Paris collection and might be lost. Hence, the only existing information on this gecko is the original description and some subsequent remarks on the holotype by G. Pasteur. However, we report on new material of *L. klemmeri* from the collection of the University of Antananarivo and provide descriptions and diagnosis of the new material.We describe the colour pattern, although the study was carried out based on specimens few years after their collection. Among the morphological data presented, we wish to stress the presence of only one internasal scale, a character not mentioned in the original description of the species. According to our data set, this character can be highly variable in some representatives of the *Lygodactylus verticillatus* group (*L. arnoulti*, *L. decaryi*, *L. blancae*, and *L. verticillatus*), but it seems to be a stable character in other species like *L. pauliani* and *L. blanci*. Morphologically, *L. klemmeri* shows close affinities to *L. heterurus* from northern Madagascar but the latter differs by having two internasal scales (versus one in *L. klemmeri*). In addition, there are some possible differences in number and pigmentation of preanal pores (11 pigmented pores in *L. heterurus* vs 9–10 unpigmented in *L. klemmeri*), in the pattern of ventral stripes (restricted to the throat in *L. klemmeri*), and the tail morphology (possibly less strongly verticillated in *L. klemmeri*). These data provide evidence for the status of *L. klemmeri* as separate species. This species seems to be a local endemic of the Bemaraha area in western Madagascar. This emphasizes the importance of this area as a centre of

endemism and the conservational importance of Bemaraha National Park.

V.2.- Morphometric and meristic characters

A reliable determination within the genus *Lygodactylus* depends on the choice of important diagnostic features. In the following, several discriminative characters are discussed that can be used for determination of lineages, groups within lineages, and of single species.

The discriminative features for lineages are the shape of the dorsal scales (not granular in the Mountain lineage and granular in the other three lineages), the presence of the claw in the first finger (absent in the Oriental lineage and in the *L. mirabilis* group of the Mountain lineage), the mental scale (undivided in the Oriental lineage and divided in all the other lineages), the number of postmental scales (mostly two in the the Oriental and Meridional lineage and three for all the other lineages), the number of preanal pores in males (5-7 in the Oriental lineage, 7-9 in the Meridional lineage, 9-15 in the Occidental lineage, and 7-11 in the Mountain lineage), and the characteristics of the dorsal pattern (typical distinct ocelated pattern in the Mountain lineage that otherwise only occurs in *L. arnoulti* and *L. pauliani* from the Occidental lineage).

Discriminative characters for groups within the lineages are the verticillation of the tail (verticillated only in the *L. verticillatus* group of the Occidental lineage and not verticillated in all the other groups), the gular colour pattern (distinct in *L. ornatus* group within the Occidental lineage), and the previously decribed presence of the claw in the first finger (absent in the *L. mirabilis* group of the Mountain lineage which otherwise only occurs in the Oriental lineage). Within the Mountain lineage, the dorsal pattern can be striated or ocelated, but if it appears striated then is this an additional unique character among all Malagasy *Lygodactylus*.

There are several single characters that can be already seen as discriminative characters for species determination within lineages. For instance, *L. miops* can be identified if five postpostmental scales and an undivided mental scale (a character of the Oriental lineage) are found. *L. rarus* is the only species with a dark-white striped tail. *L. bivittis* has two characteristic light longitudinal stripes and undivided finger lamellae. *L. sp. nov*. Manantantely has two big and distinct spots in the neck, and can be differentiated from three other species with smaller spots in the neck as follows: from *L. expectatus* by the divided mental scales, from *L. verticillatus* by a not-verticillated tail and two postmental scales, and from *L. tuberosus* by the absence of the claw on the first finger. *L. guibei* is the only species within the Oriental lineage that has tubercles at the tail. *L. tolampyae* has a characteristic broad and distinct contact between the mental scale and the infralabials that can be identified in direct comparison with species of the other groups of the Occidental lineage.

It is worth to mention that variable characters, although being not informative enough when taken solely, can be quite helpful for determination in combination with other characters. These are the internasal scales, the postpostmental scales, the infra and supralabial scales, the number of adhesive lamellae in the fourth finger, the dorsolateral tubercles, the snout-vent length (SVL), the number of preanal pores as well as the surrounding scales. For instance, in *Lygodactylus* the SVL can vary between approximately 20 and 40 mm among lineages and even within species. However, if the lineage is known for a given specimen, it could be shown that within the Mountain lineage SVL can discriminate between the two species *L. mirabilis* and *L. blanci* (Figure 25).

Sexual dimorphism in *Lygodactylus* is not much pronounced. In the field, adult males can only be recognized by the presence of preanal pores and by the presence of a hemipenis,

but only on treated specimens after injection of ethanol. The body shape and body size are a common difference between males and females in other lizards (Andersson 1994, Hews 1996, Olson *et al*. 2002). However, as could be seen exemplarily on *Lygodactylus tuberosus*, no significant snout-vent length difference could be found by measuring 126 adult males and 99 females (Figure 26).

The hemipenis is an important character to distinguish lineages. In the case of the Oriental lineage (Figures 1.2, 2.2, 5.2), the hemipenis have a short pedicel (0.5-1 mm) relative to the apex, and instead of arms, the hemipenis are formed by two big lobes without a distinct papillae field. In *L. rarus* however, the papillae field is faint or not distinct compared to the other lineages. In contrast to the remaining lineages, the hemipenis of the Oriental lineage have deep calyces instead papillae fields, which are absent around the sulcus spermaticus in the sulcal side. In the Meridional lineage (Figures 7.2, 21.2, 22), the hemipenis are subcylindrical and are characterized by a relatively large pedicel (ca. 1.8-2 mm) and relatively short arms (0.8-1.5 mm). The truncus and the arms are covered with papillae fields formed by spines that are absent in the sulcal side. The Sulcus spermaticus is formed by two channels. The Occidental lineage (Figures 9.2, 12.2, 13.2) shows two different kinds of hemipenis. Usually, the pedicel is 1.5-2.5 mm long, the arms are relatively long with ca. 1.5-2 mm, no papillae fields can be found in the sulcal side. But in the case of *L. tolampyae* (Figure 13.2), the arms are very long (2.5 mm) and the papillae fields are also present in the sulcal side. The specimens examined from the Mountain lineage show rather short hemipenial arms (0.5-1 mm) relative to a long pedicel (1.8-2 mm). The hemipenis is covered by distinct papilae fields formed by spines. The sulcal side has no papillae fields.

V.3.- *Lygodactylus* systematics based on 16S rRNA mitochondrial gene

One common way to test the conclusiveness of traditional systematics based on morphological data is the comparison with phylogenetic trees based on DNA sequence data (Estes *et al.* 1988). For instance, the construction of phylogenetic trees by sequencing two mitochondrial genes (cytochrome b and 12S rRNA) could be used to reassess the phylogeny of the genus *Tarentola* (Carranza *et al*. 2000). In our study, we present results of a phylogenetic analysis of 15 available (from 22) Malagasy *Lygodactylus* species and additional four from Africa, based on partial sequences (498 bp) of the mitochondrial 16S rRNA gene.

Our phylogenetic tree is in accordance to our grouping based on morphological data and to Pasteur's grouping, since the Oriental, the Occidental and the Meridional lineage could be resolved. With sufficiently high bootstrap values the monophyly of the Oriental lineage was supported. This result is consistent with the morphological characters of the Oriental lineage. There are several characters, for instance the mental undivided scales with two adjacent submental scales, the absent claw in the first finger, the presence of postanal sacs, and the hemipenis structure that clearly distinguish this lineage from the other Malagasy lineages. This might further explain Pasteur's former assignation of the species from Oriental lineage in a separate subgenus called *Domerguella* within *Lygodactylus* (Pasteur 1964). Unfortunately, no sequence data of any species from the Mountain lineage were included in the analysis and thus no conclusions can be made about the corroboration of the grouping based on morphology can be drawn for the Mountain lineages within the Malagasy *Lygodactylus*.

A total of 49 specimens belonging to 15 Malagasy species of *Lygodactylus* were included in the molecular analysis. With supportive bootstrap values specimens of the same species were

placed at the same branch. However, within several species, divergences among conspecific individuals were observed. In the case of *L. madagascariensis*, one specimen ZSM-FGMV 2002.778 is placed on a separate branch than the remaining five specimen of this species (Figure 27). It turned out that this particular specimen was sampled at Montagne d'Ambre, which is the type locality of a different subspecies *L. madagascariensis* subsp. *petteri*, whereas the other specimen belong to *L. madagascariensis* subsp. *madagascariensis* and were sampled Manongarivo and Tsaratanana. As can be seen in Table 5, the pairwise sequence identity within the subspecies *madagascariensis* varies between 99-100%, whereas the sequence identity between the two subspecies is only 88% and thus explaining their position in the tree. Similarly, the divergence within conspecific individuals of *L. tolampyae* can be explained by their different geographic distribution, although all specimen show no morphological differences.

Figure 27. Divergences among conspecific individuals of the same species. Part of the maximum likelihood phylogram of the Malagasy *Lygodactylus* (Figure 23) comprising *L. madagascariensis* and *L. tolampyae*. For each specimen, the type locality and in brackets the respective Genbank sequence identifier as well as the field number is given. For *L. madagascariensis*, the specimen with field number FGMV 2002.942 belongs to *L. madagascariensis* subsp.*petteri*, whereas the remaining specimens belong to *L. madagascariensis* subsp. *madagascariensis*. Numbers at nodes are bootstrap values in percent from a maximum likelihood analysis

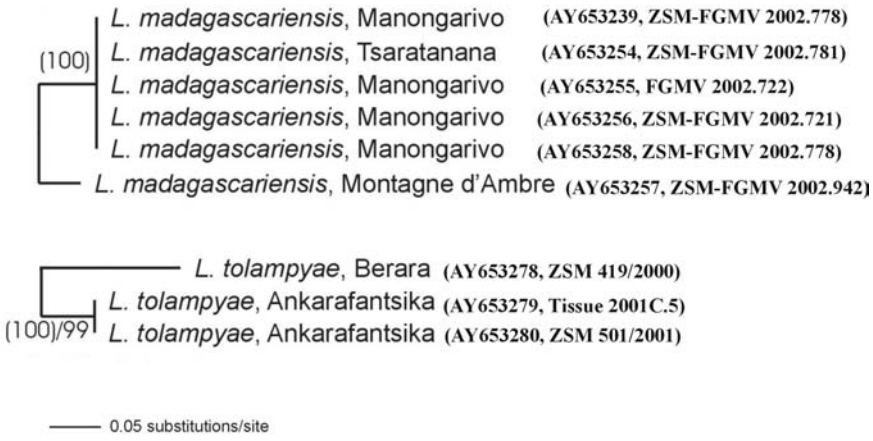


Table 5. Sequence identity matrix based on pairwise alignments of *Lygodactylus madagascariensis* 16S rRNA fragments. *L. mad.* = *Lygodactylus madagascariensis*. Identifiers in brackets correspond to 16S rRNA partial sequences deposited in the NCBI Genbank database. Asterisks indicate that the respective 16S rRNA sequence fragment belongs to *L. madagascariensis* subsp. *petteri*. Remaining unlabeled sequences correspond to *L. madagascariensis* subsp. *madagascariensis*. Sequence identities of 1 correspond to identical sequences.

	***L. mad.* (AY653239)**	***L. mad.* (AY653254)**	***L. mad.* (AY653255)**	***L. mad.* (AY653256)**	***L. mad.* (AY653258)**	***L. mad.** (AY653257)**
***L. mad.* (AY653239)**	1.000	0.990	0.990	0.993	0.990	0.880
***L. mad.* (AY653254)**	0.990	1.000	1.000	0.993	1.000	0.878
***L. mad.* (AY653255)**	0.990	1.000	1.000	0.993	1.000	0.878
***L. mad.* (AY653256)**	0.993	0.993	0.993	1.000	0.993	0.878
***L. mad.* (AY653258)**	0.990	1.000	1.000	0.993	1.000	0.878
***L. mad.** (AY653257)**	0.880	0.878	0.878	0.878	0.878	1.000

The weaker support in parts of our tree indicates that additional sequencing effort is necessary to substantiate the individual branches of the tree, but in addition it might also reflect the high genetic differentiation of these lizards.

Although, from our standpoint, more sequence data would be needed for a well supported phylogeny for *Lygodactylus*, our data already indicates that molecular studies have the potential to clarify several issues of the systematics and biogeography in *Lygodactylus*.

We could show that one specimen (ZSM 783/2001) was considered to be *L. madagascariensis madagascariensis* because of its morphology, and indeed the subsequent molecular analysis did not support the assignment of this specimen to *L. madagascariensis madagascariensis* due to the high genetic divergence to the in general genetically homogenous specimen we sequenced so far from this species. We therefore named this specimen *L. sp.* Tsaratanana according to its sampling place. Further analysis (e.g. resequencing of the fragment) has to proof its status of a new species. Similarly, while *L. aff. pictus* (ZMA 19595 from Isalo) morphologically is undistinguishable from the other ten specimens of *L. pictus* included in this study (see Table 1 and Figure 23), the molecular analysis suggests a grouping closer to *L. tuberosus*, but within the Meridional lineage. However, in this case specimen ZMA 19595 was the only specimen collected from the Isalo area and thus the observed genetic divergence might be explained by population structure.

Several other hypotheses are suggested by our data, but need further investigation. *Microscalabotes* was described as a genus related to *Lygodactylus* (Pasteur, 1965) according to a note from Boulenger (1883) in which he described two Malagasy specimens very similar to *Lygodactylus*, but with differences in the extremity structure having not divided adhesive lamelles.

Microscalabotes bivittis (referred in the text as *Lygodactylus bivittis*) is placed within the *L. tuberosus* in the tree and close to African species of *Lygodactylus* and thus indicating that the monotypic genus *Microscalabotes* might be a synonym of *Lygodactylus.* The highly similar hemipenial structures (to *L. montanus* Figure 19.2 and *L. mirabilis* Figure 17.2), and additional morphological characters (like granular dorsal scales, divided mental scales with two postpostmental scales) of this species compared to other *Lygodactylus* further strengthens this hypothesis.

Pasteur postulated in 1965 that Malagasy *Lygodactylus* were originated by a line which ancestor could be *Lygodactylus capensis* from the African continent. If the phylogenetic position of the African species within the Malagasy *Lygodactylus* species was corroborated, it would indicate a complex biogeographic history of the genus, possibly involving multiple and multi-directional dispersal events, similar to what was postulated for chameleons (Raxworthy et al., 2003).

VI.-CONCLUSIONS

With the analysis and discussion of the results, we conclude:

The determination within *Lygodactylus* is difficult because this genus consists of small-sized species with cryptically colour pattern. We describe the characters and give illustrations needed for determination of the main Malagasy lineages and the species of the genus *Lygodactylus*, providing an actualized identification key.

Our study supports Pasteur's classification of the Malagassy species based on newly collected specimens, and we suggest the extension with the Mountain lineage as an additional main group.

We regroup the Meridional lineage by *Lygodactylus pictus* and *L. bivittis* groups according to morphology and southern distribution. We also include to this lineage descriptions of a new species from Manantantely (South-East Madagascar).

We reorganize the groups within the Occidental lineage in *L. verticillatus*, *L. tolampyae*, *L. ornatus* and *L. pauliani* groups. We report on new material of *L. klemmeri* from the collection of the University of Antananarivo and providing description and diagnosis.

There are some discriminative characters available that can be used for determination of main lineages, groups within these lineages and single species. However there are many variable characters, although being not informative enough when taken solely, can be quite helpful for determination in combination with other characters.

We consider the hemipenial structures as a good discriminative character, able to separate main lineages, species group and in some cases species.

Our phylogenetic tree is in accordance to Pasteur's grouping, since the Oriental, Occidental and Meridional lineages could be resolved. The monopholy of the Oriental lineage was highly supported, this result is consistent with the morphological characters of this lineage.

Microscalabotes bivittis, described as a genus related to *Lygodactylus*, is placed in the tree within the *L. tuberosus*, indicating that this monotypic genus *Microscalabotes* might be a synonym of *Lygodactylus*.

If the phylogenetic position of the African species within the Malagasy *Lygodactylus* species is corroborated, it would indicate a complex biogeography history of the genus, possibly involving multiple and multidirectional dispersal events.

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