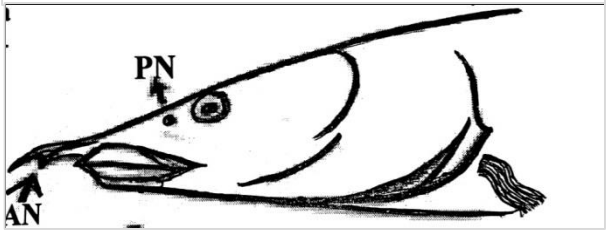
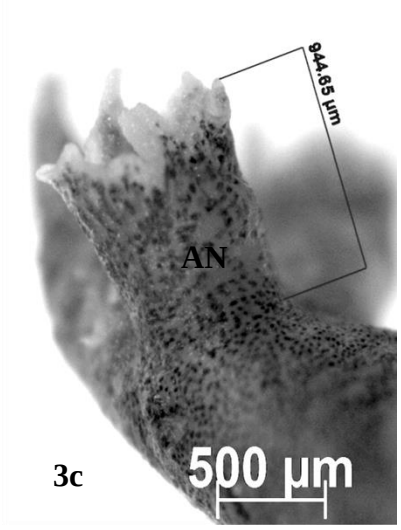
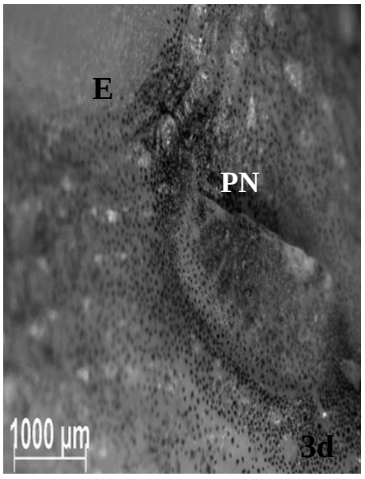
3a



3b

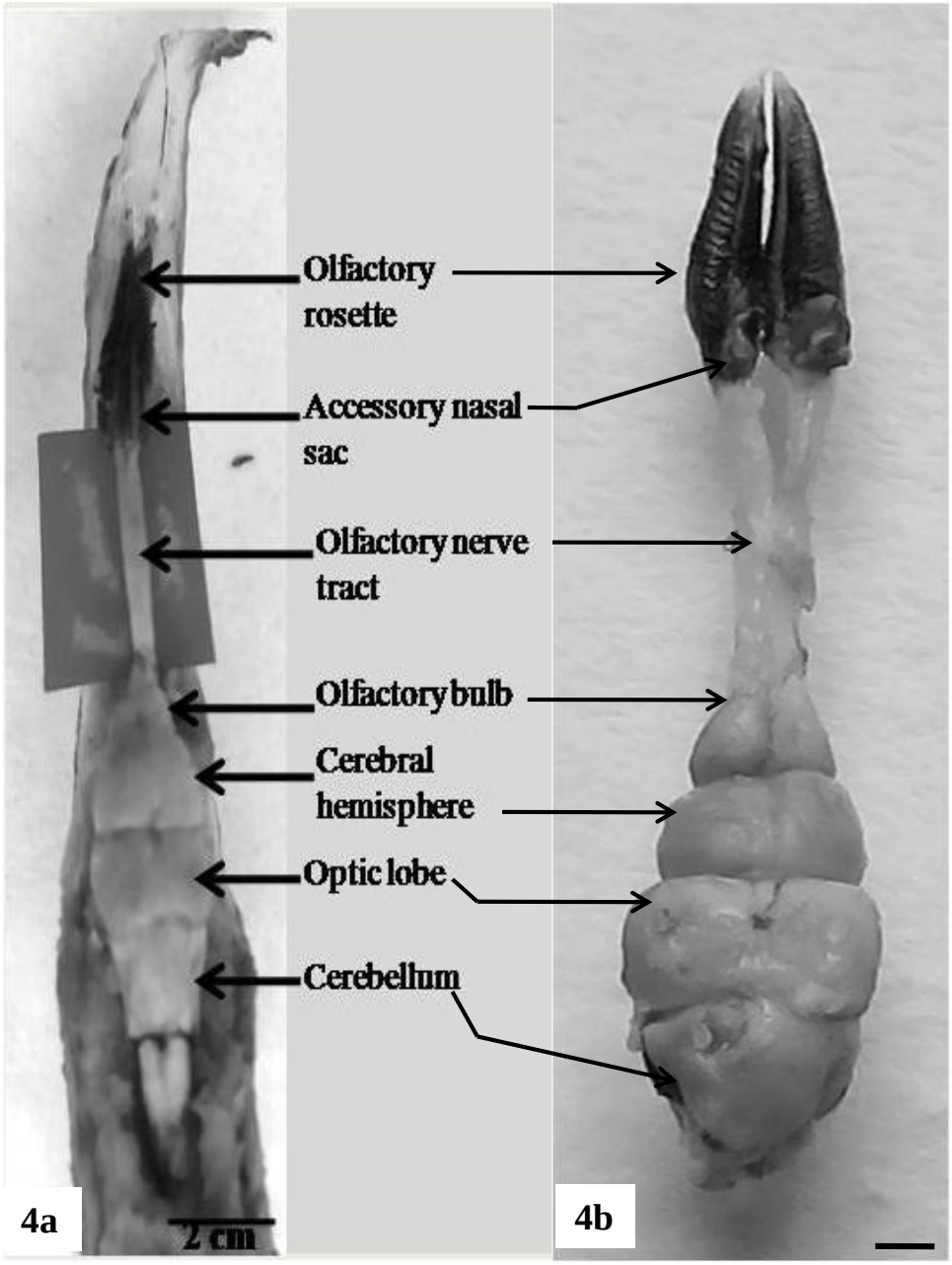


3c

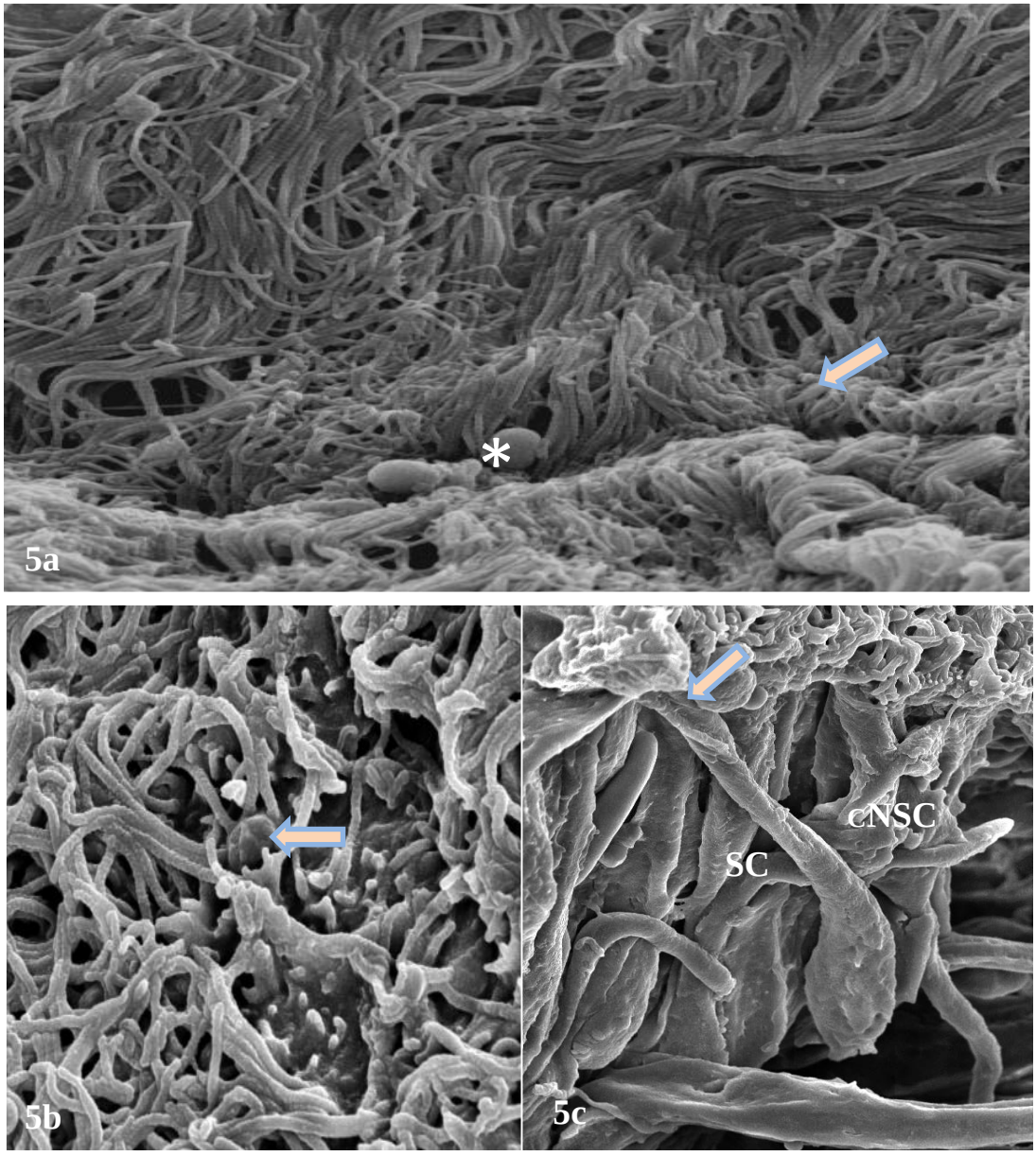


3d

Figs. 3 - The photograph shows the head part of *M. armatus.* (3a) The anterior and posterior nostrils (arrows) are marked at the snout region of head. (3b) Diagrammatic view of specimen head denotes distinct anterior nostril (AN) and posterior nostril (PN) respectively. [not to scale]. (3C) The anterior nostril (AN) is devoid of any nasal flaps. (3d) The posterior nostril (PN) is located at the anterior to eye (E), partly covered with nasal flap (arrow).



Figs. 4 (4a & 4b) - The photographs denote the dissected olfactory apparatus of *M. armatus* with its variable structural components *viz.*, Olfactory rosette, Accessory nasal sac, Olfactory nerve tract, Olfactory bulb, Cerebral hemisphere, Optic lobe, Cerebellum. Scale bar = 2 cm.



Figs. 5- (5a) The micrograph shows the cilliary embedded (arrow) non-sensory neuroepithelium with prominent mucous droplets (star). [Magnification- X 2000 (approx)]. (5b) The olfactory knob of ciliated sensory receptor cell shows prominent 5-6 cilia (arrow). [Magnification - X 1000 (approx)]. (5c) The external morphology of sensory cell (arrow) as well as non sensory (cNSC) and supporting (SC) cellular elements are also marked within the neuroepithelium. [Magnification- X 700 (approx)].

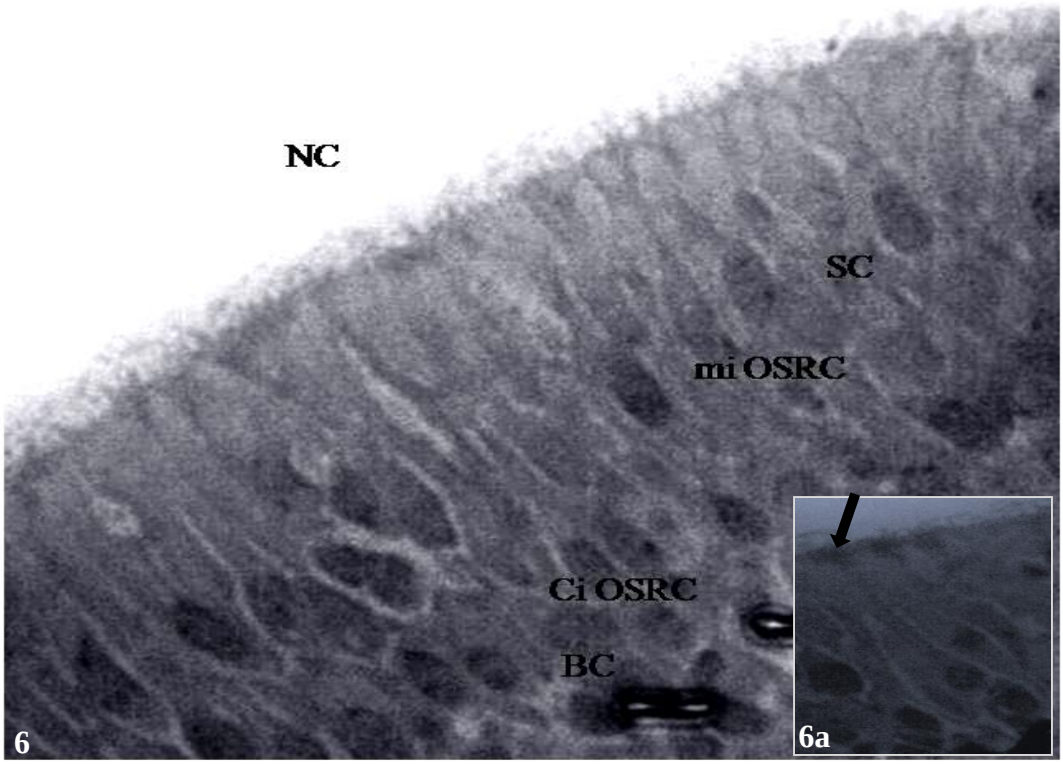


Fig. 6 – The photograph shows ciliated olfactory sensory receptor cell (Ci OSRC), micovillous olfactory sensory receptor cell (mi OSRC), supporting cell (SC), basal cell (BC) that are arranged within the neuroepithelium of *M. armatus* (semithin section) [NC: Nasal Cavity]. (6a) The ciliated sensory receptor cell with distinct olfactory knob bearing cilia (arrow) towards the nasal cavity (NC) [Magnification- X 100 (approx.)].

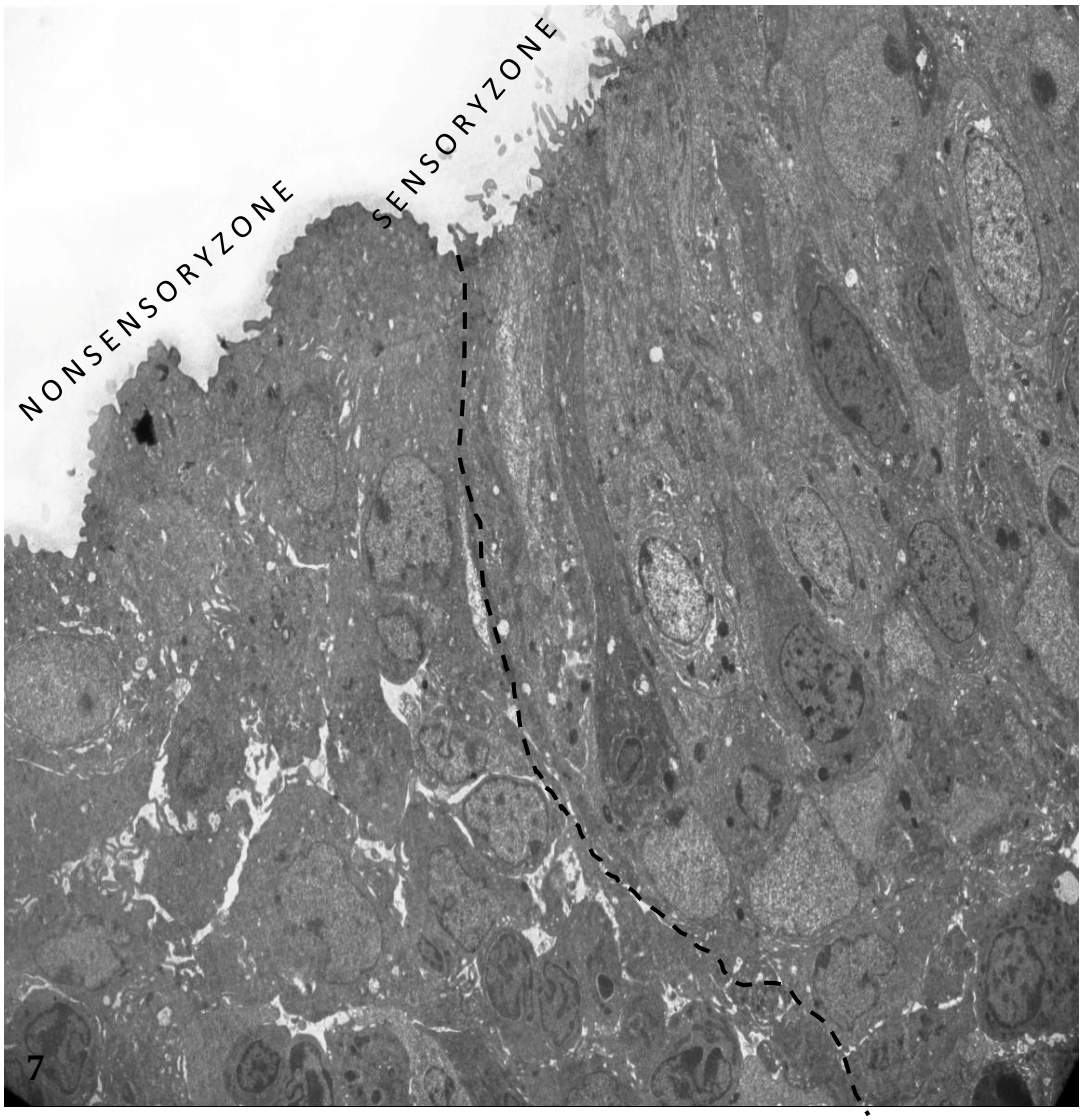
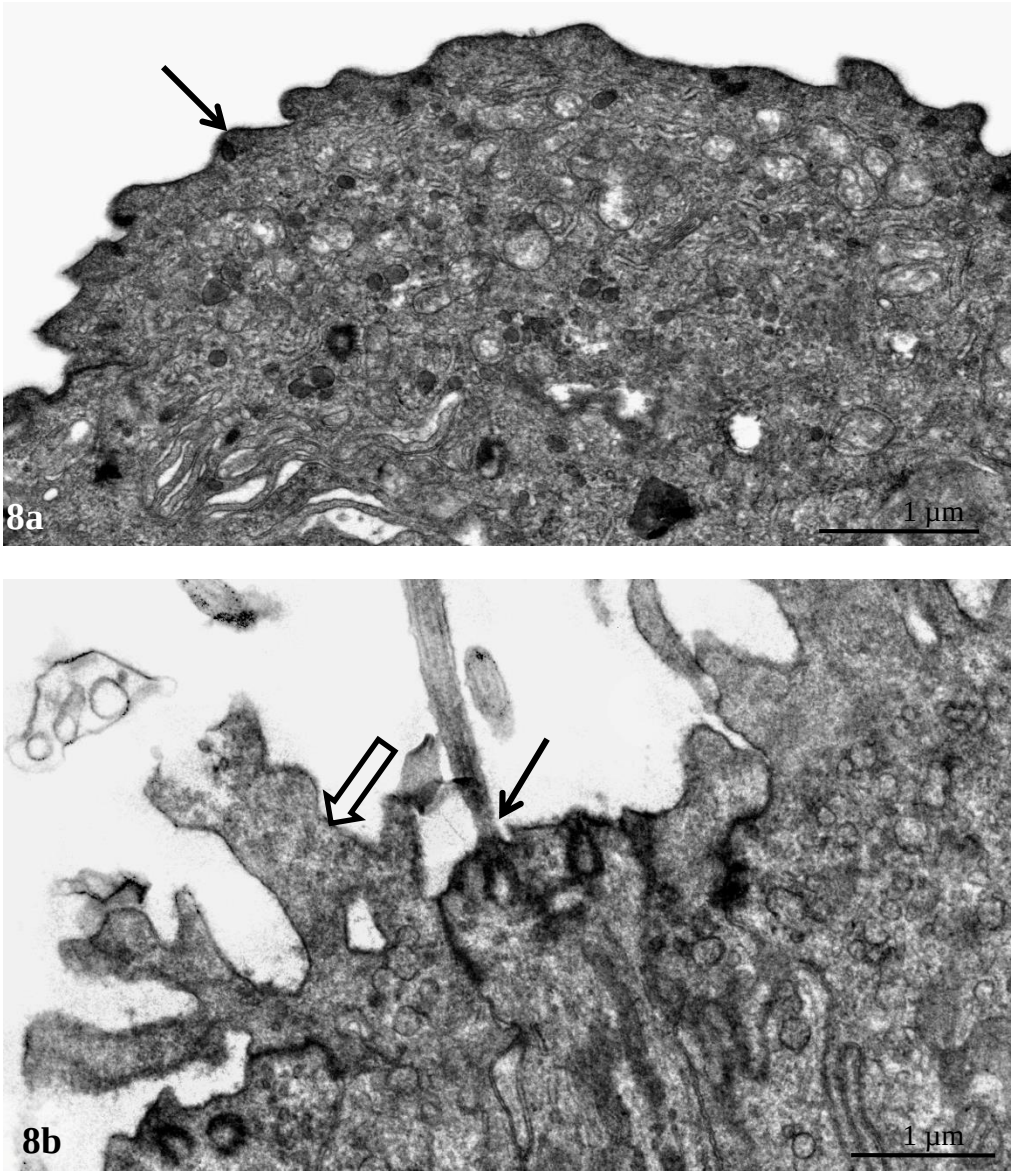
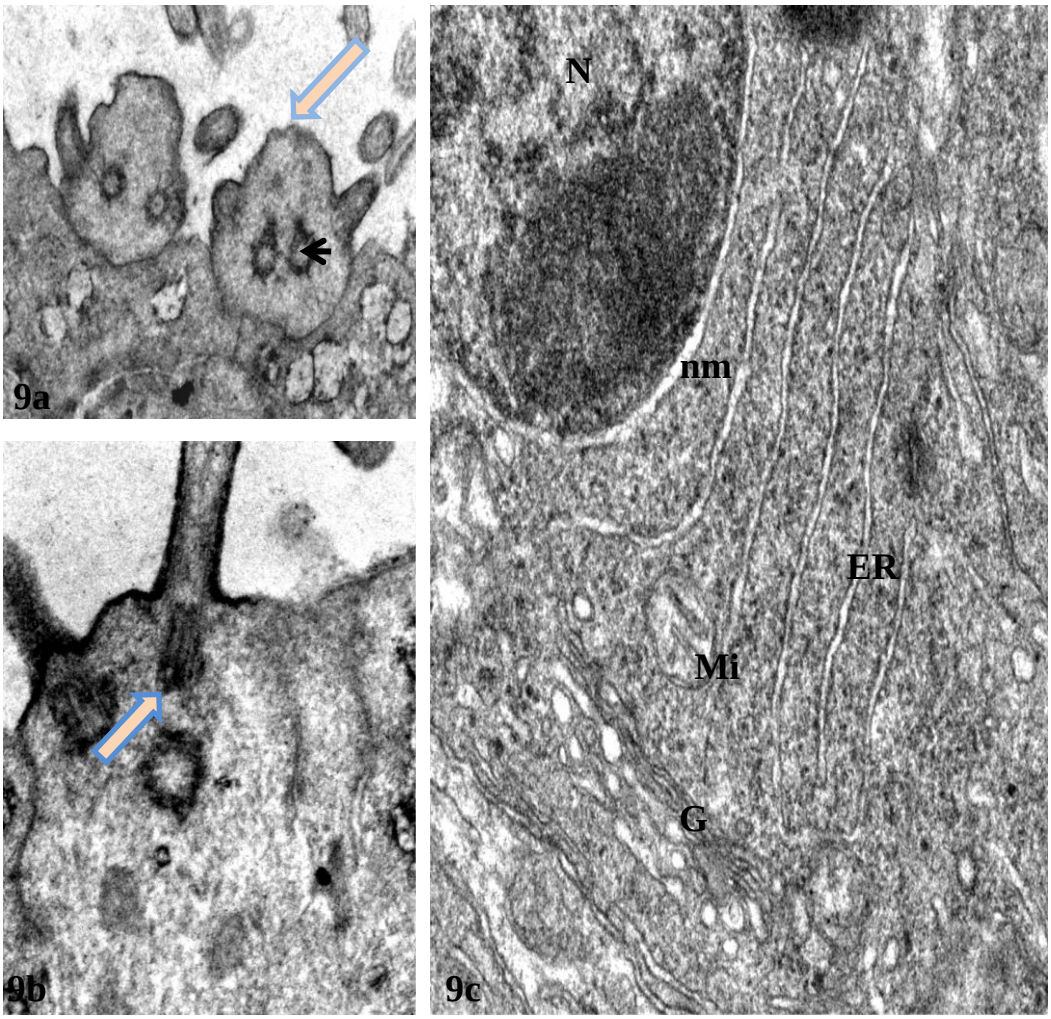


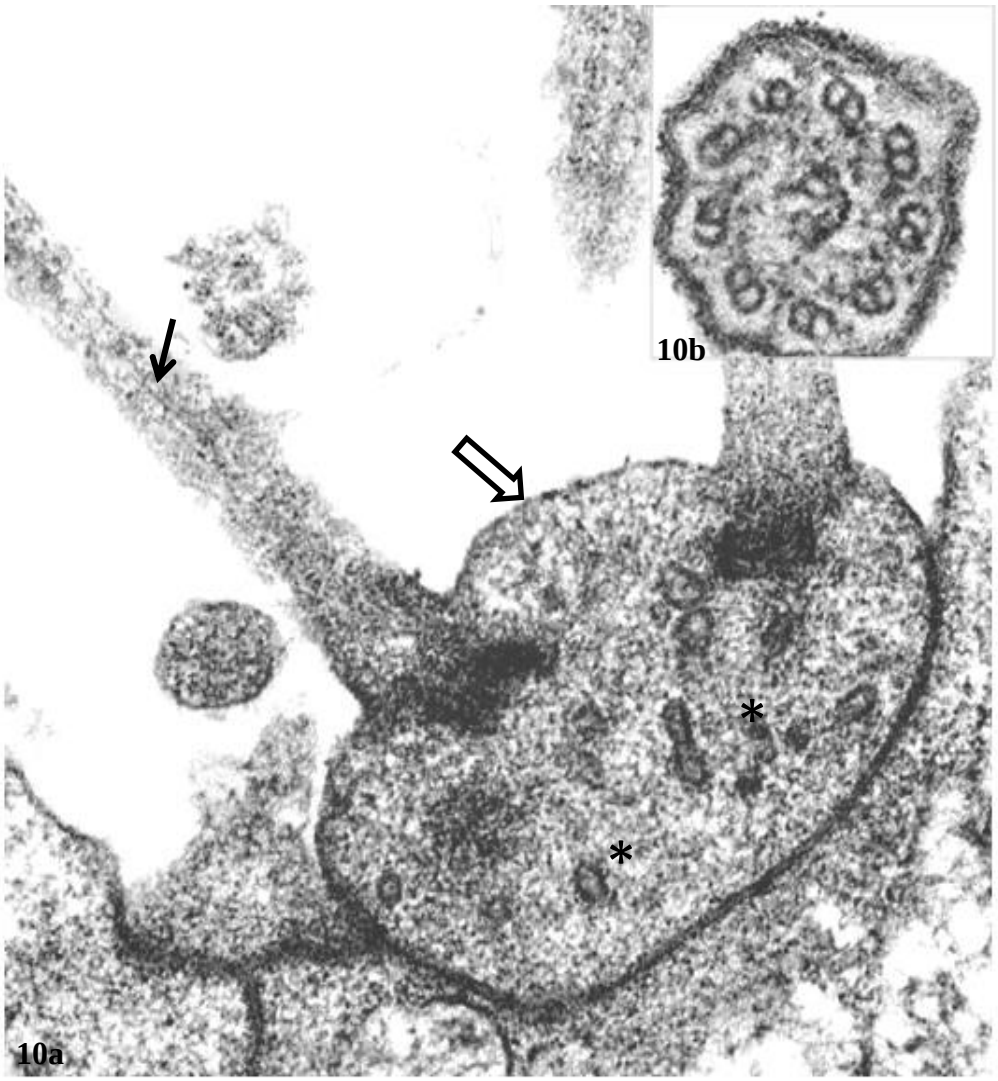
Fig. 7 - The photomicrograph denotes a distinct boundary line in between sensory and non sensory olfactory neuroepithelial components. of *M. armatus* [Magnification – X 2550 (approx.)].



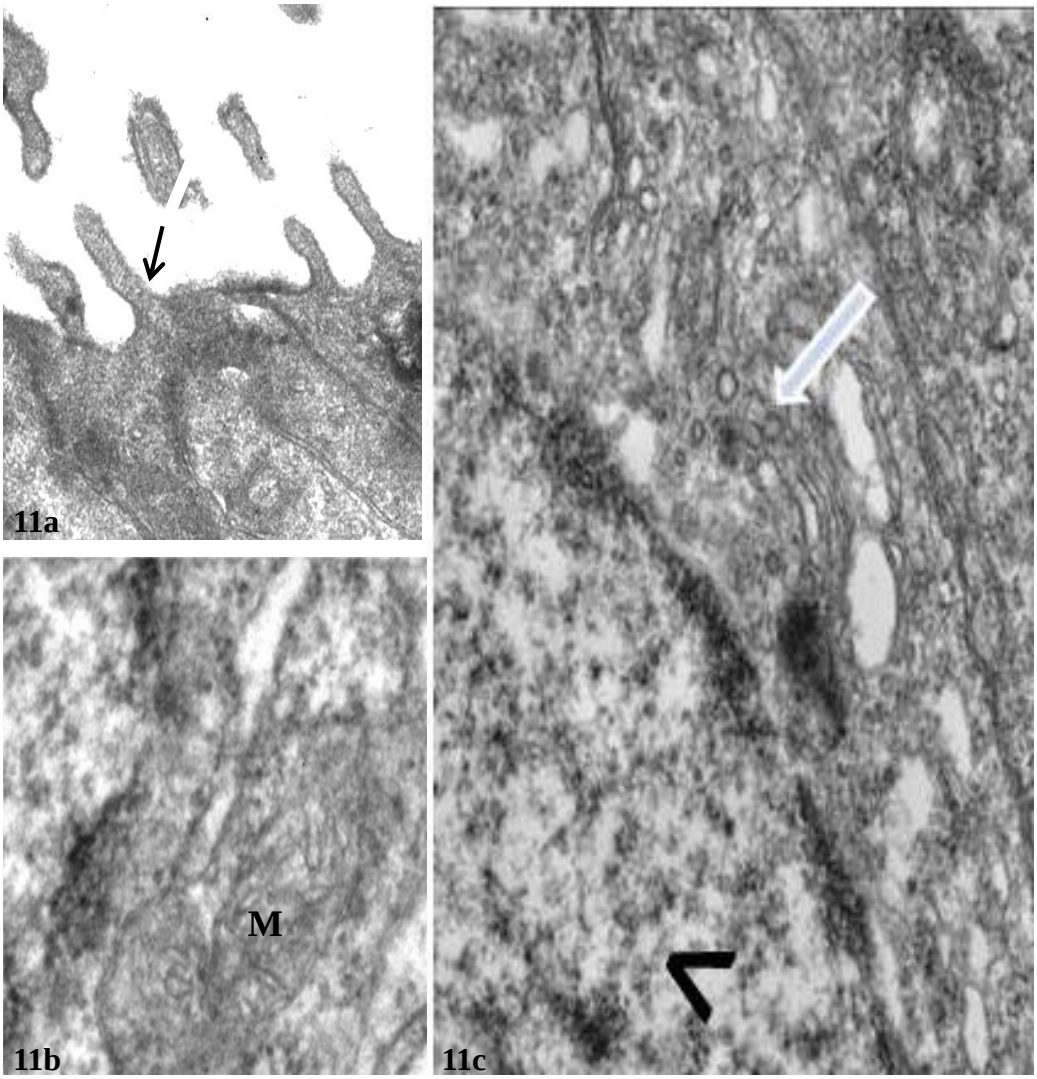
Figs. 8 - The electron micrograph denotes orientations of apical boundry line of neuroepithelium towards nasal cavity (NC) of *M. armatus.* (8a) The photograph denotes the upper surface architecture of nonsensory epithelial components of neuroepithelium (8b) The distinct apical projections of sensory components are distinctly marked (arrows). [Magnification – X 2550 (approx.)].



Figs. 9 - The photomicrograph of ciliated sensory receptor cell of *M. armatus*. (9a) The sensory knob (blank arrow) of ciliated sensory receptor cell denotes centriolar structure (solid arrow), (9b) Basal body (arrow) of the ciliated sensory receptor cell that present beneath the part from where cilia are emerge out. (9C) The perinuclear part of the ciliated sensory receptor cell are marked with nuclear part (N), cisternae of endoplasmic reticulum (ER), mitochondria with cristae (Mi), stacked of Golgi apparatus (G) [Magnification. X 2550 (approx.) & X 5000 (approx.)].



Figs. 10 – The micrograph denotes the apical olfactory knob (arrow) of ciliated sensory receptor cell. (10a) The sensory knob with microfilaments at their cilliary projections (arrow) , vesicles (stars) at their cytoplasmic knob. (10b) In inset the transverse sectional view of cilia with prominent (9+2) arrangement pattern of microtubule. [Magnification - X 15000 (approx.)].



Figs. 11 – The photograph of microvillous sensory receptor cell of *M. armatus*. (11a) The sensory knob of microvillous sensory receptor cell denotes microvilli structure (arrow) (11b) Mitochondria of the sensory receptor cell merges out to nasal cavity. (11c) The perinuclear part of the microvillous sensory receptor cell are marked with nuclear part (arrow head), Golgi apparatus (arrow) [Magnification. X 2550 (approx) & X 4000 (approx)].

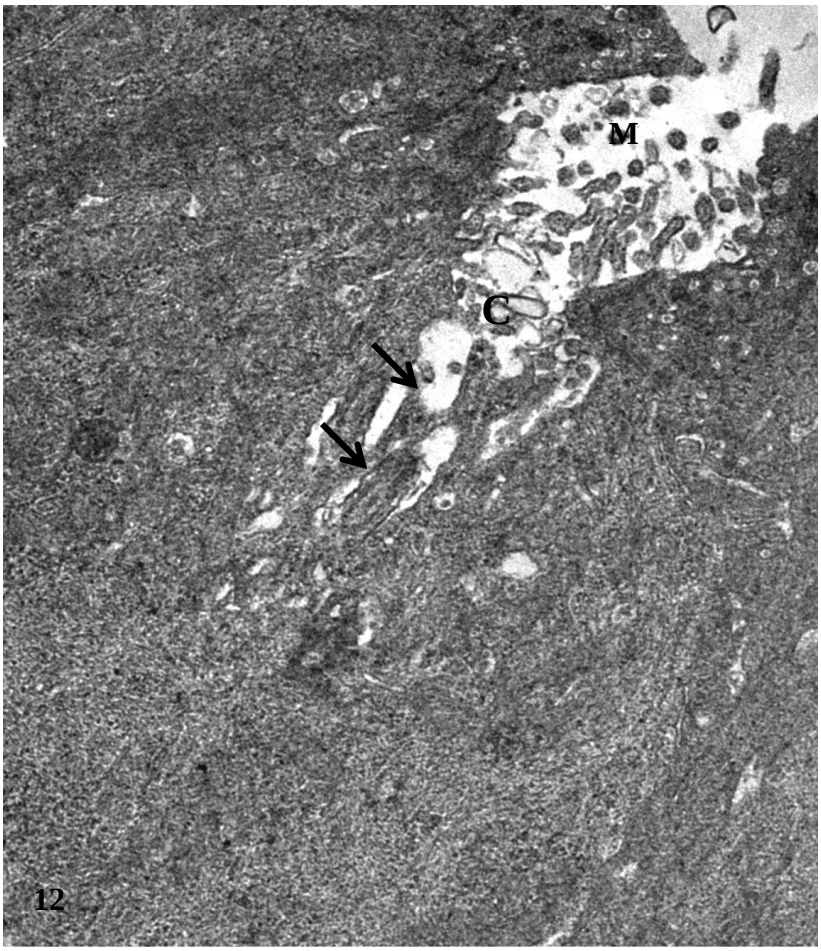
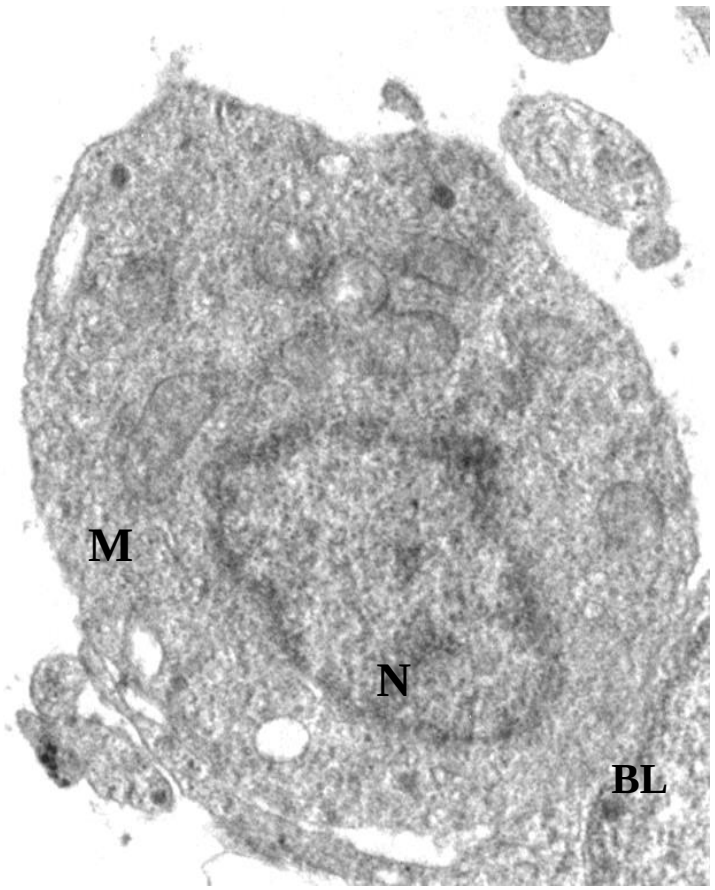


Fig. 12 - The electron micrograph of Crypt sensory receptor cell is characterized with sunken cilia (c) and apical microvilli (m) within the neuroepithelium of *M. armatus.* The invaginations at their apical margin are clearly marked out (arrows). [Mag. X 5600 (approx.)].



13

Fig. 13 - The photomicrograph shows the basal cell (BC) of *M. armatus* within the olfactory neuroepithelium that lies adjacent to the basal lamina (BL). [Magnification X 2550 (approx.)].

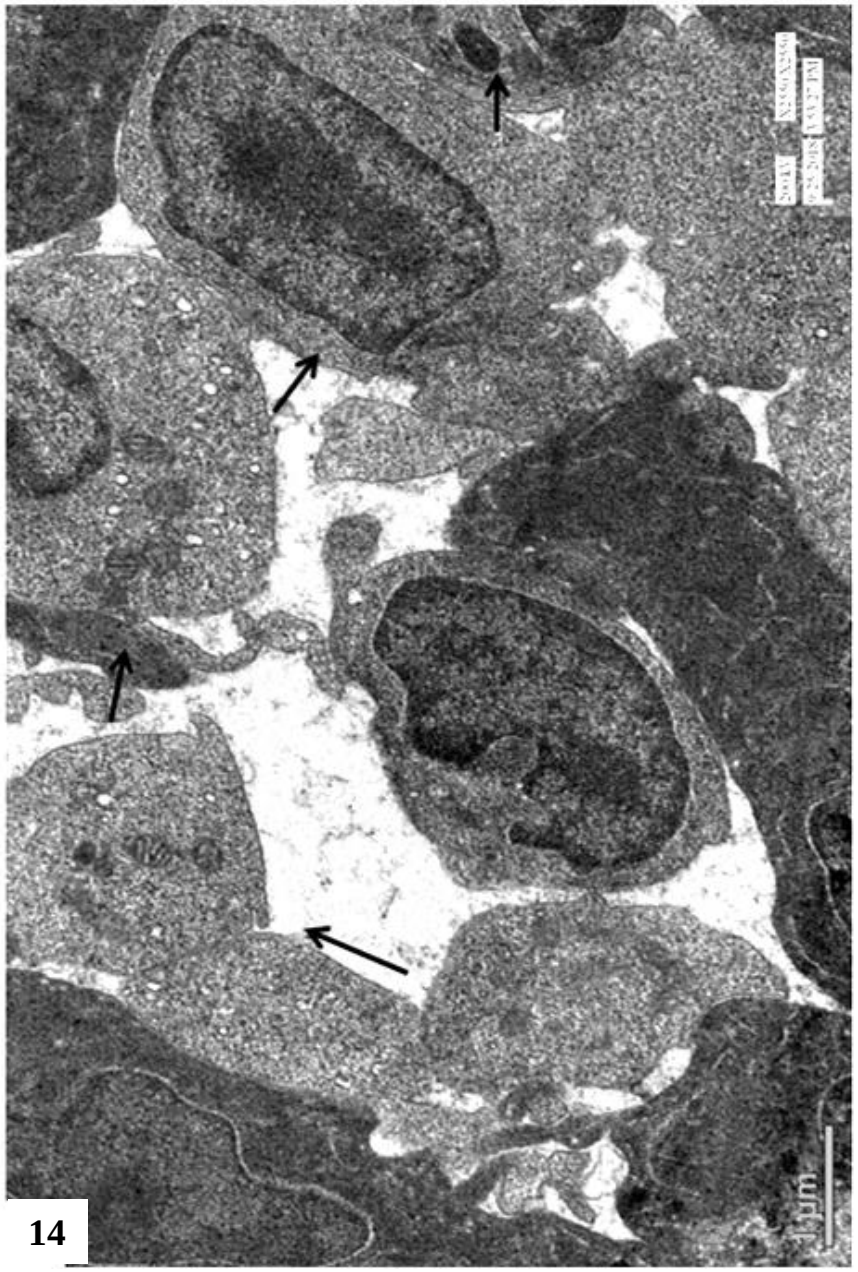
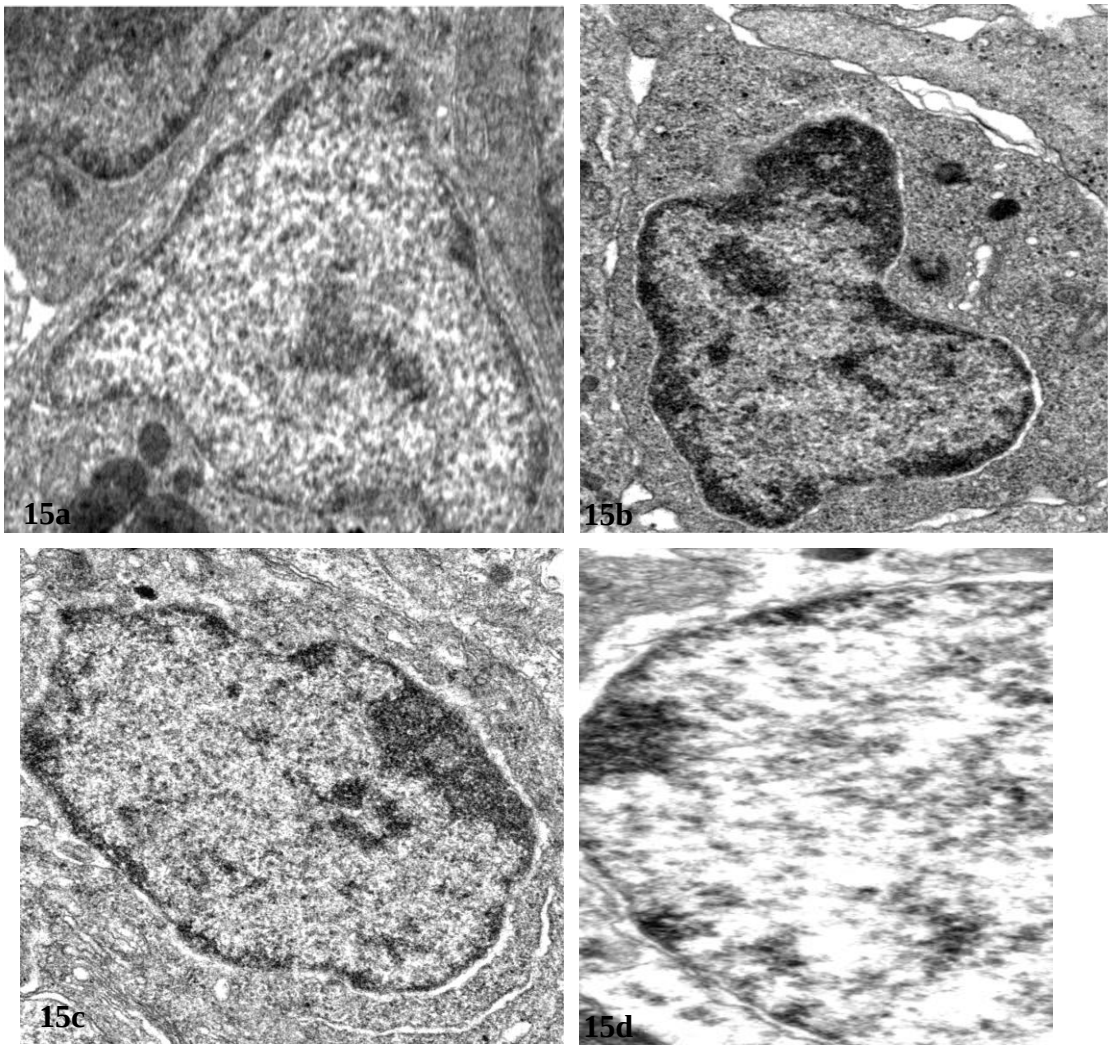


Fig. 14 - Variable differentiating stages of immature sensory receptor cells (arrows) are marked within the olfactory neuroepithelium of *M. armatus*.



Figs. 15 - The photographs are denote variable differentiating stages of basal cell components within the olfactory neuroepithelium of *M. armatus. (*15a*)* Electron lucent basal cell. (15b) Early differentiating stage of basal cell. (15c) Nucleus of mature sensory receptor cell. (15d) Nucleus of degenerating sensory receptor cell. [Magnification X 2550 (approx.)].

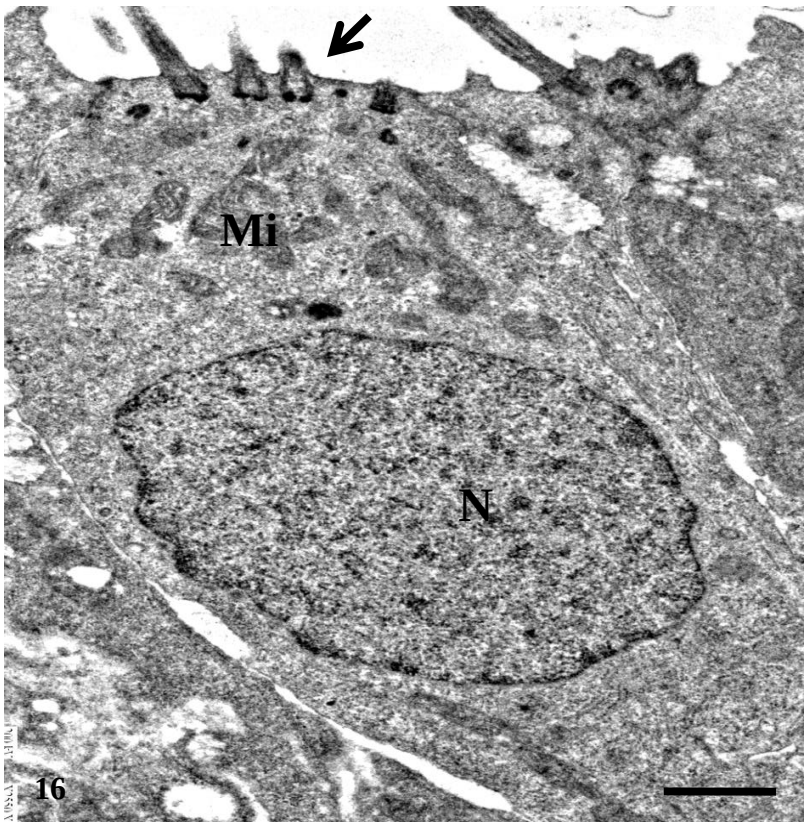


Fig. 16 - The photomicrograph of ciliated supporting cell (arrow) shows enlarge nucleus (N) and series of apical cilia along with basal body at their apical extremities. Scale bar = 2 µm. [Magnification X 2550 (approx.)].

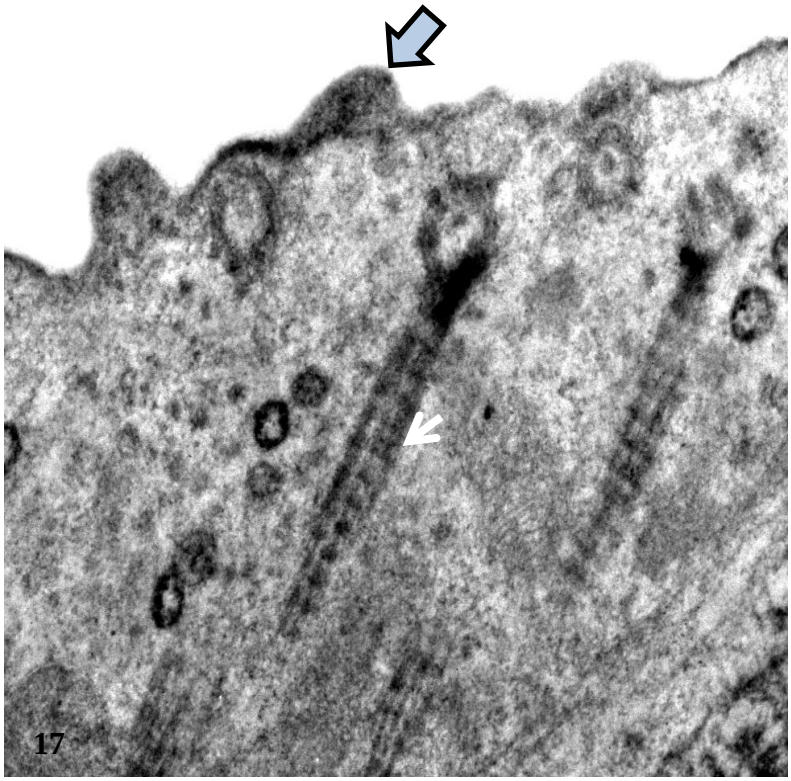


Fig. 17 - The electronmicrograph of non sensory neuroepithelium denotes micro ridge like structure (arrow) at the periphery of the neuroepithelium and striated rootlets with threads like extensions at their cytoplasmic area of non sensory cell. [Magnification X 5000 (approx.)].

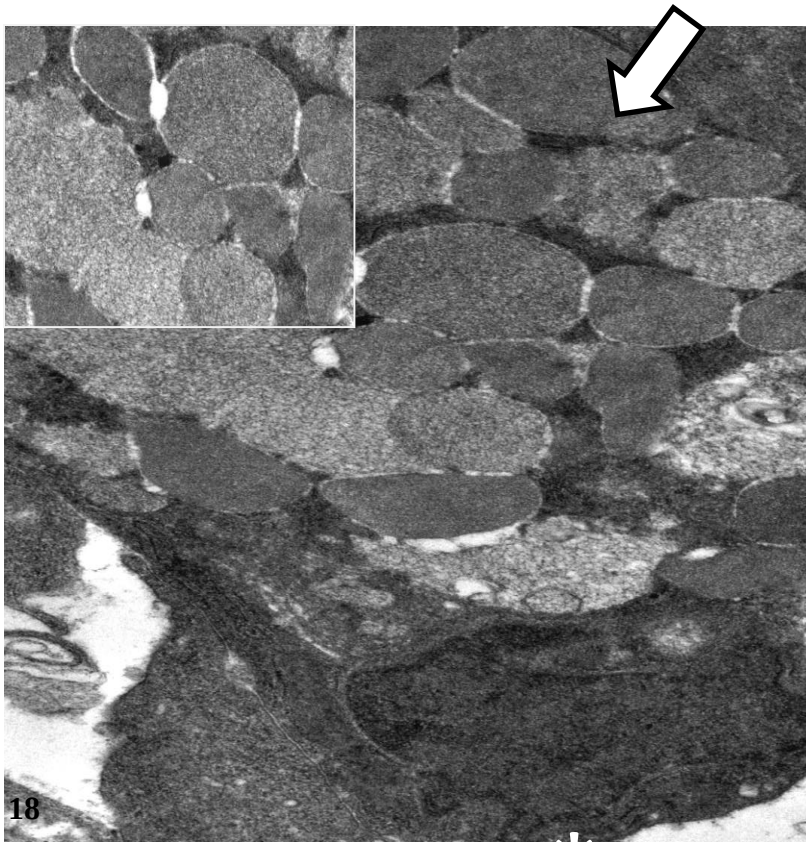


Fig. 18 - The electronmicrograph shows the epithelial goblet cell that marked with prominent intracellular components *viz.*, secretary mature lobules (blank arrow), immature secretary lobules (inset view), nuclear elements (star). [Magnification X 2550 (approx)].

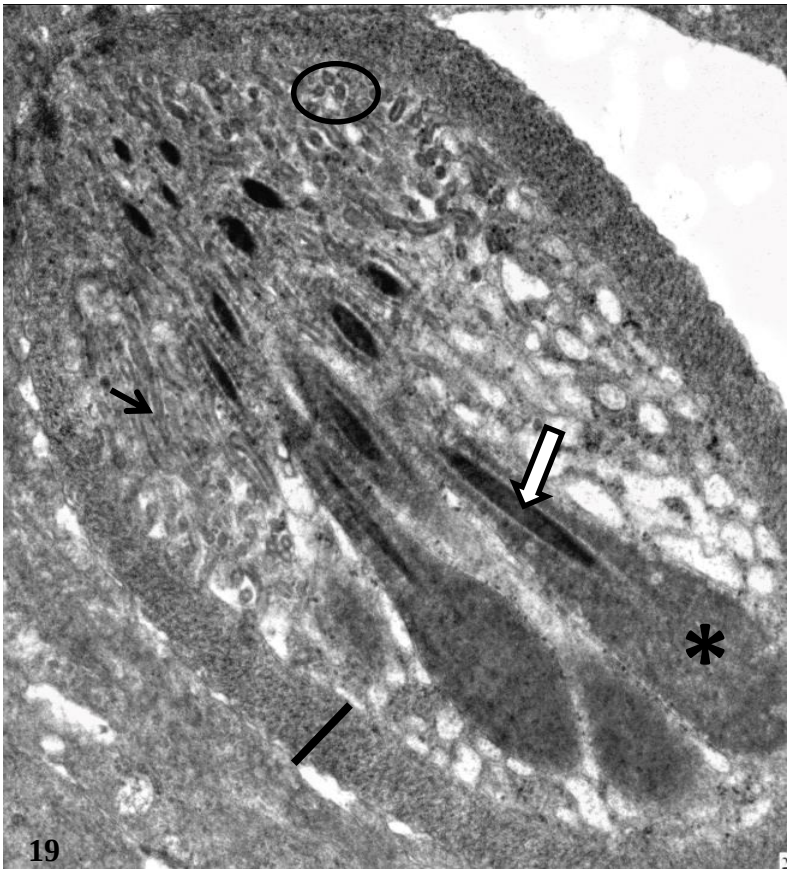


Fig. 19 - The ultrastructural photograph of neuroepethelial components denotes solitary structure of rodlet cell and is marked with several morphological characteristics *viz*., thick capsular structure (average thickness: 0.5 µm) mature olfactory rodlet sac (star) with rodlet core (blank arrow), mitochondrial labyrinth (solid arrow), micro vesicles (circle). [Magnification X 2550 (approx)].

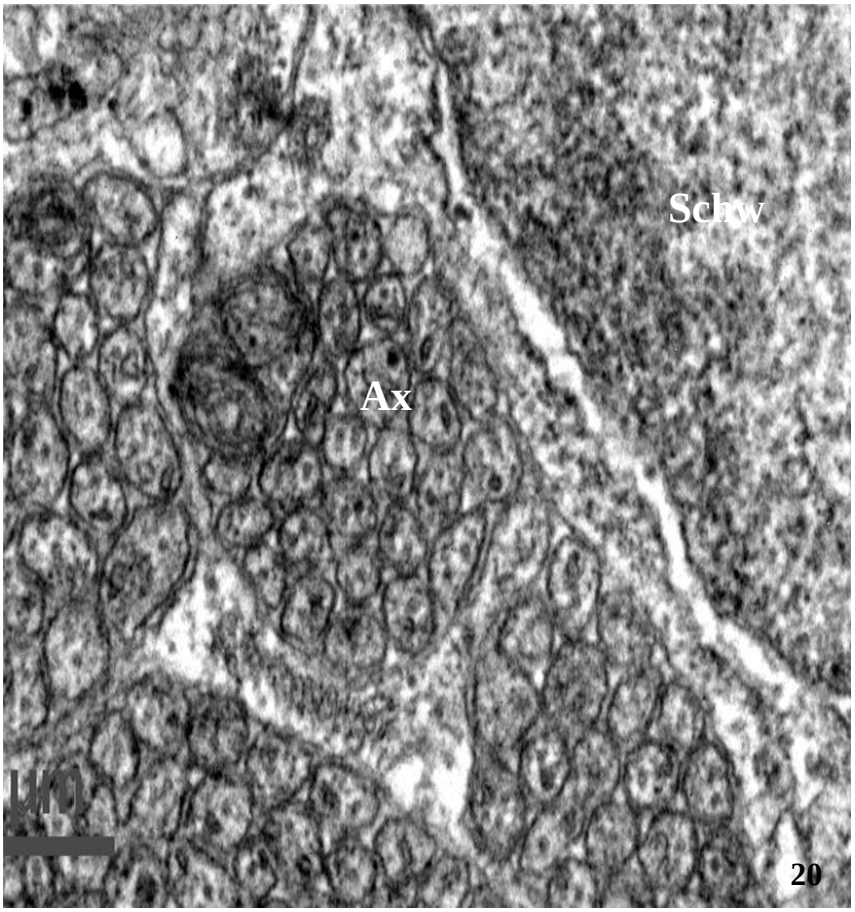


Fig. 20 - The photomicrograph denotes the arrangement pattern of bundles of axonal processes (Ax) of sensory componrnts that are very much closest to Schwann cell (Schw). [Magnification X 5000 (approx.)].

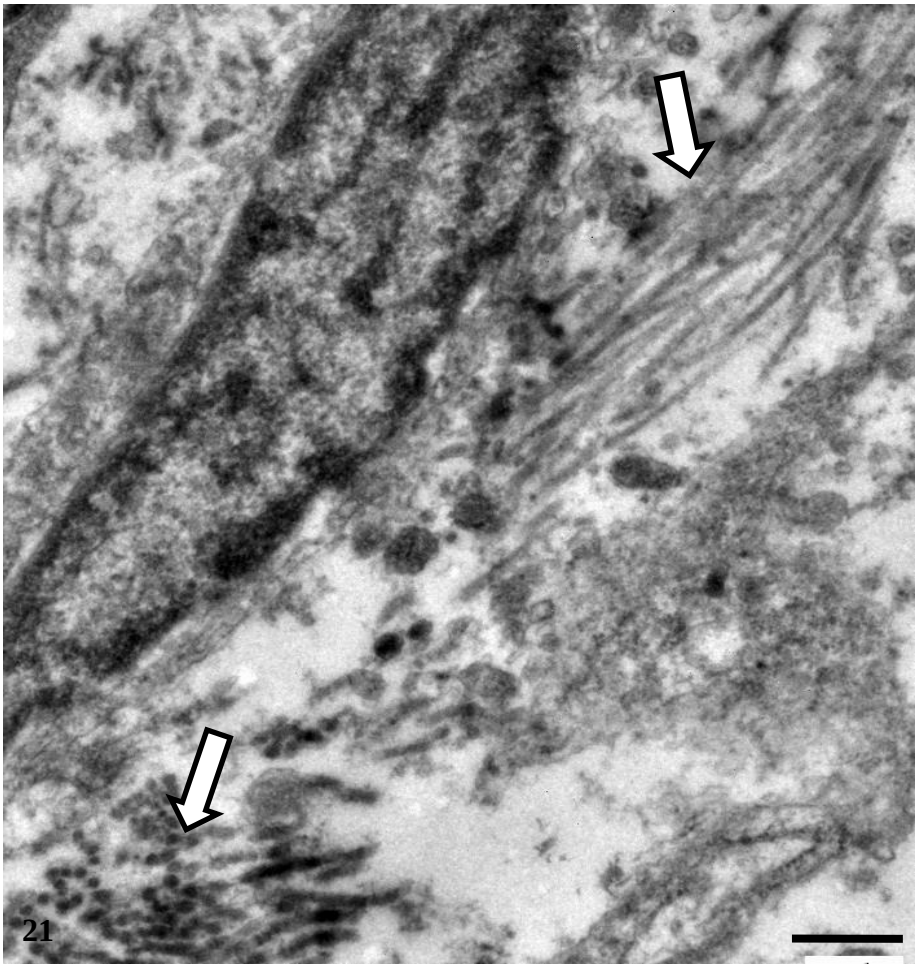


Fig. 21 - The photomicrograph of central core region within the olfactory neuroepithelium of *M. armatus* denotes distinct arrangement of collagen fibers (arrows) that are very much close to fibroblast cell. Scale bar = 2 µm [Magnification X 2550 (approx.)].

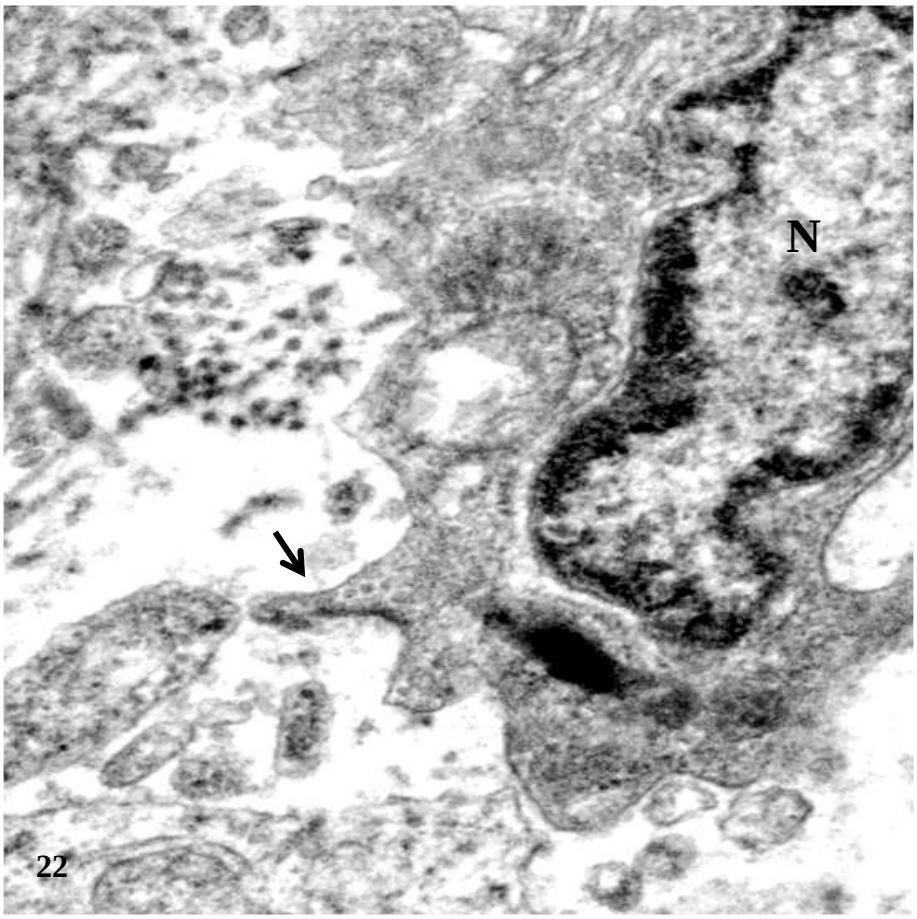


Fig. 22 - The transmission electron micrograph shows the fibroblast cell with distinct pseudopodial membrenal extensions (arrow). Nucleus (N) is marked with less hterochromatin structure than euchromatin granular structure . [Magnification X 2550 (approx)].

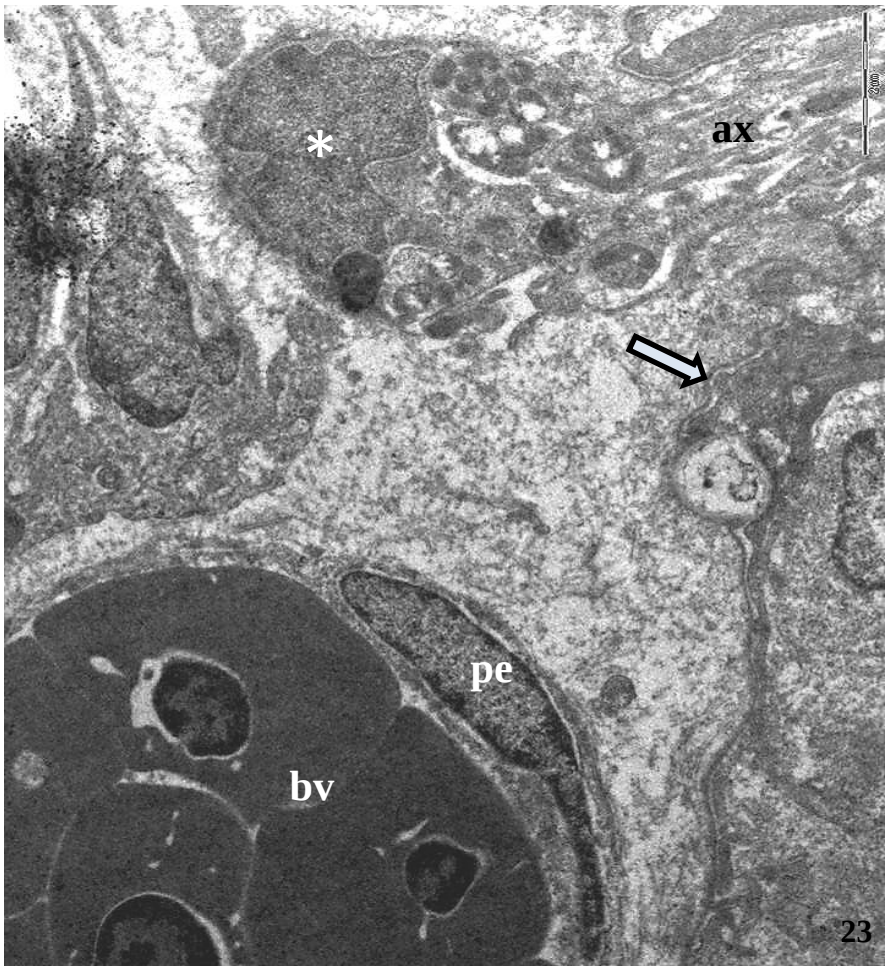
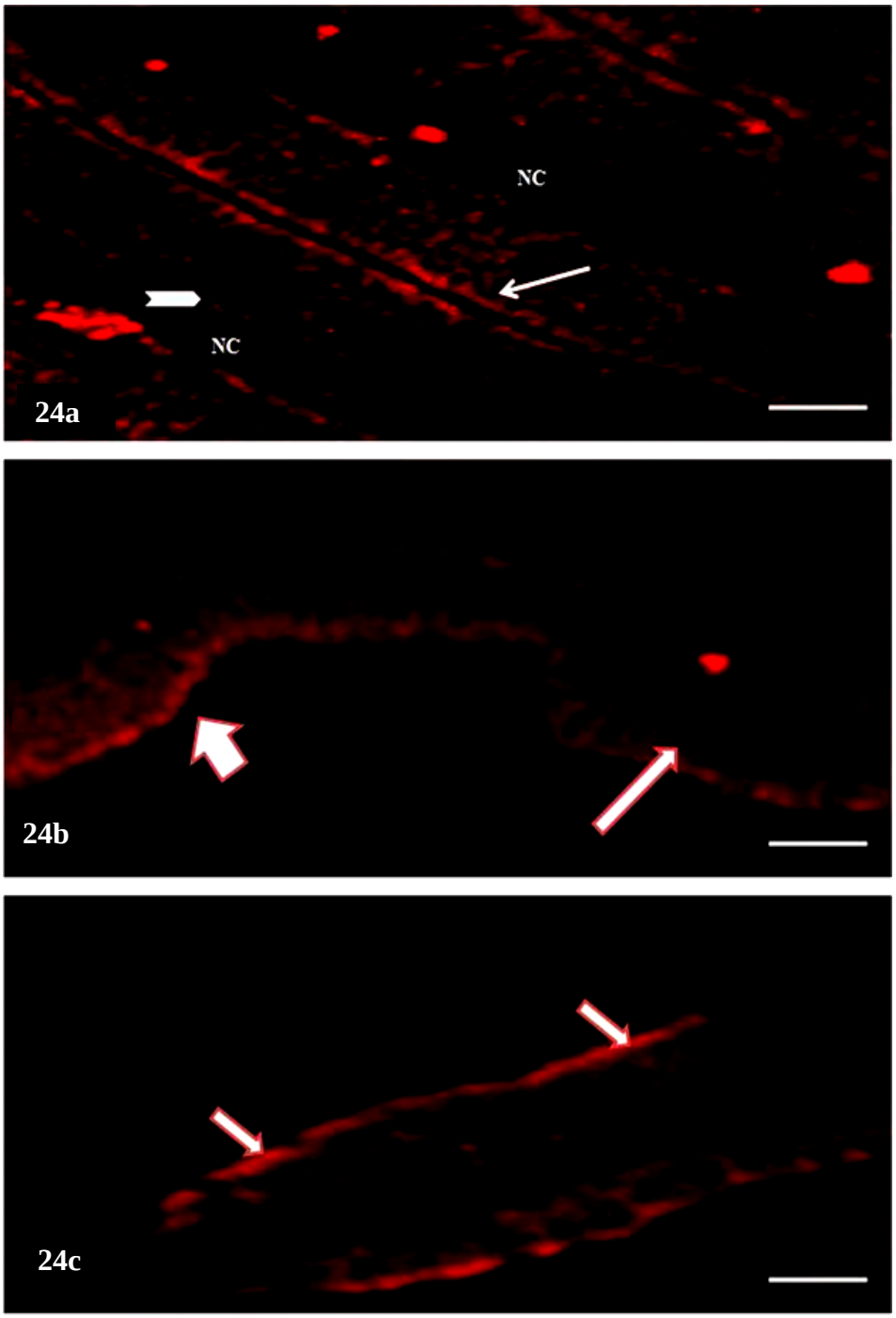
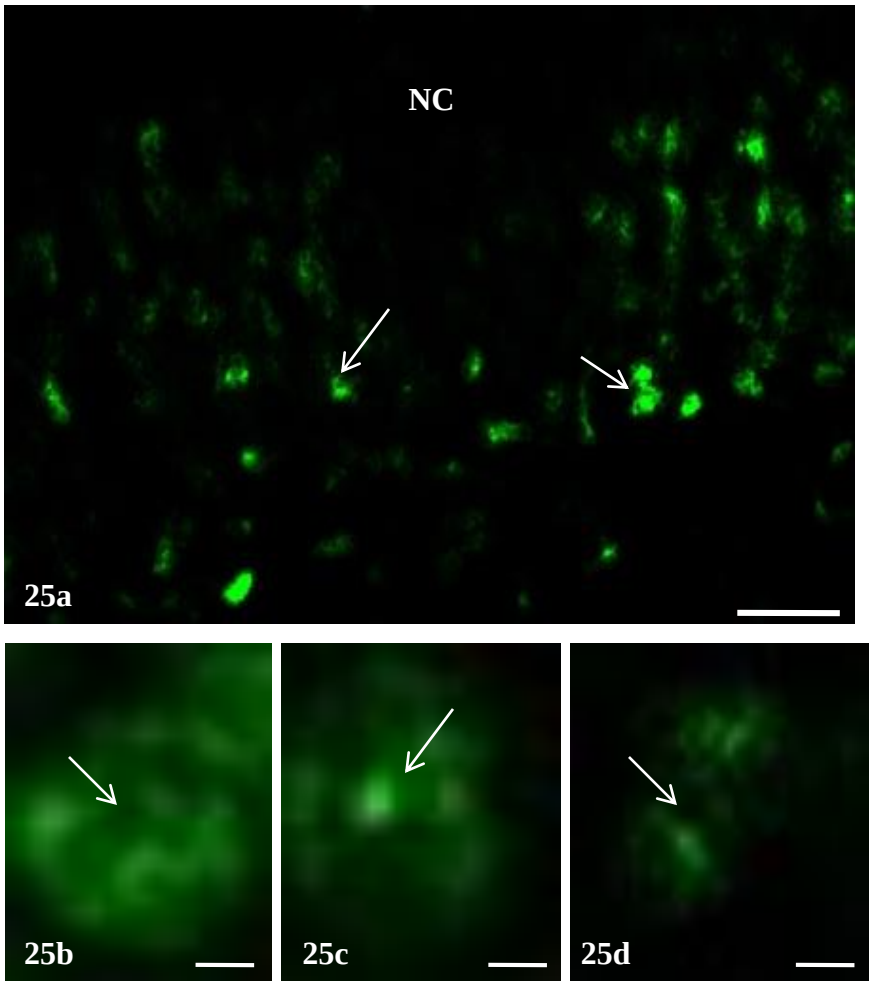


Fig. 23 - The electron micrograph of olfactory neuroepithelium of *M. armatus* denotes the lamina propia region of the neuroepithelium with distinct basal lamina (arrow), axonal bundles (ax) that encircled by Schwann cell (star), blood vessels and perivascular cell (pe). [Magnification X 2550 (approx.)].



Figs. 24 - Olfactory receptor protein expression within the olfactory eneuroepithelium of *M. armatus*. (24a) In the photomicrograph the expression of $G\alpha_{olf}$ receptor within the ciliated sensory receptor cells are strongly marked (arrows) than other part of the neuroepithelium. Scale bar = 2 µm. (24b & 24c) The ciliated dendron of the cOSRN are distinctly marked than the basal cell of the neuroepithelium. Scale bar = 2 µm (arrows).



Figs. 25 - The characteristic variations in nuclear elements of different neuroepithelial components of *M. armatus* were marked under fluorescence microscope. (25a) – The pseudostratified olfactory neuroepithelium shows strongly stained nuclear elements of cOSRN [arrows] and it gradually decreased towards the nasal cavity [NC]. (25b-25d) Diverse stages of proliferative nuclear elements of basal cells are marked (arrows). Scale bar = 20 µm

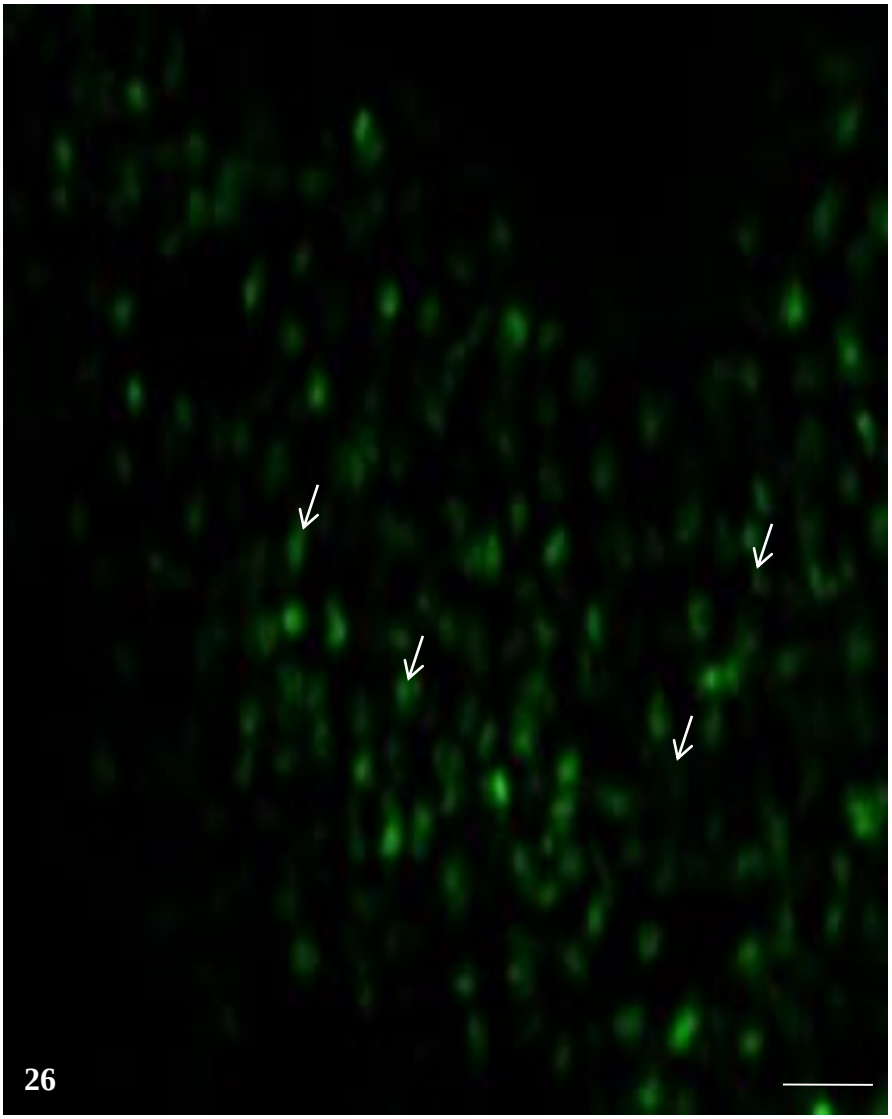
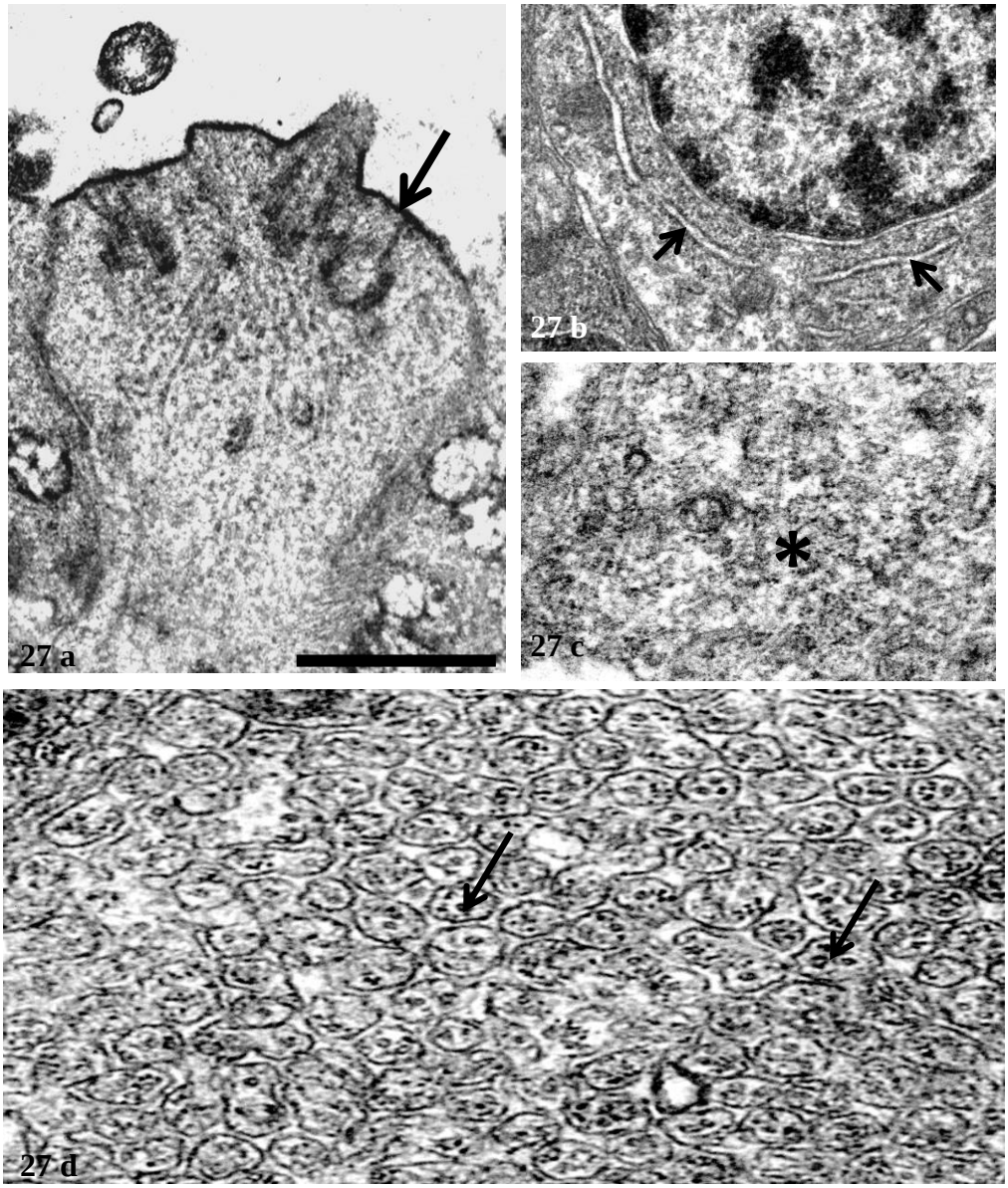
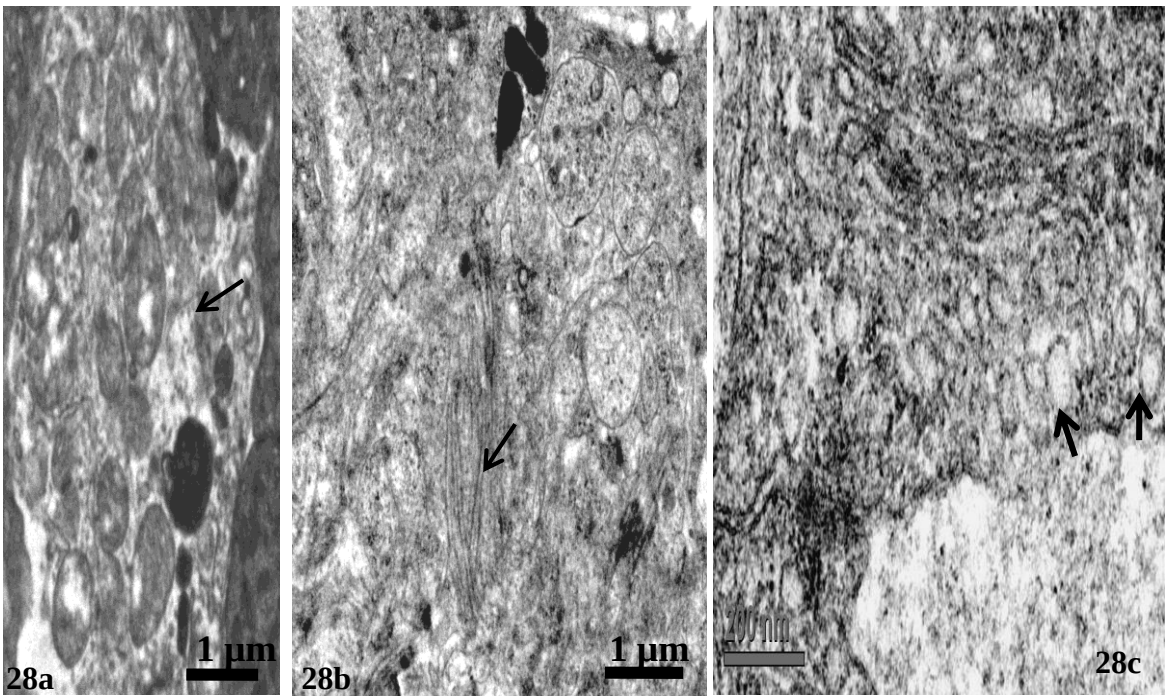


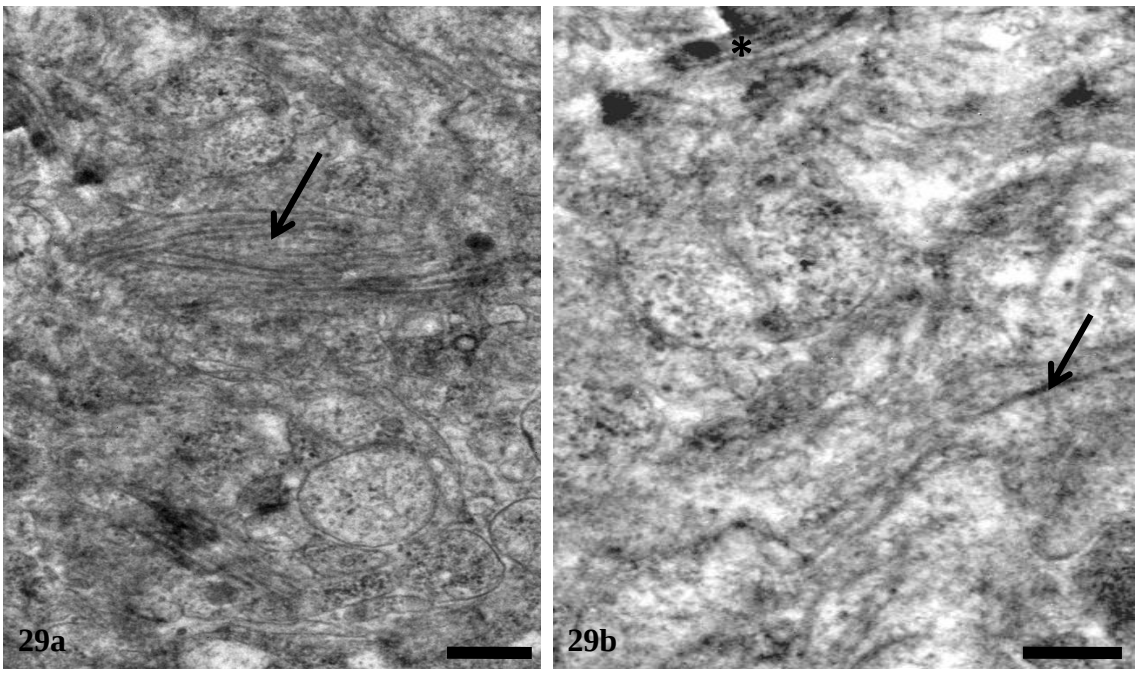
Fig. 26 - The characteristic variations in nuclear elements of different neuroepithelial components of *M. armatus* are marked under fluorescence microscope. The olfactory neuroepithelium (OE) shows variable morphology of the nucleus at different depths (arrows). Scale bar=2µm.



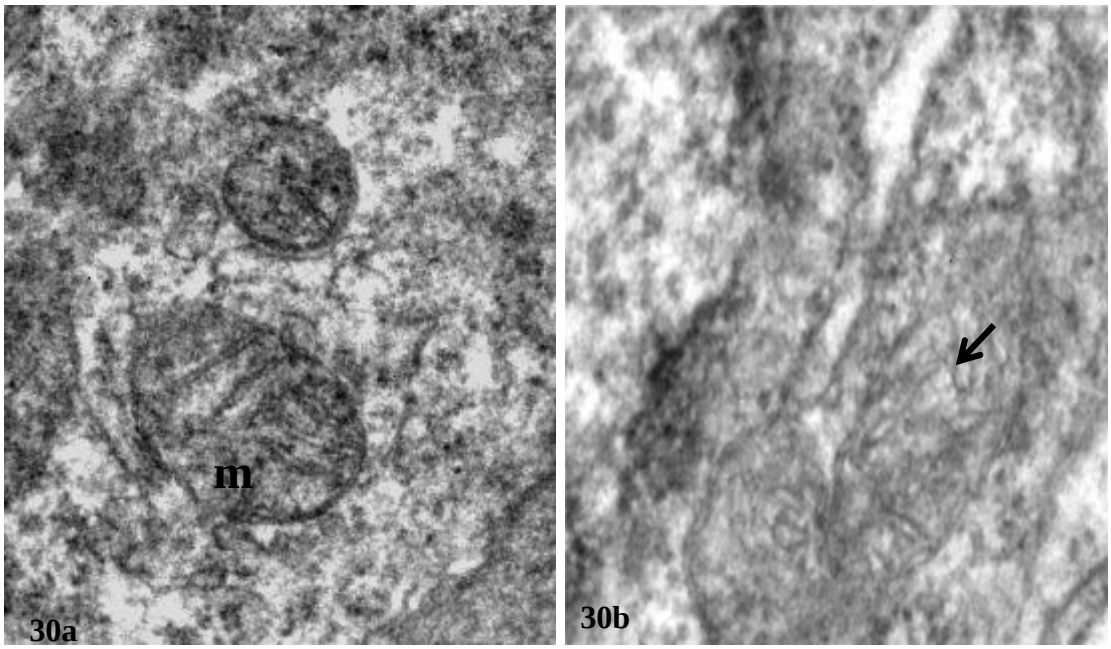
Figs. 27- The photographs shows different subcellular regions of cOSN in *M. armatus* when bioaccumulation value of Cd is 0.09%. (27a): The olfactory knob of cOSRN in *M. armatus* (arrow). (27b) The rough endoplasmic reticulum (rER) at perinuclear part of cOSRN (arrows). (27c) The crossbridge arrangement of cytoskeletal elements within the cytoplasmic region of OSRN (star). (27d) The axoplasm shows prominent presence of microtubules (arrows).



Figs. 28: The photographs shows different cytoplasmic region of cOSRN in *M. armatus* when bioaccumulation value of Cd is 10.93% in cOSN. (28a) The diversified lysosomal accumulation within the perinuclear region of cOSN in *M. armatus*. (28B) The fragmented microtubules and neurofilaments (arrow) are noted. (28C) Irregular vesicular (arrows) crowding at the synaptic region of cOSRN.



Figs. 29 (29a) The crossbridge arrangement of cytoskeletal elements are marked within the cytoplasmic region of cOSRN (29b) The fragmented microtubules (diameter 10 nm.-15 nm.) and neurofilaments (diameter 5 nm.-10 nm.) are noted (arrows) within cytoplasmic cOSRN when Cd level is 10.93 mass percentage. Scale bar= 1 µm.



Figs. 30 The perikaryon of ciliated olfactory sensory receptor neuron (OSRN) in *M. armatus* . (30a) The mitochondria (m) with cristae are marked within the OSRN when Cd accumulation level within cytoplasm is 0.09%. Magnification X 3000 (approx.). (30b)The arrangement pattern of cristae are irregular and shows dilation (arrows) within the perinuclear cytoplasm of Cd induced OSRN. [Magnification X 5000 (approx.)].

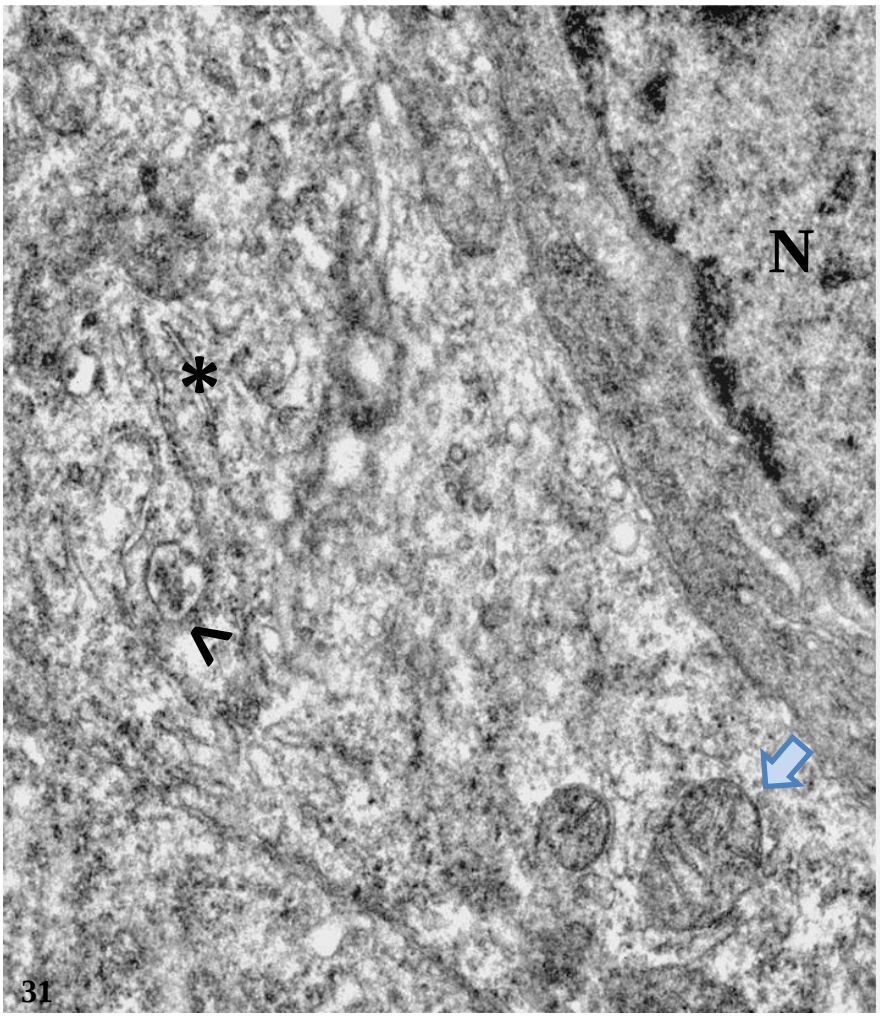


Fig. 31 - The photomicrograph indicates the perikaryon of olfactory ciliated sensory receptor neuron in *M. armatus* . The double membrane mitochondria with cristae are well marked (arrow). The multiple inner vesicles (diameter: 50 nm - 60 nm) within single membrane structures are shows near the periphery of the nucleus and close proximity of rough endoplasmic reticulum. [Magnification X 2550 (approx.)].