

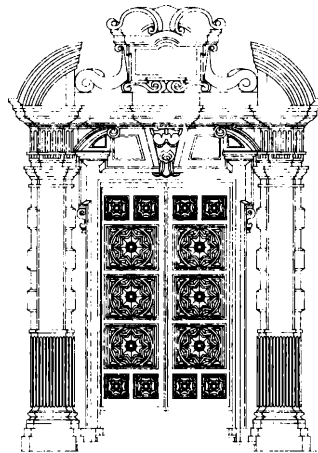
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## Osteological research on the genus *Kentropyx* from Argentina and revalidation of the specific status for *Kentropyx lagartija* (Gallardo, 1962) (Squamata: Teiidae)

Maria Esther Tedesco - José Miguel Cei



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Maria Esther TEDESCO \*, José Miguel CEI \*\*

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 (Squamata: Teiidae)

ABSTRACT

Cranial and post-cranial osteological characters of specimens belonging to western and eastern populations of *Kentropyx viridistriga* have been studied. Results of this research point out significant clear-cut morphological differences, in agreement with former studies of the Authors on exo-somatic characters of the same population samples. A subspecific status for western and eastern populations of *K. viridistriga* is then untenable, and in accordance with the lack of intergradation in their intermediate Chacoan contact area, a specific status for *Kentropyx lagartija* (Gallardo, 1962) as "evolutionary species" (sensu Frost and Hillis, 1990) is revalidated.

INTRODUCTION

The genus *Kentropyx* (Spix, 1825) extends from the northern countries of South America to the northern provinces of Argentina. Eight species have been recognized by Gallagher and Dixon (1992). *Kentropyx viridistriga* (Boulenger, 1894) from Parana region and *Kentropyx lagartija* (Gallardo, 1962) from Tucumán, were reported for Argentina, but Gallagher and Dixon (1992) treated *lagartija* as a synonym of *viridistriga*. In a further study of the geographic variation of *K. viridistriga*, on the basis of its exo-somatic characters, Tedesco et al. (1994) sustained a subspecific category for *K. viridistriga lagartija* from Northwestern region of Argentina, establishing as nominated form *K.v.viridistriga* from the Eastern region.

With the fundamental purpose of a more suitable evaluation of the real sys-

\* Dep. Biología, Universidad Nacional del Nordeste, Corrientes, Argentina

\*\* Dep. Ciencias Naturales, Universidad Nacional de Río Cuarto, Río Cuarto (Córdoba), Argentina

tematic rank of the Argentine populations, through a comparative analysis of their osteological characters at the cranial and post-cranial anatomical level, our present research was carried out. In their former taxonomic studies either Gallardo (1962) or Gallagher and Dixon (1992) made no suggestion of this kind of morphological observations.

## METHODS AND MATERIALS

A sample of 6 adult individuals for each subspecies (3 males, 3 females) was used. The skeletonized specimens were obtained according to the cleaning and double staining procedure described by Wassersug (1976). Only characters showing significant interspecific differences, and invariable in the same species, were considered. No appreciable osteological sex differences can be reported in the samples.

The compared photographic records have been obtained with an Olympus SZH 10 Microscope, at a magnification of 10 X.

The reported abbreviations are: UNNEC-Universidad Nacional del Nordeste, Corrientes; FML-Fundación Miguel Lillo, Tucumán.

Studied materials: *Kentropyx viridistriga lagartija*, FML 01186-6, 01553, 02148-5 (3 males), 01204-2, 01204-3, 02148-4 (3 females), all from Rio Sali, Tucumán, Argentina.

*Kentropyx viridistriga viridistriga*, UNNEC 001059, Colonia Madariaga, San Miguel, Corrientes, Argentina; 001056, Laguna Soto, Corrientes, Argentina; 001067, Rincón Santa Maria, Corrientes, Argentina (3 males); 001069, Laguna Brava, Corrientes, Argentina; 04757-04758, Area Natural Protegida, Mburucuyá, Corrientes, Argentina, (3 females).

## RESULTS

In order to our observations both the Argentine forms can be easily distinguished in having the following osteological characters.

### *Kentropyx viridistriga lagartija*

**Cranial region.** Premaxillary bones with laterally expanded maxillary processes. Nasal process slightly globose proximally, needle-like distally (Plate 1, 1: Mxpr, Npr). Range of the numbers of monocuspided premaxillary teeth, from 6 to 8. Hyoid dorsoventrally wide and flattened. Entoglossus process plane, large as the hypohyal processe (Plate 1, 2).

**Post-cranial region.** Pectoral girdle with ventrally convex clavicle, showing a gently rounded or curved upper border (Plate 2, 1, 2: Cl). Interclavicle without lateral processes. Escapulo-coracoid peculiarly different in having a major size, a larger suprascapula, a stronger scapula and distinct fenestrae and epicoracoid. Suprascapula going 2 times into the portion made by scapu-

la, glenoid cavity and coracoid; scapulo-coracoid fenestra equal or subequal to the anterior and posterior coracoid fenestrae (Plate 3, 1).

Sternum with rhomboidal presternum, narrow as the base and larger than wide (Plate 2,1,2).

Pelvic girdle with stout and wide bones and slightly smaller than in the other form (Plate 4,1). Epi-pubis small, triangular and apical. Pubis dorsoventrally flattened. Epiischium cartilaginous, almost rhomboidal, projecting anteriorly until the middle of the ischiopubic fenestra, but not entering the pubic symphysis. Hypo-ischium large, distally expanded, almost fin-like, being its width equal to its length. Ischium laminar, broad, slightly quadrangular; ilium strong and short. Ischio-pubic fenestra irregular, slightly hearth-shaped.

Pubis and ischium disjoined (Plate 4,1,2).

### *Kentropyx viridistriga viridistriga*

**C r a n i a l r e g i o n .** Premaxillary bones with backward turned maxillary processes. Nasal process slightly widened proximally, narrowing distally (Plate 1,3 : Mxpr, Npr). Range of the numbers of monocuspidated premaxillary teeth from 8 to 10. Hyoid almost cylindrical, laterally flattened. Entoglossus process somewhat cylindrical, larger than the hypohyal process. (Plate 1,4).

**P o s t - c r a n i a l r e g i o n .** Pectoral girdle with flattened, ventrally no convex clavicle, with upper border right. Interclavicle with broad, sharp-pointed lateral processes (Plate 2,3; Lp). General differential characters of the scapulo-coracoid formerly given in the osteological description of *lagartija*. Suprascapula is going almost 3 times into the portion made by scapula, glenoid cavity and coracoid; scapula-coracoid fenestra equal or subequal to the anterior and posterior coracoid fenestrae (Plate 3,2).

Sternum with rhomboidal presternum, broad at the base and wider than larger (Plate 2, 3, 4).

Pelvic girdle with somewhat slender or frail bones, but larger in size (Plate 4,3); epi-pubis triangular, apical, larger than in *lagartija*; pubis dorsoventrally triangular. Epiischium cartilaginous, large and slender, projecting anteriorly more than the half of the ischio-pubic fenestra, but no entering the pubic symphysis. Hipo-ischium moderately narrower, distally shaped, being its basal width equal or subequal to the half of its whole length. Ischium laminar, slightly narrower than in *lagartija*, almost rectangular; ilium slender and large. Ischio-pubic fenestra about hearth-shaped.

Pubis and ischium fused: a clear cut difference with pubis and ischium of *lagartija* (Plate 4, 3, 4).

## DISCUSSION

The results of our comparative osteological screening agree with the former data obtained in the research by Tedesco et al. (1994) on exo-somatic, met-

ric and meristic characters shown by the Argentine teiid lizards of the genus *Kentropyx*. Both series of observations, in spite of their dissimilar kinds of evidence, support the conviction that the subspecific category given to the Western and Eastern populations, named respectively *K. viridistriga lagartija* and *K. v. viridistriga*, is unsuitable. In fact, Western and Eastern population are two very distinct taxa, easily distinguishable by a number of significant morphological, chromatic as well as osteological characters. On the other hand, no intergradation between them was still reported, nor intermediate specimens were collected in Chacoan districts lying between the distribution areas of these geographically separated forms.

Cranial and post-cranial osteological features, analysed in our comparative research point out a remarkable set of peculiar differences, likely at a interspecific level in order to their anatomical interest and functional correlation. Clear cut differences were so found in the nasal and maxillary processes; in the number of premaxillary teeth; in the processus entoglossus of the hyoid; in the shape of the clavicle, having a curved upper border in *lagartija*, a right upper border in *viridistriga*; in the interclavicle, showing in *viridistriga* a wide lateral process, lacking in *lagartija*; in size and structure of the scapula-coracoid; in the sternum shape, larger than wide in *lagartija*, wider than large in *viridistriga*; in the general structure of the pelvic girdle; in the shape and length of the epischium; in the strikingly distally enlarged hypoischium, whose expanded fin is equal to the length of the same hypo-ischium in *lagartija*, but shorter, being only a little more than its half in *viridistriga*; and finally in the fused pubis and ischium bones in *viridistriga*, still disjoined in *lagartija*.

We will not recall here the significant statistical differences stressed by Tedesco et al. (1994) when Western and Eastern population of *Kentropyx viridistriga* were compared for 15 metric and meristic morphological variables. The diversity of several important characters, dealing with lepidosis, as well as with color patterns or craniometry, were emphasized by their results. The hasty synonymizing of *lagartija* with *viridistriga* by Gallagher & Dixon (1992), without a suitable anatomical or analytical support, sound almost incomprehensible.

## CONCLUSIONS

Converging data provided by so different methodological approaches, may suggest then two suitable combinations of many peculiar character states for these still discussed teiid lizards from the Western subtropical Argentina and the Eastern biotopes of the Parana River, such as Paraguay and Corrientes. Their allopatric range and the lack of intergradation in the Central Chacoan flats, where they could contact, also provide valid argumentations for the application to these disjoined populations of the *Kentropyx viridistriga* complex, a condition of "evolutionary species", such as defined in the recent discussion of that new biological

concept, carried out by Frost & Hillis (1990) and Frost et al. (1992). *Kentropyx lagartija* (Gallardo, 1962) is then resurrected as valid species; *Kentropyx viridistriga* (Boulenger, 1894) is again no more a trinomial taxon. With the resurrection of *Kentropyx lagartija* we like to express a posthumous homage to the late Prof. José Maria Gallardo, a remarkable Argentine herpetologist, recently died.

#### ABBREVIATIONS USED IN THE FIGURES

Promaxillary bone: Npr - nasal process; Mxpr - maxillary process.  
 Hyoid: Bh - basihyal; Cerb. I-ceratobranchial I; Cerb. II-ceratobranchial II; Chy - ceratohyal; Hyh - hypohyal; Pen-processus entoglossus.  
 Scapulo-coracoid: A - acromion; C - coracoid; Gc - glenoid cavity; Ec - epicoracoid; Fc - foramen coracoideum; Fca-fenestra coracoidea anterior; Fcp - fenestra coracoidea posterior; Fsc-fenestra scapularis; Fssc-fenestra scapulo-coracoidea; Mc-mesocoracoid; Msc-mesoscapula; Mtc-metacoracoid; Pc-precacoracoid; Sc-scapula; Ssc-suprascapula.  
 Sternum and clavicle: Cl-clavicle; Sr-sternal ribs; I-interclavicle; Lp-lateral process; Ms-mesosternum; Ps-presternum.  
 Pelvic girdle: Eis-epi-ischium; Epu-epi-pubis; IpF-ischio-pubic fenestra; Fobt-foramen obturator; His-hypo-ischium; Il-ilium; Is-ischium; Plp-pubis lateral process; Pu-pubis.

#### ACKNOWLEDGMENTS

We wish to thank cordially the Lic. Maria Celina Godoy for her assistance in the photographic work of this paper, and Mr. Roberto Hugo Aguirre for his assistance in the fine graphic details of our Color Plates.

#### RIASSUNTO

Si presenta uno studio osteologico comparativo, mediante la tecnica di colorazione e diafanizzazione, delle regioni cranica e post-cranica di esemplari di ambo i sessi dei teidi della specie *Kentropyx viridistriga* d'Argentina, attualmente suddivisa in due sottospecie, una orientale o forma nominale, l'altra occidentale o *Kentropyx viridistriga lagartija*. I risultati di queste osservazioni mostrano chiaramente differenze assai notevoli, di livello sicuramente specifico, tra le suddette sottospecie, concordando con dati anteriori comparativi, ottenuti da studi morfologici e statistici di caratteri exosomatici in tali forme. Considerando anche la assenza d'intergradazione tra le popolazioni orientali e occidentali di *Kentropyx viridistriga*, si conclude che una posizione di "specie evolutiva" s'addice a questi taxa, e si propone convalidare nuovamente la specie *K. lagartija* (Gallardo, 1962) del Nordovest d'Argentina, limitando *K. viridistriga* (Boulenger, 1894) alle popolazioni orientali della regione del Rio Paraná.

Maria Esther TEDESCO  
 Dep. Biología, Universidad Nacional del Nordeste  
 Corrientes, Argentina

José Miguel CEI  
 Dep. Ciencias Naturales, Universidad Nacional de Rio Cuarto  
 Rio Cuarto (Cordoba), Argentina

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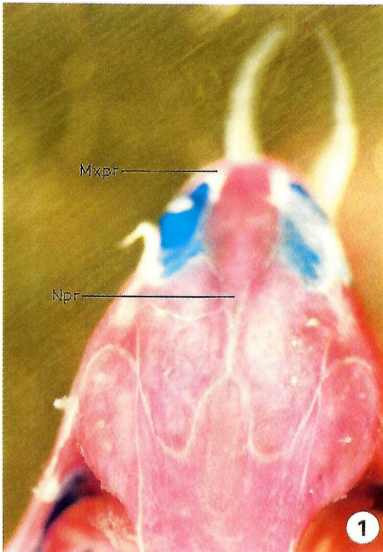


Fig. 1 - Premaxillary bone of *Kentropyx lagartija* (dorsal view)  
Mxpr - Maxillary process; Npr - Nasal process  
(Specimen 01204-02).

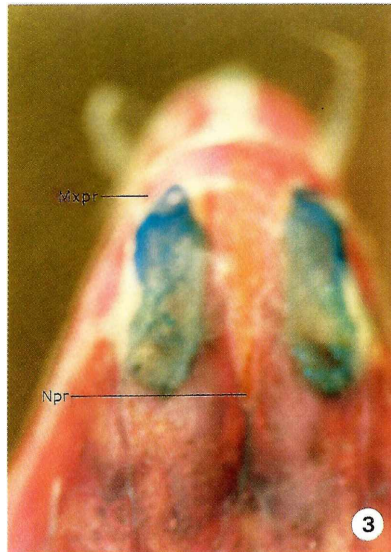


Fig. 3 - Premaxillary bone of *Kentropyx viridistriga* (dorsal view)  
Mxpr - Maxillary process; Npr - Nasal process  
(Specimen 04758).

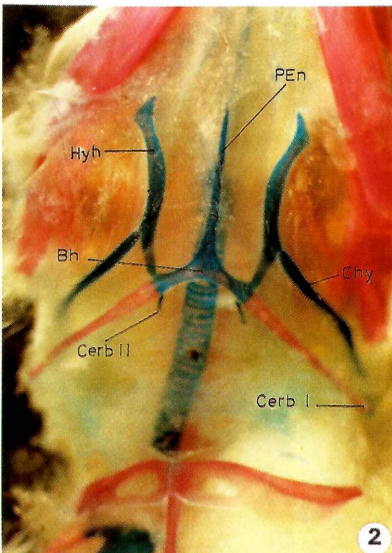


Fig. 2 - Hyoid structures of *Kentropyx lagartija* (ventral view)  
Pen - processus entoglossus; Hyh - Hypohyal; Bh - Basihyal; Chy - Ceratohyal; Cerb.I - Ceratobranchial I; Cerb. II - Ceratobranchial II.  
(Specimen 01186-6).

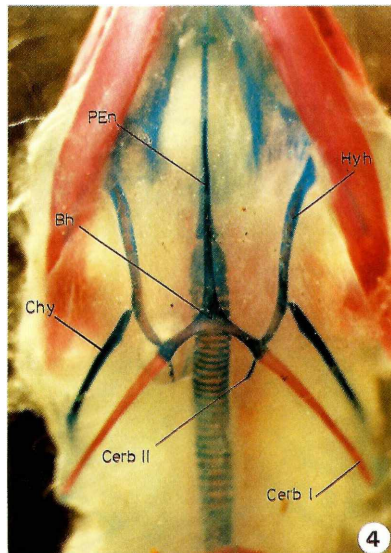


Fig. 4 - Hyoid structures of *Kentropyx viridistriga* (ventral view)  
Pen - Processus entoglossus; Hyh - Hypohyal; Bh - Basihyal; Chy - Ceratohyal; Cerb. I - Ceratobranchial I; Cerb. II - Ceratobranchial II.  
(Specimen 04757).



PLATE 2

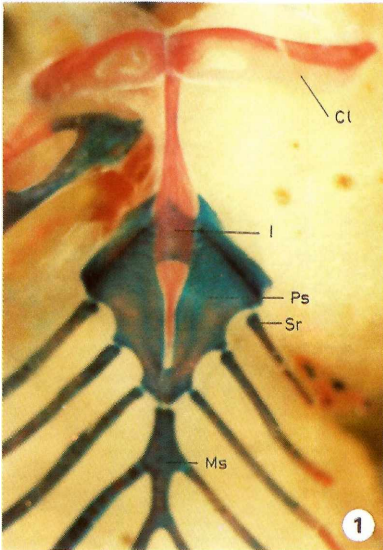


Fig. 1 - Clavicle and sternum of *Kentropyx lagartija* (ventral view)

Cl - Clavicle; I-Interclavicle; Ps - Presternum; Sr - Sternal ribs; Ms - Mesosternum.  
(Specimen 01204-2).

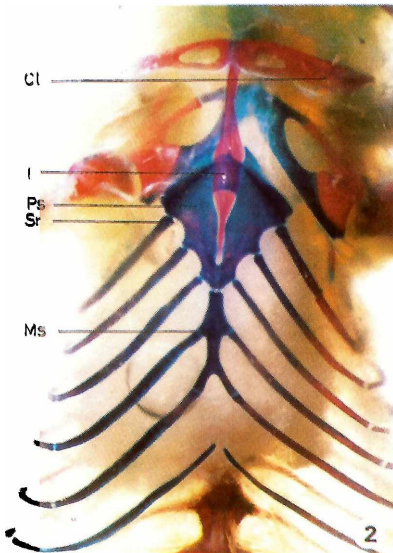


Fig. 2 - Clavicle and sternum of *Kentropyx lagartija* (ventral view)

Cl - Clavicle; I-Interclavicle; Ps - Presternum; Sr - Sternal ribs; Ms - Mesosternum.  
(Specimen 01204-2).

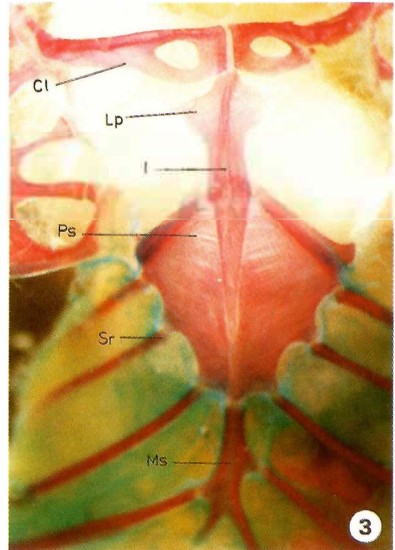


Fig. 3 - Clavicle and sternum of *Kentropyx viridistriga* (ventral view)

Cl - Clavicle; I-Interclavicle; Lp - Proceso lateral; Ps - Presternum; Sr - Sternal ribs; Ms - Mesosternum.  
(Specimen 001069).

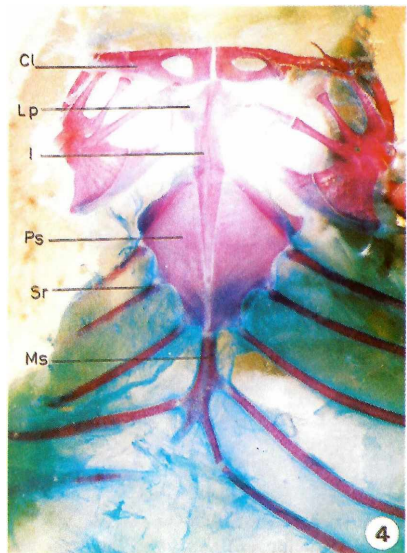


Fig. 4 - Clavicle and sternum of *Kentropyx viridistriga* (ventral view)

Cl - Clavicle; I-Interclavicle; Lp - Proceso lateral; Ps - Presternum; Sr - Sternal ribs; Ms - Mesosternum.  
(Specimen 001069).

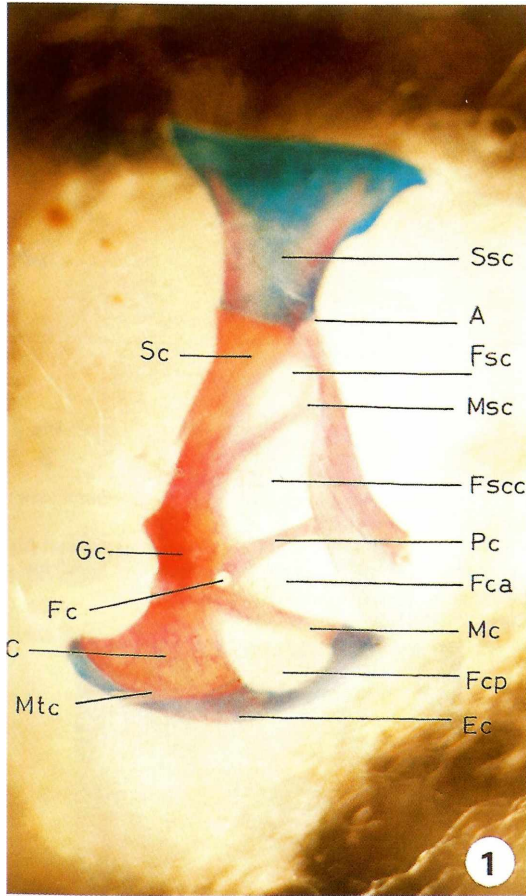


Fig. 1 - Scapulo-coracoid bone of *Kentropyx lagartija* (ventral view)  
 Ssc - Suprascapula; A - Acromion; Sc - Scapula; Msc - Mesoscapula; C - Coracoid; Fc - Foramen coracoideum; Pc - Precoracoid; Mc - Mesocoracoid; Ec - Epicoracoid; Gc - Glenoid cavity; Fsc - Fenestra scapularis; Fsc - Fenestra scapulo-coracoidea; Fca - fenestra coracoidea anterior; Fcp - Fenestra coracoidea posterior.  
 (Specimen 01204-2).

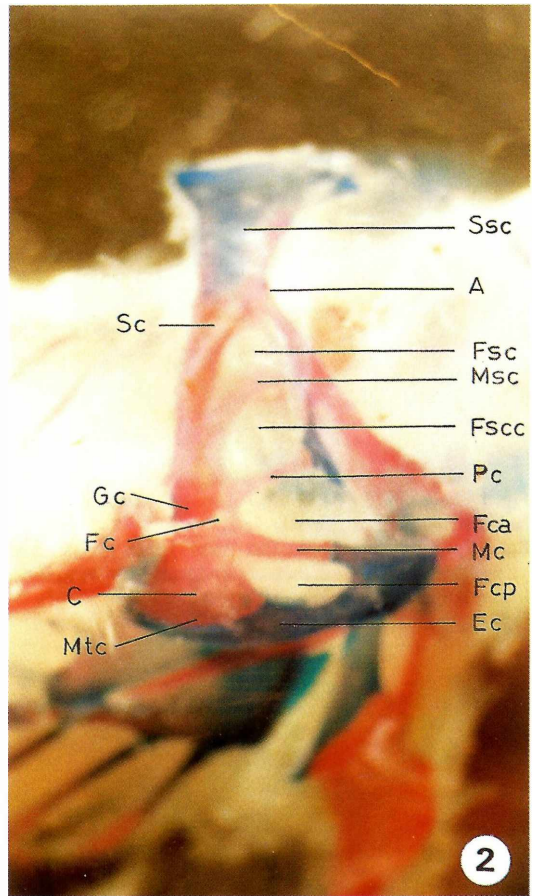


Fig. 2 - Scapulo-coracoid bone of *Kentropyx viridistriga* (ventral view)  
 Ssc - Suprascapula; A - Acromion; Sc - Scapula; Msc - Mesoscapula; C - Coracoid; Fc - Foramen coracoideum; Pc - Precoracoid; Mc - Mesocoracoid; Ec - Epicoracoid; Gc - Glenoid cavity; Fsc - Fenestra scapularis; Fsc - Fenestra scapulo-coracoidea; Fca - Fenestra coracoidea anterior; Fcp - Fenestra coracoidea posterior.  
 (Specimen 0010069).



PLATE 4

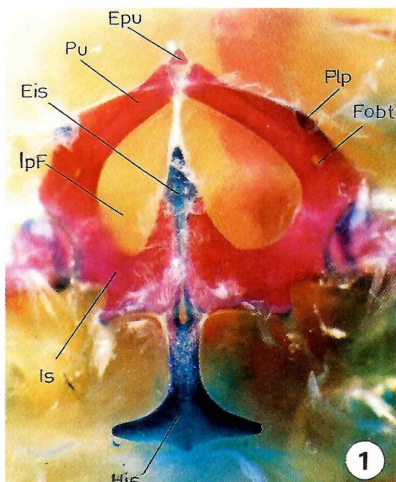


Fig. 1 - Pelvic girdle of *Kentropyx lagartija* (ventral view) Ischium and pubis disjoined.  
 Epu - Epi-pubis; Pu - Pubis; Plp - Pubis lateral process; Eis - Epiischium; Fobt - Foramen obturator; Is - Ischium; IpF - Ischio-pubic Fenestra; His - Hypo-ischium.  
 (Specimen 01186-6).

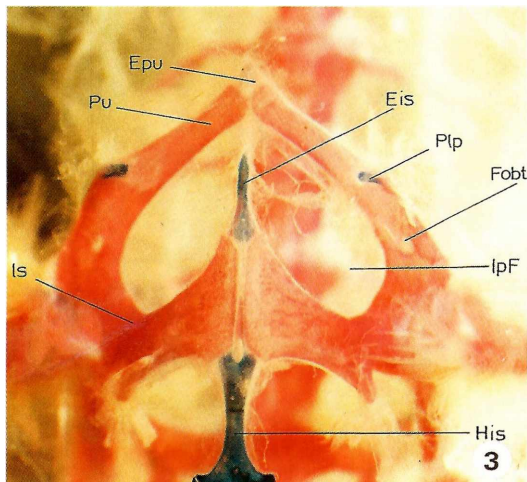


Fig. 3 - Pelvic girdle of *Kentropyx viridistriga* (ventral view) Ischium and pubis fused.  
 Epu - Epi-pubis; Pu - Pubis; Plp - Pubis lateral process; Eis - Epiischium; Fobt - Foramen obturator; Is - Ischium; IpF - Ischio-pubic Fenestra; His - Hypo-ischium.  
 (Specimen 001069).

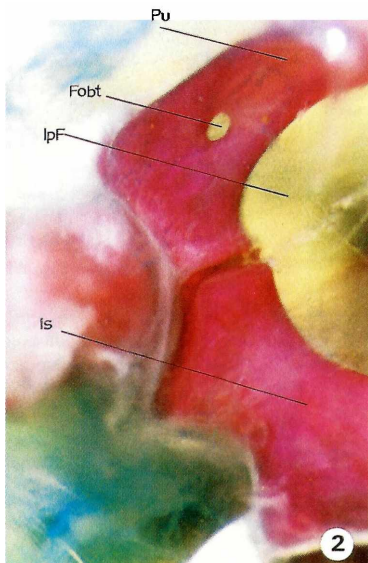


Fig. 2 - Detail of the ischio-pubic suture in *Kentropyx lagartija* (ventral view) Ischium and pubis disjoined : magnified.  
 Pu - Pubis; Fobt - Foramen obturator; IpF - Ischio-pubic Fenestra; Is - Ischium.  
 (Specimen 01204-2).

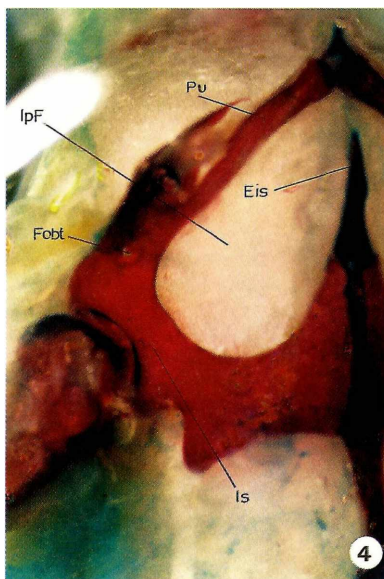


Fig. 4 - Detail of the ischio-pubic fusion in *Kentropyx viridistriga* (ventral view) Ischium and pubis fused : magnified  
 Pu - Pubis; Fobt - Foramen obturator; IpF - Ischio-pubic Fenestra; Is - Ischium; Eis - Epi-ischium.  
 (Specimen 04757).