species, the values range from 45% in *O. carvalhoi* and *O. occidentalis* ($2n = 22$) to 181% in *C. dorsata* ($2n = 104$)[21].

The polyploid species of Ceratophrydidae show successive values of DNA content corresponding to the duplicated genomes. The triploid hybrid ($3n = 33$) produced by interspecific mating of the diploid *O. cultripes* ($2n = 22$) and the tetraploid *O. americanus* ($4n = 44$)[22] has a DNA content almost intermediary to the diploid and the tetraploid species.

The high values of DNA found in Gymnophiona and Caudata may be related to their phylogenetic origin from a common ancestral genome. On the other hand, the Salientia, whose DNA content is smaller, probably derived from another Stegocephalian ancestral genome that evolved in a different direction, from which the primitive reptiles originated too.

Genic duplications, detected by successive increases in DNA, played an important role in the evolution of the species. While the original genes are, for instance, in charge of basic functions for the maintenance of the species, the duplicated genes supply raw material for new mutations, whose adaptative values are possibly higher. This mechanism may produce a faster diversification and a higher genetic polymorphism. Eventually, during the evolutive process, new proteins and enzymes may be coded by the duplicated DNA.

Resumen. Fueron determinados por citofotometría los valores de DNA en 33 especies de Amphibia, en las que estaban incluidas 30 especies de Salientia, 1 de Gymnophiona y 2 de Caudata, y fueron comparadas con sus constituciones cromosomicas. Las variaciones encontradas sugieren que hubo aumento de DNA, independientemente, en las diferentes familias estudiadas y que en general, las especies más primitivas filogeneticamente, poseen menor cantidad de DNA, cuando comparadas a los valores encontrados para las más evoluidas.

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Sex Chromosomes of a Pygopodid Lizard, *Lialis burtonis*

The lizard family Pygopodidae of the Australia–New Guinea region contains about 15 species, all limbless. Despite a superficial resemblance to snakes (Figure 1), anatomical studies imply a close relationship to the large family Gekkonidae[1]. The karyotypes of pygopodids are thus of interest to serve as a basis of comparison with other morphological features. To our knowledge, there are no other published reports on the chromosomes of any pygopodid lizard.

Through the courtesy of Dr. RICHARD ROSS, and the cooperation of the Museum of Comparative Zoology, we received one male and one female *Lialis burtonis* from Mareeba, Atherton Tableland, Queensland (Australia). Knowing nothing about the reproductive states of the lizards (they had been in captivity for some months before we received them in mid-June) we injected them 3 times on alternate days with 100 IU per injection of Equinex Serum Gonadotropin (Ayerst Laboratories) during the week prior to sacrifice. Our aim was to stimulate meiotic and mitotic divisions. 12 h preceding sacrifice the lizards were injected with 0.1 ml Colcemide (CIBA), in a solution of 50 mg/l, to accumulate mitotic metaphase cells. Following sacrifice, gonads were minced in a hypotonic citrate solution and permanent slides were made as previously described[2].

Male: All stages of meiotic and mitotic divisions were seen in abundance. At diakinesis there are 16 bodies. Close examination reveals that one is a trivalent, the other 15 bivalents (Figure 2). In the first meiotic metaphase, cells with 16 and 17 chromosomes appeared equally abundant. Mitotic metaphase cells confirm that the diploid number is 33 (Figure 3). There is one large pair of submetacentric chromosomes; a smaller pair of even more submedian chromosomes; approximately 3 pairs of subtelocentric chromosomes in which a short arm may be seen; approximately 5 pairs of telocentrics decreasing gradually in size, and not differing markedly from the subtelocentrics; and approximately 5 pairs of microchromosomes, 1 of which is clearly bi-armed. There are no sharp breaks between macro- and microchromosomes, nor between the telocentrics and subtelocentrics – hence the use of the word 'approximately'. Thus there are 15 autosomal pairs and 3 unpaired sex chromosomes.

Female: Only 3 cells were clear enough for analysis in the female. The diploid number appears to be 34, with 17 pairs of chromosomes, the 2 largest pairs are two-armed (Figure 4). One of the smallest pairs of chromosomes appears to be metacentric.

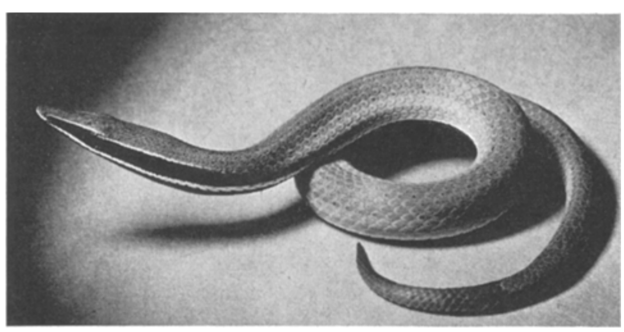

Fig. 1. *Lialis burtonis*, female.

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It appears that *Lialis burtonis* is characterized by an X_1X_2Y sex chromosome system. Very similar systems have been found in the iguanid lizard genera *Anolis*[3], *Polychrus*[2], and *Sceloporus*[4]. Presumably it is derived from a more primitive XY system. Although until recently there was the widespread assumption that there was no sex chromosomal heteromorphism among lizards[5], male heteromorphism may be the rule rather than the exception. PENNOCK et al.[6] have demonstrated X-Y in the iguanid genus *Uta*, which appears superficially to lack heteromorphism; and COLE et al.[7] have found it in the teiid genus *Cnemidophorus*.

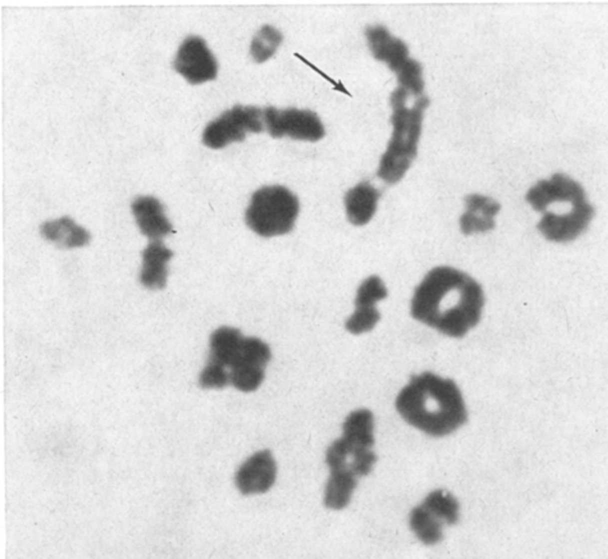

Fig. 2. Diakinesis in the male. The arrow points to the sex trivalent.

Fig. 3. Mitotic metaphase in the male. $2n = 33$. Vertical line = 10 μ.

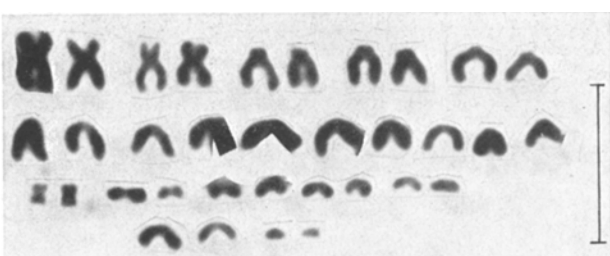

Fig. 4. Mitotic metaphase in the female. $2n = 34$. Vertical line = 10 μ.

In the cases of X_1X_2Y in *Anolis* and *Sceloporus* the Y is clearly metacentric. This also appears to be true for *Lialis*. The chromosome we are calling X_1 appears to be a medium sized telocentric, the X_2 is in the size range of the microchromosomes.

In addition to the interesting aspect of heteromorphism, the *Lialis* karyotype also provides taxonomic inference, for there is a definite resemblance between the karyotype of this pygopodid and a typical gekkonid, and it is unlike the karyotype of almost all other lizards. Several of the major lizard families are characterized by having representatives with 24 macrochromosomal arms, and 24 microchromosomes[8,9]. Not falling into this pattern are the Lacertidae, which tend to have all acrocentric chromosomes in the karyotype and an N.F. of 38[10]; the Scincidae, which are reported to have from 2–6 pairs of metacentric macrochromosomes, often a sharp break in size between macro- and microchromosomes, and an N.F. of 36–38[8,11]; and the Gekkonidae which have diploid numbers ranging from 32–46, with relatively few metacentric chromosomes, and a rather unclear distinction between macro- and microchromosomes[8,12].

Thus we at least can say that the *Lialis* karyotype supports the concept of Gekkonid affinity. Further study within the highly specialized family Pygopodidae would be rewarding both for the taxonomic implications, and for further understanding of the sex chromosome system.

Zusammenfassung. Es wird erstmals über den Karyotyp einer Eidechse der Familie Pygopodidae, *Lialis burtonis* mit dem Geschlechtschromosomensystem X_1X_2Y berichtet. Die diploide Chromosomenzahl des Männchens ist 33 und diejenige des Weibchens 34. Morphologisch scheint der Karyotyp eine Ähnlichkeit mit demjenigen der Geckoniden zu besitzen.

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