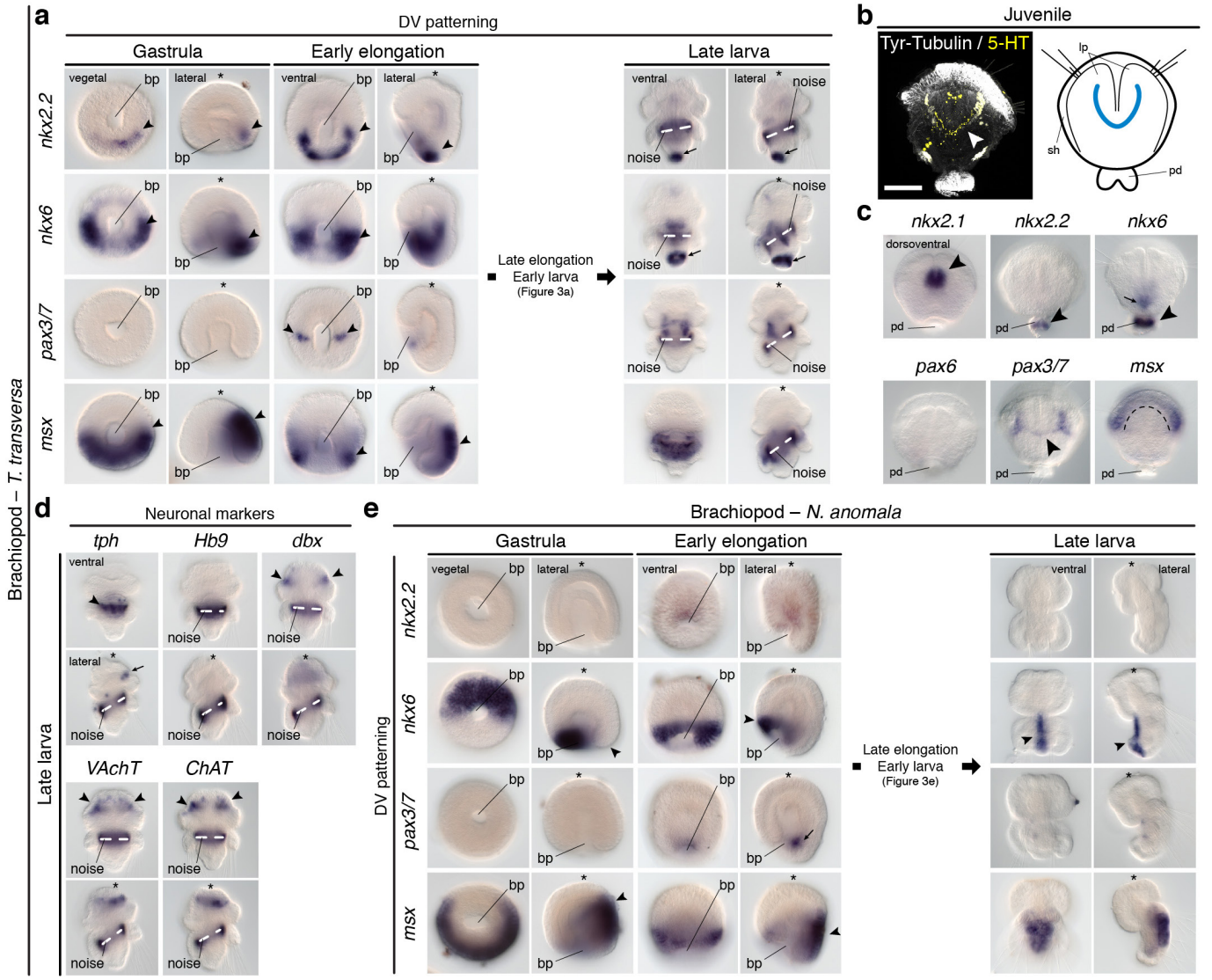

Extended Data Figure 7 | Gene expression in Brachiopoda. a, Gene expression during early gastrulation and elongation, and in late larvae of *T. transversa*. The gene *nkx2.2* is expressed ventroposteriorly (black arrowhead) and in the pedicle lobe of the larva (arrow). The gene *nkx6* is detected in two bilateral symmetrical ectodermal posterior clusters (arrowheads) and in the archenteron wall. In the larva, *nkx6* is expressed in the pedicle lobe (arrow) and midgut. *pax3/7* is first detected in two ventrolateral domains at the prospective apical-trunk boundary (arrowheads), and in the ventral anterior region of the larva. The gene *msx* is first expressed dorsally, in the future mantle ectoderm (arrowheads), and in the mantle of the larva. **b**, In 2-day-old post-metamorphic juveniles, the CNS comprises a main serotonergic anterior commissure (white arrowhead; dorsoventral view) that innervates the developing lophophore. The schematic drawing is not to scale, and the blue line represent the commissure. **c**, The gene *nkx2.1* is expressed in the anterior region (arrowhead), between the lophophores in 2-day-old juveniles. The genes *nkx2.2* and *nkx6* are expressed in the pedicle (arrowheads), and *nkx6* is also detected in the gut (arrow). The gene *pax6* shows no expression, *pax3/7* is detected in the neural commissure (arrowhead), and *msx* is expressed in the cells at the edge of the mantle (dotted line). **d**, Neuronal markers in late larvae of *T. transversa*. The serotonergic marker *tph* is expressed in the anteroventral condensation of the mantle lobe (arrowhead) and in dorsal ectodermal cells of the apical lobe (arrow). No expression is detected for *Hb9*, and the genes *dbx*, *VAchT* and *ChAT* are all detected in the anterior apical neuroectoderm (arrowheads). **e**, Gene expression during early gastrulation and elongation, and in late larvae of *N. anomala*. The gene *nkx2.2* is expressed in the anterior blastoporal lip at the onset of axial elongation, and it is not detected in the late larva. The gene *nkx6* is asymmetrically expressed around the blastopore, in the putative anteroventral ectoderm (arrowhead). As the blastopore closes, the expression extends posteriorly and concentrates along the midline of the larva (arrowhead). The gene *pax3/7* is detected in the posterior mesoderm at the onset of axial elongation (arrow). The gene *msx* is expressed in the prospective mantle lobe ectoderm (arrowheads) and in the dorsal shell-forming epithelium of the late larva. The asterisks indicate the animal/anterior pole and white dashed lines in **a** and **d** mark the region of background noise caused by probe trapping in the shell-forming ectoderm. Panel orientations are indicated in the first row/column and apply to the rest of the panels in the same column/row. Scale bar, 100 μm in **b**.