



Lumbar glands in the frog genera *Pleurodema* and *Somuncuria* (Anura: Leiuperidae): histological and histochemical perspectives

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Introduction

Amphibian skin is a complex organ formed by an epidermis and an underlying dermis, which possesses a *stratum spongiosum* and a *stratum compactum* (Elias and Shapiro 1957; Fox 1994). The Eberth–Katschenko (EK) layer lies between the dermal strata; it is formed by an amorphous substance in which calcium salts are deposited (Elkan 1968; reviewed by Toledo and Jared 1993). Two types of dermal glands developed in all living adult amphibians are considered synapomorphies of the group (Parsons and Williams 1963) – the mucous glands, usually associated with respiration and water balance, and the serous (or granular or poison) glands, related to defense mechanisms (Toledo and Jared 1995). Also, mixed (or seromucous) glands have been found exclusively in urodèles (Delfino *et al.* 1986 in Brizzi *et al.* 2002), whereas lipid glands occur in some anurans (Blaylock *et al.* 1976). In several anuran species, an aggregation of numerous secretory units in certain regions of the body constitutes the so-called

Abstract

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The skin in the lumbar region of nine species of *Pleurodema* and in the monotypic genus *Somuncuria* (Anura: Leiuperidae) bears macroglándulas [lumbar gland (LG)]. Lumbar glands of *Pleurodema bibroni*, *P. borellii*, *P. brachyops*, *P. bufoninum*, *P. cinereum*, *P. cordobae*, *P. kriegi*, and *P. thaul*, as well as *Somuncuria somuncurensis*, were examined using histological and histochemical methods. The epidermis and the dermis of LGs are described. Also, skin of LGs presents characteristic features as the interruption of the Eberth–Katschenko layer and the presence of a differentiated type of gland only observed in macroglándula and not previously described for *Pleurodema* or *Somuncuria*; this is termed lumbar serous gland. These glands are filled with a granular product, which occasionally is immersed in a matrix. Differences in the secretory products of mucous and serous glands are described, as well as inter- and intraspecific variability of gland structure. The mode of toxin expulsion from macroglándulas and the homology between lumbar and inguinal glands among anuran families are discussed.

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macroglándulas. The most common are parotoid, paracnemid, lumbar, and hedonic glands (Quay 1972; Toledo and Jared 1995).

Leiuperidae includes seven neotropical anuran genera (Grant *et al.* 2006), five of which bear a pair of dorsolateral sacral macroglándulas, called lumbar glands (LGs) (*Edalorhina*, *Pleurodema*, *Somuncuria*) or inguinal glands (*Eupemphix* and *Physalaemus*). We differentiate LG and inguinal glands based on their form and position; the LG is prominent, oval, elevated, and visible when animal rests, whereas the inguinal gland is flat, subcircular, and partial obliterated by hind limb when animal rests. Eight of the fourteen members of the widely distributed South American genus *Pleurodema* have LGs (*P. bibroni*, *P. borellii*, *P. brachyops*, *P. bufoninum*, *P. cinereum*, *P. cordobae*, *P. kriegi*, and *P. thaul*; taxonomy follows Frost 2011 and Kolenc *et al.* in press). The monotypic *Somuncuria* endemic to the Meseta de Somuncurá (Río Negro Province, Argentina) possesses slightly developed LGs. *Somuncuria* bears osteological and karyological similarities with