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**On the Male Genital Tracts in
Crocidura suaveolens (Pallas, 1811)**

[With 1 Table]

The genital tract of 5 adult males and one embryo of *C. suaveolens* has been examined. The histological structure of accessory glands (*gl. ampullarum*, *gl. prostaticae*, *gl. bulbo-urethrales*) and their development show, that those glands are homologous to accessory glands in *Soricinae*. There are two swellings on *vas deferens*: proximal and distal (*gl. amullarum*), both similar in structure to those in genus *Sorex*. The prostatic pocket described in *C. russula* does not occur in *C. suaveolens*. The existence of well developed *gl. paragenitales* has been stated. These glands lie between the *corpus penis* and the rectum, and more caudally they surround also this latter. Neither the site nor the number of the openings of those glands have been stated. The author suggests, the above glands are the perineal glands — which so far have not been described in any representative of *Soricidae*.

I. INTRODUCTION

The structure of the male genital tracts in various species of the genus *Crocidura* has been described by Ärnäck - Christie - Linde (1907), Kaudern (1911) and Godet (1950; 1951; 1952). There are, however, no data concerning the microscopic structure of those organs. Godet (1951) has described in *Crocidura russula* (Hermann, 1780) a blind pocket occurring in *pars prostatica urethrae*, similar to that stated in the mole and the hedgehog. Since during the former investigations (Kowalska - Dyrz, 1966) such a pocket had not been found in the representatives of *Soricinae*, its presence in *Crocidura* seemed to be also doubtful. The data concerning the structure of the male genital apparatus in *Crocidura suaveolens* (Pallas, 1811) have not been found either.

For the above mentioned reasons the investigations presented in this paper were undertaken.

II. MATERIAL AND METHODS

The animals were captured in Wrocław in May and June 1965. Genital organs of 5 sexually mature males of *C. suaveolens* and one litter (6 embryos measuring 10—12 mm) fixed in Bouin's fluid. Serial paraffin slices were 5—7 μ thick. The preparations were stained with Delafield's hematoxylin and eosin.

III. RESULTS

In a sexually mature male the testes (2.7×3.6 mm on the average) are lying in elongated cremastery sacs.

Vas deferens, after leaving the *cauda epididymidis* is thin and typically built. At about one third of its length *vas deferens* forms a small conic distention which basis adheres to a large ampullar swelling (Fig. 1 n). Histological structure of the conical distention is almost identical with the structure of the proximal swelling of the *vas deferens* in genus *Sorex* (Kowalska-Dyrcz, 1966), except that it bulges into the *gl. ampullarum* (Fig. 2). The distal swelling (*gl. ampullarum*) in a sexually mature male has 2.4×4.1 mm on the average (Fig. 1 a). Histological structure of this gland resembles that in Shrews. This resemblance is particularly well seen in its proximal portion, where the structure of the epithelium, the arrangement of pockets and the manner of secretion are the same as in *Sorex* (Kowalska-Dyrcz, 1966). In the central and terminal portions of the gland the secretory epithelium is exceedingly low (4μ on the average). Within the pocket no spermatozoa have been observed. Glandular tubes are remarkably overgrown by connective tissue in terminal and sometimes in peripheral portions of the gland. The ampullar glands ends before the entrance of the *vas deferens* into dorsal wall of the urethra. Some minute glandular tubes however, are found in its walls as far, as on *crista urethralis*.

Laterally to the neck of urinary bladder, lies a pair of glands with smooth structure. The glands reach ventral and partially, dorsal sides of the neck. In a sexually mature male their dimensions are 5×4 mm. They are termed the *gl. prostaticae* (Fig. 1 p). Their histological structure is similar to that in genus *Sorex* (Kowalska-Dyrcz, 1966). They are tubulo-alveolar glands. In their secretion *corpora amylacea* have not been observed. In peripheral portions of the gland the degeneration of epithelium occurs frequently. Two excretory ducts are issued from each of the two lobes of the gland. The ducts enter into ventro-lateral walls of the urethra, and then they shift to the lateral position (for the openings, see below).

Urethra. The structure of the *pars prostatica urethrae* is simple: a stratified (2—3 layers) cuboidal epithelium lines its lumen, a layer of connective tissue with single longitudinal bands of *m. urethralis*, and circular bands of this muscle appear on the outside. These last surround also the ducts of prostatic glands and the *vasa deferentia*. The *vasa deferentia* are coursing in the dorsal wall of the urethra and open into its lumen on the *colliculus seminalis* (Fig. 3), by about 100μ more caudally than the prostatic glands ducts. The *colliculus seminalis* forms

a distinct single point that bulges dorsally to the lumen of the urethra. The ducts of prostatic glands lying in lateral walls of the urethra are at first double (2 on each side). Farther caudally the each pair of ducts fuses into one duct. They empty into lateral wall of the urethra (beyond but on a level with *colliculus seminalis*) by two openings, one on each side at a time. In this portion of the urethra there are neither diverticula nor blind pocket. On the other hand, within the *bulbus penis* one observes the *sinus urethrae bulbi* (Fig. 4) found on the boundary of the *pars membranacea* and *pars spongiosa urethrae*. The sinus is irregular in shape and rather small in size, being surrounded by a well developed *corpus spongiosum*. The ducts of *gl. bulbo-urethrales* empty into the urethra at the cranial end of the sinus. The presence of *gl. urethrales* has not been stated.

Gl. bulbo-urethrales. Oval small glands measuring 1.8×1.5 mm on the average, are lying dorso-laterally to the *m. bulbo-cavernosus*, one on each side. Their cranial portions penetrate between the *m. ischio-cavernosus* and *bulbo-cavernosus*. A compact mass of *gl. paragenitales* adheres to them ventrally and caudally. The inner structure of those glands differs somewhat from that in genus *Sorex*. The *gl. bulbo-urethrales* are complex tubular glands (Fig. 5). The substance of the gland consists of numerous branches of tubes with distinct lumen that passes into irregular sinuses in the central portion of the gland. A long excretory duct is continuous with the central sinus. The glandular epithelium is prismatic, the cytoplasm is granular, and the nuclei are lying basally. The long excretory duct is issued from the cranial portion of the gland. At its initial portion the duct is built of a single-layered epithelium, identical with glandular epithelium of tubes. Farther on the ducts are built of a stratified (2—3 layers) prismatic epithelium. The ducts are not accompanied by glandular tissue. The ducts enter dorsally between *m. bulbo-cavernosus* and *m. urethralis* and course caudally parallelly to the dorsal wall of the urethra. They enter the lumen of the urethra in its dorsal wall immediately before the ramification of the *sinus urethrae bulbi* (Fig. 4).

Gl. paragenitales. Ventrally and medially to the *gl. bulbo-urethrales* and also caudally to them are large agglomerations of tubular glands. They are built of prismatic cells with large spherical nuclei lying basally. The secretion is merocrine. Lateral groups of those glands form 2 compact masses (Fig. 6), adhere to the *gl. bulbo-urethrales*. Hence, seen macroscopically the *gl. bulbo-urethrales* seem to have a bipartite structure. Farther on caudally the agglomerations of glandular tubes fulfil the space between the *corpus penis* and *rectum*, surrounding also this latter (Fig. 7). They lie beyond the *m. sphincter ani*. The separate

groups of glandular tubes are fenced from one another by connective tissue and the bands of striated muscle fibers. Neither the site nor the number of the openings of those glands have been stated. It seems, however, that they empty by means of a few openings either into the proctodeum or on the surface of the skin close to the wall of proctodeum. In this last region one sees also polyptychic holocrine sebaceous gland.

Development. Among 6 embryos being at my disposal only one male has been stated. The development of its excretory ducts and accessory glands was the following: Well differentiated testes ($880 \times 680 \mu$) lie down in the cavity of the abdomen on both sides of the urinary bladder. The Wolffian ducts measure about 50μ in diameter in their initial portion, in median part being slightly harrowed to be widened again in the distal, terminal portion. Both ducts open on the top of the fold of dorsal wall of the *sinus urogenitalis*. The fold is the bud of *colliculus seminalis*. Since no remnants of Müllerian ducts have been stated it seems that they had completely atrophied. The buds of *gl. prostaticae* (one on each side) are growing from the lateral walls of the sinus; more or less on the level with the openings of Wolffian ducts (Fig. 8). They lie within distinct blastemas and are about 100μ long. They are directed ventrally and cranially. The buds of *gl. bulbo-urethrales* are growing from the dorso-lateral walls of the sinus at the site typical for those glands (Fig. 8). They continue in backward direction reaching the sides of the gut (intestine). The club-shaped distal portions of the buds show a secondary budding (Fig. 9). They are lying within well developed blastemas continuous with the blastema of the *bulbus penis*. The total length of buds amounts to 400μ approximately.

IV. DISCUSSION

The structure of the genital apparatus in the male of *C. suaveolens* is almost identical with that in shrews (Kowalska-Dyrz, 1966). The histological analysis has shown the existence of two swellings of *vas deferens*, homologous to the proximal and distal swellings in shrews. So far, only Kaudern (1911) has mentioned the possible homology between the portion of *vas deferens* adjoining to the ampulla in *Crocidura indica*, Robinson & Kloss, 1922, and the proximal swelling in other shrews.

Gl. prostaticae arise in form of a pair of buds growing from the lateral walls of the *sinus urogenitalis*. In a mature male they have always one pair (it has been stated in all 5 cases) of openings emptying into the urethra. The openings are lying in lateral walls of the urethra beyond but in a level with *colliculus seminalis* (in *Neomys* they always empty

within *colliculus seminalis*, Kowalska-Dyrcz, 1966). Godet (1951) in *Crocidura russula* (Hermann, 1780) and Kaudern (1911) in *C. indica* have stated two pairs of prostatic glands ducts. It must be emphasized that in *C. suaveolens* each lobe also issues two ducts, which, however fuse into a single duct emptying into the urethra. Both, formation and histological structure of the prostate, show its homology with the prostatic gland in shrews.

The structure of the urethra is identical as in shrews. The prostatic pocket described by Godet (1950; 1951) in *C. russula* does not occur in *pars prostatica urethrae*. There is, instead, the *sinus urethrae bulbi* associated with the openings of the ducts of *gl. bulbo-urethrales*, that resemble in shape and size the sinus of genus *Neomys* (Kowalska-Dyrcz, 1966). The above facts prove that the authoress was right to criticize the opinion expressed by Godet (1950; 1951) concerning the structure of the urethra in *Soricidae* (Kowalska-Dyrcz, 1966).

Gl. bulbo-urethrales resemble in shape and size those in *Neomys fodiens* (Pennant, 1771). They differ, however, in their microscopical structure from the *gl. bulbo-urethrales* in *Sorex* being rather similar to those glands in *Talpidae* (Eadie, 1948; 1951). They have not tubulo-alveolar structure being complex tubular glands. Unlike *Sorex* (Kowalska-Dyrcz, 1966) their excretory ducts have not glandular character. The localization of those glands, their development and site of the openings of their excretory ducts show that those glands are homologous to *gl. bulbo-urethrales* in other *Insectivora*.

No data concerning the occurrence of *gl. paragenitales* in *Soricidae* have been found in the available literature. The absence of this kind of gland in *Crocidura* has been stated by Eadie (1951) as well as by Godet (1952) who gave the tables of all accessory glands in *Soricidae*. Considering the descriptions given by Eadie (1947; 1948; 1951) concerning the *gl. perineales* in *Talpidae* as well as their topography within this family, it seems that the glands occurring in *C. suaveolens* should be classified into the above category. On the other hand, however, it is known that the proctodeum in *Sorex* and *Neomys* is surrounded by well developed proctodeal glands (Hamperl, 1926), whose structure does not differ essentially from *gl. perineales*. Hence, in order to establish to which class the glands described in the present paper should be assigned some more detailed studies of their structure, localization and sites of the openings of their excretory ducts seem to be necessary.

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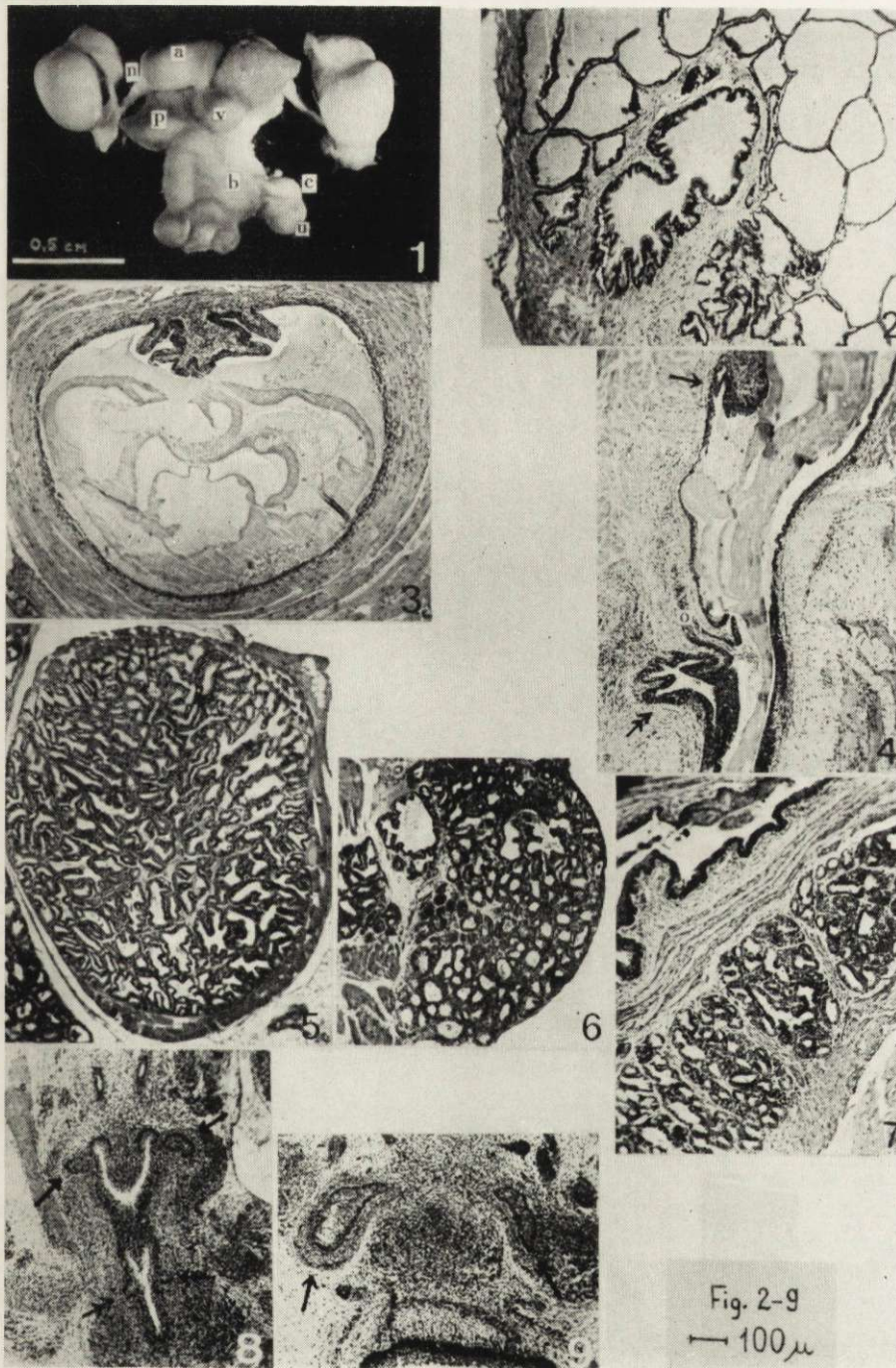
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UKŁAD PŁCIOWY WYPROWADZAJĄCY
SAMCÓW *CROCIDURA SUAVEOLENS* (PALLAS, 1811)

Streszczenie

Zbadano budowę układu płciowego wyrowadzającego 5 dojrzałych płciowo samców *Crocidura suaveolens* (Pallas, 1811), oraz jednego zarodka płci męskiej. Analiza histologiczna gruczołów dodatkowych (*gl. ampullarum*, *gl. prostaticae*, *gl. bulbo-urethrales*) u osobników dorosłych oraz sposób i miejsce ich powstawania u zarodka wskazują, że są one homologiczne gruczołom dodatkowym *Soricinae* (Kowalska-Dyrcz, 1966). *Vas deferens* posiada dwa zgrubienia: proksymalne i dystalne (*gl. ampullarum*) o podobnej budowie jak u rodzaju *Sorex*. W *pars prostatica urethrae* brak kieszeni prostatycznej opisanej przez Godeta (1951) u *Crocidura russula* (Herman, 1780). Stwierdzono ponadto występowanie silnie rozwiniętych *gl. paragenitales*, leżących między *rectum* a *corpus penis*, a bardziej kaudalnie również wokół *rectum*. Nie ustalono napewno ilości i miejsca ujść tych gruczołów. Autorka sugeruje, że są to *gl. perineales*, nie opisane dotąd u żadnego przedstawiciela *Soricidae*.



A. Kowalska-Dyrz

auctor phot.

EXPLANATION OF PLATE V.

Fig. 1. The urogenital system in *Crocidura suaveolens* ♂, ad. a — *gl. ampullarum*, b — *bulbus penis*, c — *gl. bulbo-urethrales*, n — proximal swelling of *vas deferens*, p — *gl. prostaticae*, v — *vesica urinaria*, u — *gl. paragenitales*.

Fig. 2. Cross section (slightly longitudinal) through the proximal part of distal swelling of *vas deferens*.

Fig. 3. Cross-section through the urethra in a level with *colliculus seminalis*. One sees the openings of *vasa deferentia*.

Fig. 4. Longitudinal-section through the urethra. One sees the *colliculus seminalis* marked by arrow, *sinus urethrae bulbi* marked by double arrow and the opening of the duct of *gl. bulbo-urethralis* (o).

Fig. 5. Cross-section through the *gl. bulbo-urethralis*.

Fig. 6. Lateral group of *gl. paragenitales*.

Fig. 7. Caudal part of *gl. paragenitales* surrounding the rectum.

Fig. 8. Frontal-section through the *sinus urogenitalis* of embryo. One sees the buds of prostatic glands, marked by arrows and the buds of bulbo-urethral glands, marked by double arrows.

Fig. 9. Cross-section through the posterior part of embryo. One sees the distal part of the buds of *gl. bulbo-urethrales* marked by arrows.