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Pectoral Glands of *Scaphiopus* and *Megophrys*

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Paired masses of glandular tissue located in the skin of the pectoral region of *Scaphiopus holbrooki* were described as pectoral glands by Strecker (1910) and Tanner (1939). Pectoral glands are discoid with a diameter of approximately 3 mm and are found in both sexes of *S. holbrooki*. A photograph of the venter of a spadefoot showing the glands was published by Wright and Wright (1949). Pectoral glands have also been described as axillary breast glands or glands of the thorax (Wright and Wright, 1949). *Scaphiopus holbrooki* is the only member of the genus to possess pectoral glands and their presence was used as a taxonomic character by Tanner (1939) and Blair et al. (1957). *Scaphiopus* is, however, not the only member of the family Pelobatidae to possess pectoral glands. Taylor (1962) described several Asian pelobatids

that have pectoral glands. He noted the occurrence of paired glandular structures on the breast of *Megophrys nasuta* which are located below the insertion of the arm. *Megophrys carinensis* was described as possessing a pair of cream colored glandules on the breast suggesting mammae. *Leptobrachium pelodytoides* was noted as having a pair of small light-colored glands on the breast near the insertion point of the arm.

Even though the presence of pectoral glands in pelobatids is widely known, we could not find a structural description of the gland in the literature. This lack of information prompted us to investigate the structure of pectoral glands through the use of light microscopy. Seventeen *S. holbrooki* from White County, Arkansas, were preserved in either formol acetic acid or 2% neutral-buffered formalin. Pectoral and parotoid glands were removed intact from *S. holbrooki* along with patches of dorsal and ventral skin. Pectoral glands were removed from Field Museum of Natural History specimens of the following species of *Megophrys*: *M. carinensis* (N = 1), *M. major* (N = 2), *M. nasuta* (N = 3), and *M. parva* (N = 3). Parotoids from two (hybrid) specimens of *Bufo americanus* × *woodhousei* from Shelby County, Tennessee, were also removed for comparison with pelobatid glands. All tissues were dehydrated in ethanol, cleared in toluene, infiltrated and embedded in paraffin, and sectioned at 7-9 μm. Tissue sections were stained with either periodic acid-Schiff reagent (PAS) and/or Delafield's hematoxylin, Biebrich scarlet-orange G, and fast green.

Pectoral glands in *S. holbrooki*, *M. carinensis*, *M.*

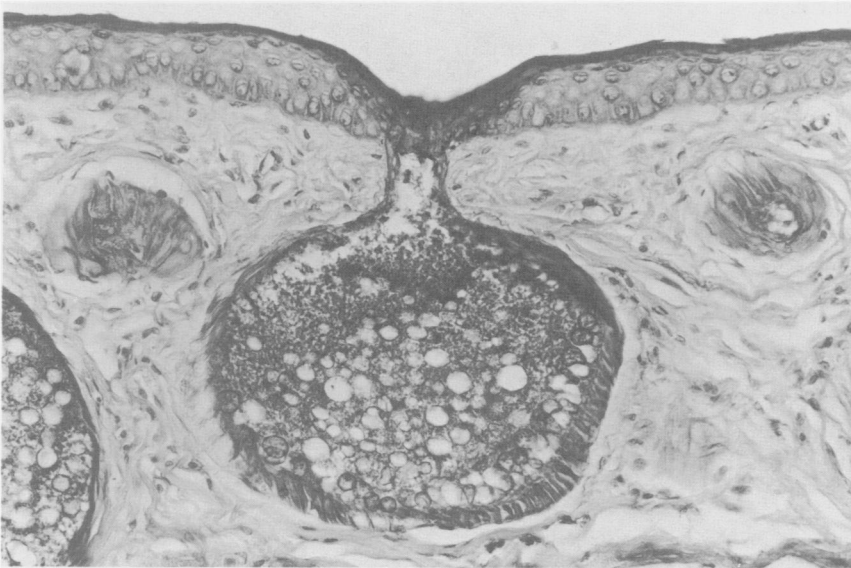


FIG. 1. Photomicrograph of granular gland from a *Scaphiopus holbrooki* pectoral gland. (200×).

major, and *M. nasuta* and parotoid glands from *S. holbrooki* consisted of a collection of granular glands located in the connective tissue of the dermis (Fig. 1). Each granular gland was surrounded by a layer of what appeared to be smooth muscle cells and possessed a duct which opened onto the skin surface. The glandular epithelium consisted of a single thin layer without discernible cell limits. Secretory products of the granular glands consisted of acidophilic droplets which filled the acini. Smaller, PAS positive mucous glands were also found within the pectoral glands, just subjacent to the epithelium, and were distinguished easily from PAS negative granular glands.

Pelobatid pectoral glands, as well as the parotoid glands of *Scaphiopus*, were identical structurally to the parotoid glands from *Bufo* that we examined and the descriptions provided in the literature for *Bufo americanus* (McCallion, 1956), *B. marinus* (Hostetler and Cannon, 1974), and *B. alvarius* (Cannon and Hostetler, 1976). Blair et al. (1940) described the parotoid glands of *S. holbrooki* and concluded that they were similar morphologically to the parotoid glands of *Bufo*, except that the acini were fewer in number and smaller. Their observations agree with ours in all aspects. McCallion (1956) noted the absence of granular glands on the venter of *Bufo americanus*. We found granular and mucous glands in all sections of dorsal and ventral skin from *Scaphiopus*. The muscular layer we observed surrounding each granular gland was also described in parotoid glands from *Bufo* (McCallion, 1956; Hostetler and Cannon, 1974; Cannon and Hostetler, 1976) and *Scaphiopus* (Blair et al., 1940). Cannon and Hostetler (1976) noted that contraction of this layer of cells probably assists in the discharge of secretory materials into the duct.

In summary, pectoral glands found in *Scaphiopus* and *Megophrys* are identical structurally to the parotoid glands found in pelobatids and bufonids, containing granular glands primarily and a few smaller mucous glands. The selective advantage for the occurrence of paired clusters of granular glands on the venter of these pelobatids remains to be determined.

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Sperm Competition in a Plethodontid Salamander: Preliminary Results

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Female plethodontid salamanders are capable of storing viable sperm throughout the many-month courtship season that precedes annual (or biennial) oviposition. Sperm are kept in a specialized female organ, the spermatheca, and eggs are not fertilized until just prior to oviposition. Sperm storage permits the decoupling of insemination and oviposition in many amphibians, sometimes for periods of weeks, months or even years (Boisseau and Joly, 1975). This situation enables a female to oviposit in a secure site without the physical presence of a male.

The decoupling of insemination and fertilization has a different significance for the male: insemination does not assure paternity. Even during the relatively short reproductive period of