Comparative Morphology and Archaeozoology

WHAT'S NEW, ELEPHANT? - MORPHOLOGICAL PECULIARITIES OF THE EXTERNAL EAR IN AFRICAN ELEPHANTS (*LOXODONTA AFRICANA*)

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The auricle and the cartilaginous part of the external meatus

Many researchers took a particular interest in the extraordinarily large auricles of African elephants (*Loxodonta africana*). Position and movements of the auricles are possibly involved in social communication and defence against insects. Furthermore, it is very likely that their surface and blood supply play a major role in thermoregulation (figures 1 and 2). Referring to several reports, elephants can voluntarily close the opening to the cartilaginous part of the meatus acusticus externus (see also figure 3). A similar mechanism seems to occur only in marine mammals such as eared seals (*Otariidae*). Nevertheless, detailed morphological data concerning the cartilaginous structures of the external ear, the muscles of the auricle (pinna) and the meatus acusticus externus as well as the vascular and nerval supply are sparse.

Fig. 1: Thermogram of an African elephant (WEISSENBÖCK, 2006).

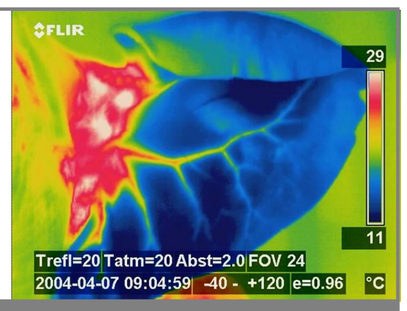

Fig. 2: Thermogram of the auricle (WEISSENBÖCK, 2006).

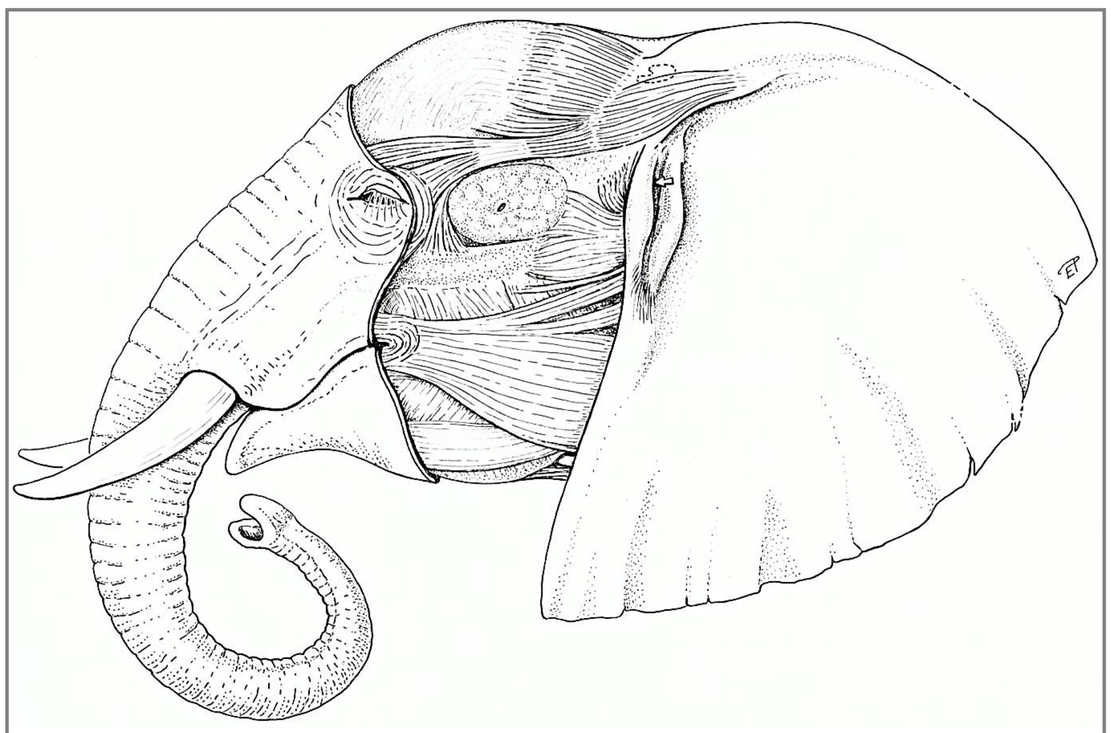

Fig. 3: Auricle and superficial muscles of the head including rostral auricular muscles. Arrow = opening of the external auditory meatus.

Specimens, methods and results

We examined the external ear of four juvenile African elephants by means of macroscopic and microscopic anatomical methods. The eminentia conchae of the auricular cartilage is connected via two rod-like structures to the cartilaginous part of the meatus acusticus externus (figures 4 and 5). Therefore, movements of the auricle alter position and/or width of the external auditory meatus. The cartilaginous part of the meatus acusticus externus consists of a rolled up layer of cartilage whose edges overlap (figure 5). In addition to a group of strongly developed muscles moving the auricle (some rostral muscles are depicted in figure 2), African elephants also have muscles which insert on the cartilago meatus acustici and connect this cartilage with the eminentia conchae of the auricular cartilage (figure 6). These muscles are the musculi meatus acustici externi, tragicus and styloauricularis. It is very likely that some of these muscles are able to vary the lumen size of the cartilaginous part of the external ear canal. The arteria auricularis caudalis and its branches supply the auricle. The nervi facialis and auricularis magnus innervate the external ear and its muscles. Branches of arteries, veins and nerves disperse tree-like over the caudal surface of the cartilago auriculae (figure 7). The course of the vessels can also be seen on thermograms (figures 1 and 2).

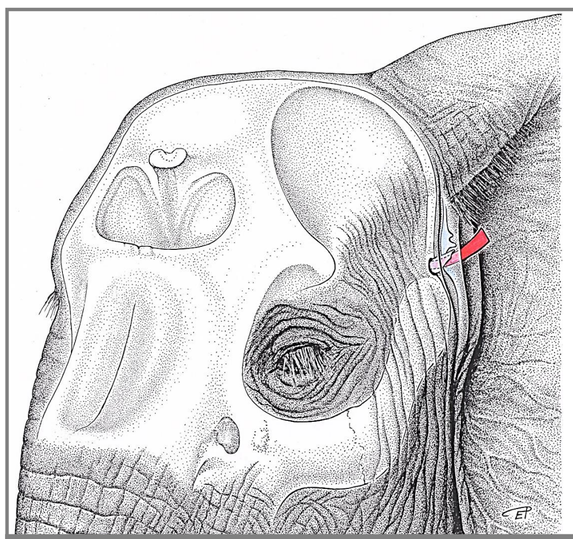

Fig. 4: Passage through the outer part of the meatus acusticus externus (red). Light blue = cartilago meatus acustici and eminentia conchae.

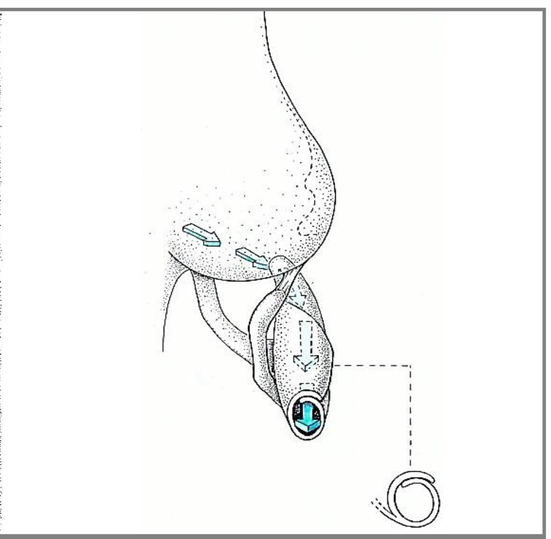

Fig. 5: Eminentia conchae and meatus acusticus externus connected by two cartilaginous rods, medial aspect. Meatus also in cross-section.

Literature

WEISSENBÖCK, N. (2006): Die Thermoregulation Afrikanischer Elefanten in Tiergartenhaltung. Diplomarbeit, Naturwissenschaftliche Fakultät der Universität Wien.

WEISSENBÖCK, N. M., WEISS, CH. M., SCHWAMMER, H. M., KRATOCHVIL, H. (2010): Thermal windows on the body surface of African elephants (Loxodonta africana) studied by infrared thermography. Journal of Thermal Biology **35**, 182-188.

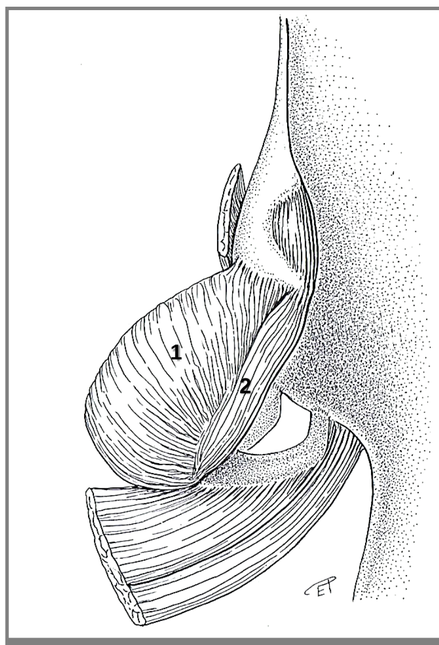

Fig. 6: Muscles inserting on the cartilaginous part of the meatus acusticus externus, lateral aspect. 1 = M. meatus acustici externi, 2 = M. tragicus.

Fig. 7: Vascular and nerval supply of the auricle, caudal aspect.

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