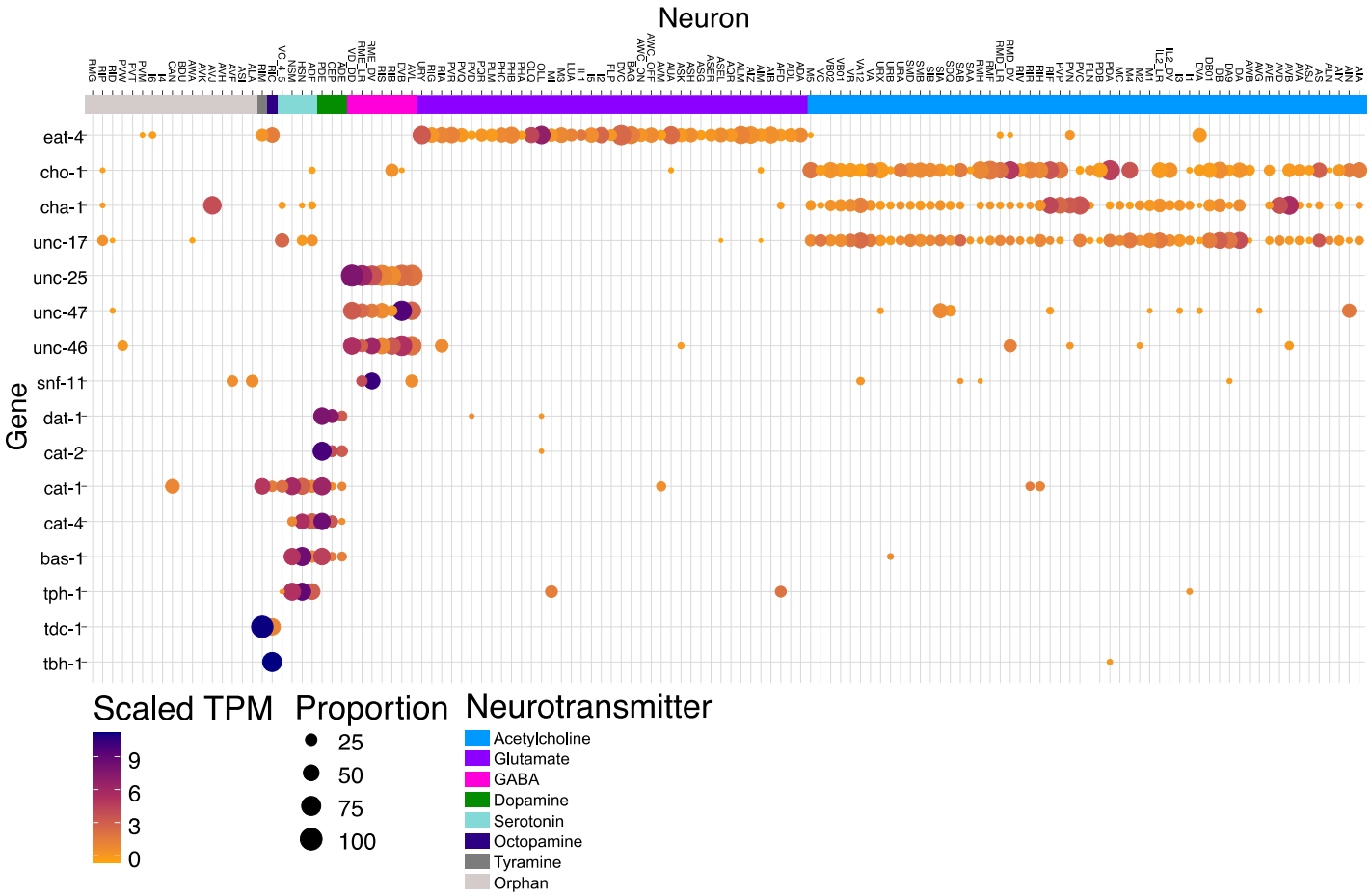
Data S1. Neuron-specific expression of additional gene families. Related to Figures 3, 4. Descriptions of the nervous-system wide expression of several gene families crucial for neuronal function.

Neurotransmitter synthesis and packaging enzymes

We used the thresholded dataset (threshold 2) to probe expression of selected gene families with predicted functions in the nervous system (Hobert, 2013), starting with genes involved in neurotransmitter synthesis and packaging.

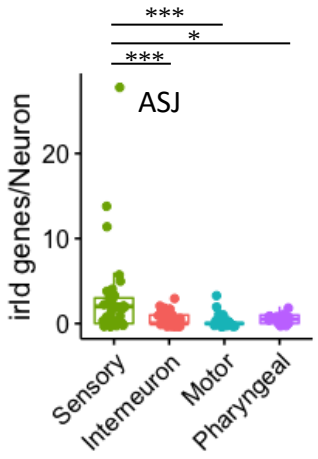


Data S1 I. Expression of neurotransmitter-related genes. Heatmap showing scaled expression within each neuron type for genes specifically required for mediating synthesis and release of different classes of chemical neurotransmitters. Note the high correspondence between independently-derived neurotransmitter usage (color bar, top) and gene expression data. See CengenApp to generate similar plots for custom sets of genes.

Irld family genes

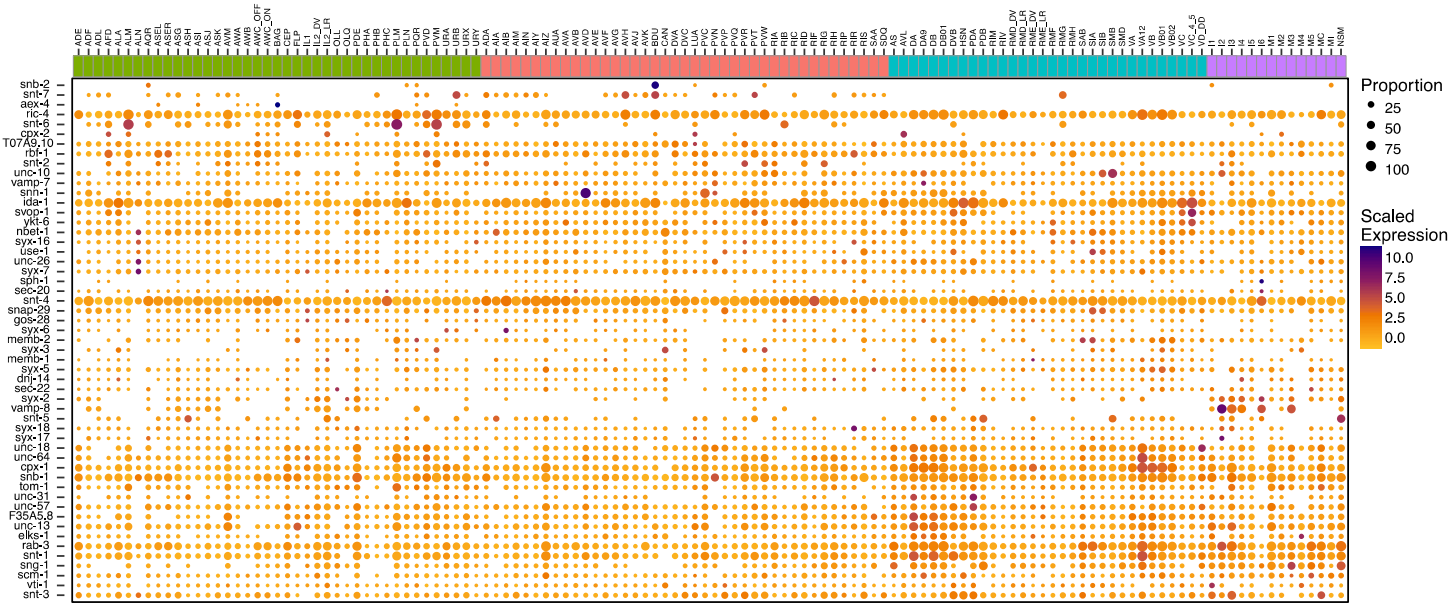
In addition to putative neuropeptide receptors, we analyzed the expression of the unusual *irld* and *hpa* gene families (Figure 3A, Data S1 II), which encode insulin/EGF-receptor-like proteins

containing the characteristic extracellular cysteine-rich L domain but lacking tyrosine kinase domains (Dlakic, 2002).



Data S1 II. *Irld* family genes. Number of genes (threshold 2) expressed in each neuron type grouped by modality for *irld* genes. Boxes are interquartile ranges. Statistical tests: ANOVA, with Tukey post-hoc comparisons for neuropeptide receptors, Kruskal-Wallis test for other genes. Note the expression is almost completely restricted to sensory neurons. *p < 0.05, ***p < 0.001.

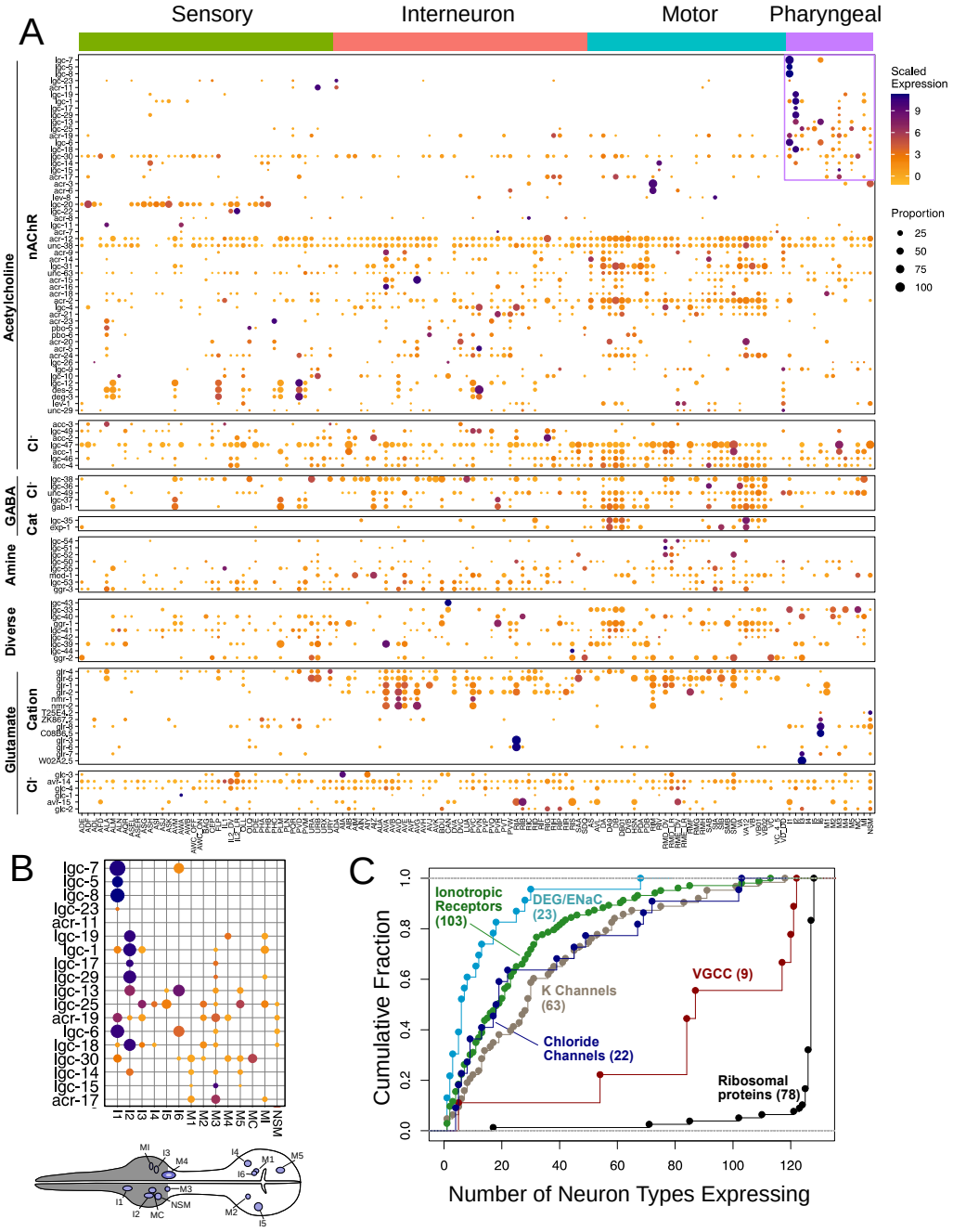
Neurosecretory machinery



Data S1 III. Neurosecretory genes. Expression patterns of genes involved in neurosecretion (rows) across all neurons (columns). Note the restricted pattern of *snb-2*, *snt-7*, *snt-6* and others.

Differential expression of ion channels

We also characterized the expression of ionotropic receptors, including: (1) pentameric Cys-loop ligand-gated ion channels (LGICs) and (2) tetrameric ionotropic glutamate receptors.

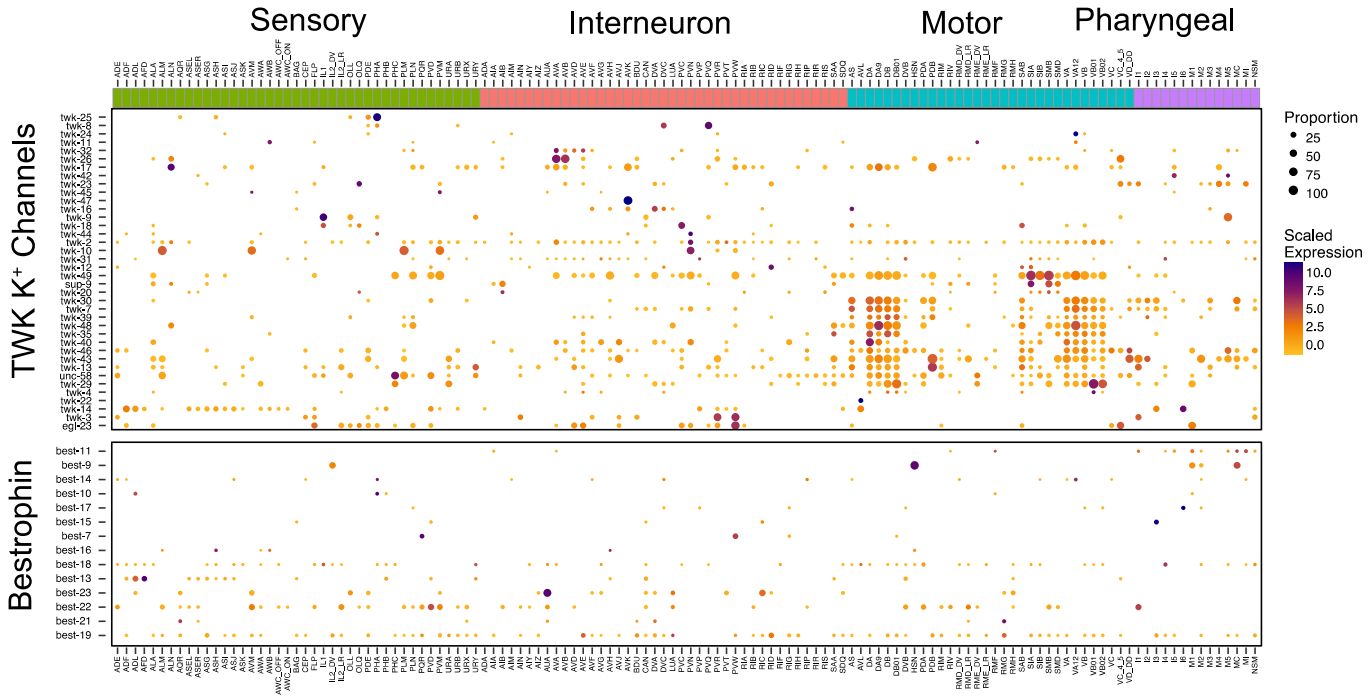


Data S1 IV. Ionotropic receptor expression. A) Expression of several classes of ionotropic receptors across all neurons. B) (top) Several ion channels are selectively expressed in pharyngeal neurons (purple box in A). (Bottom) *C. elegans* pharyngeal neurons. C) Cumulative distribution plot of number of neurons expressing several ion channel families.

Matching ionotropic receptor expression to synaptic connectivity

We used the expression patterns of ionotropic Glu and predicted ACh receptors to ask whether volume transmission is likely for these neurotransmitter systems as has been proposed for GABA (Gendrel et al., 2016). We detect predicted ionotropic ACh receptors (52 nAChR-like genes and 7 *acc*-like genes) in all neurons, including those that are not postsynaptic to ACh-expressing neurons. Ionotropic Glu receptors (16 genes, including *nmr*, *glr*, *avr* and *glc* genes) are detected in all 33 neuron types that are not postsynaptic to Glu-expressing neurons, thus suggesting wide-spread extra-synaptic signaling for ACh and Glu.

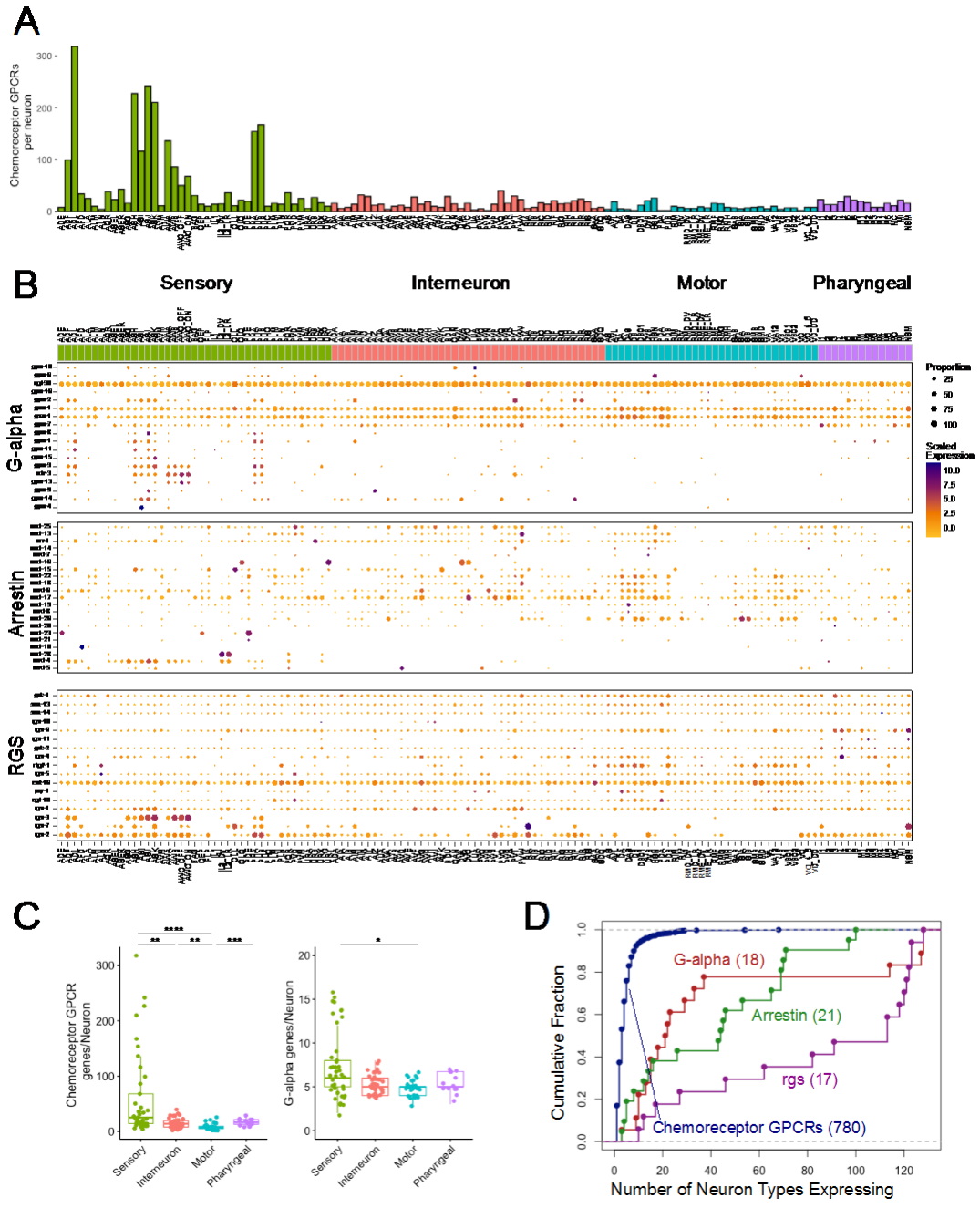
Voltage-gated potassium ion channels and bestrophin chloride channels



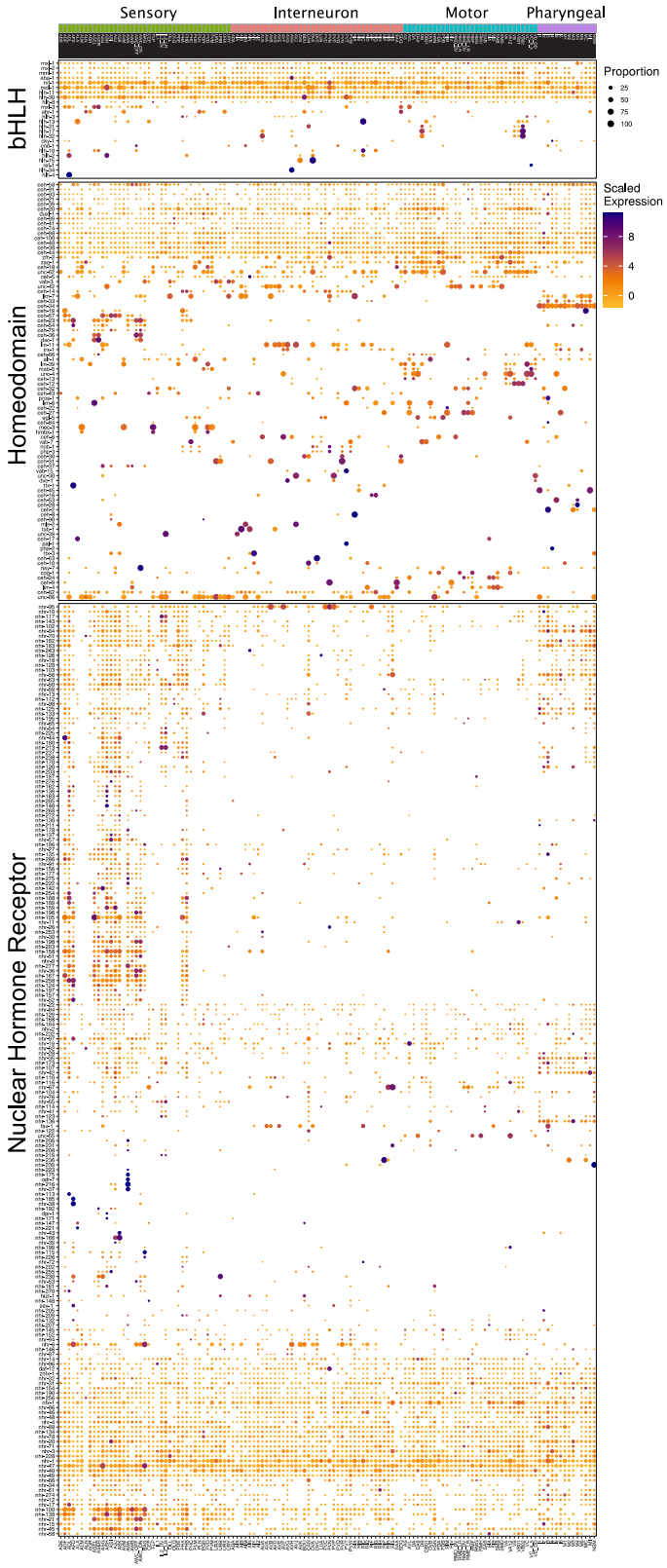
Data S1 V. Potassium and Chloride Channels. Expression of TWK-type potassium channels (top), with widespread expression in ventral nerve cord and sublateral motor neurons and bestrophin-type chloride channels (bottom) across all neurons.

Sensory receptors and downstream signaling components

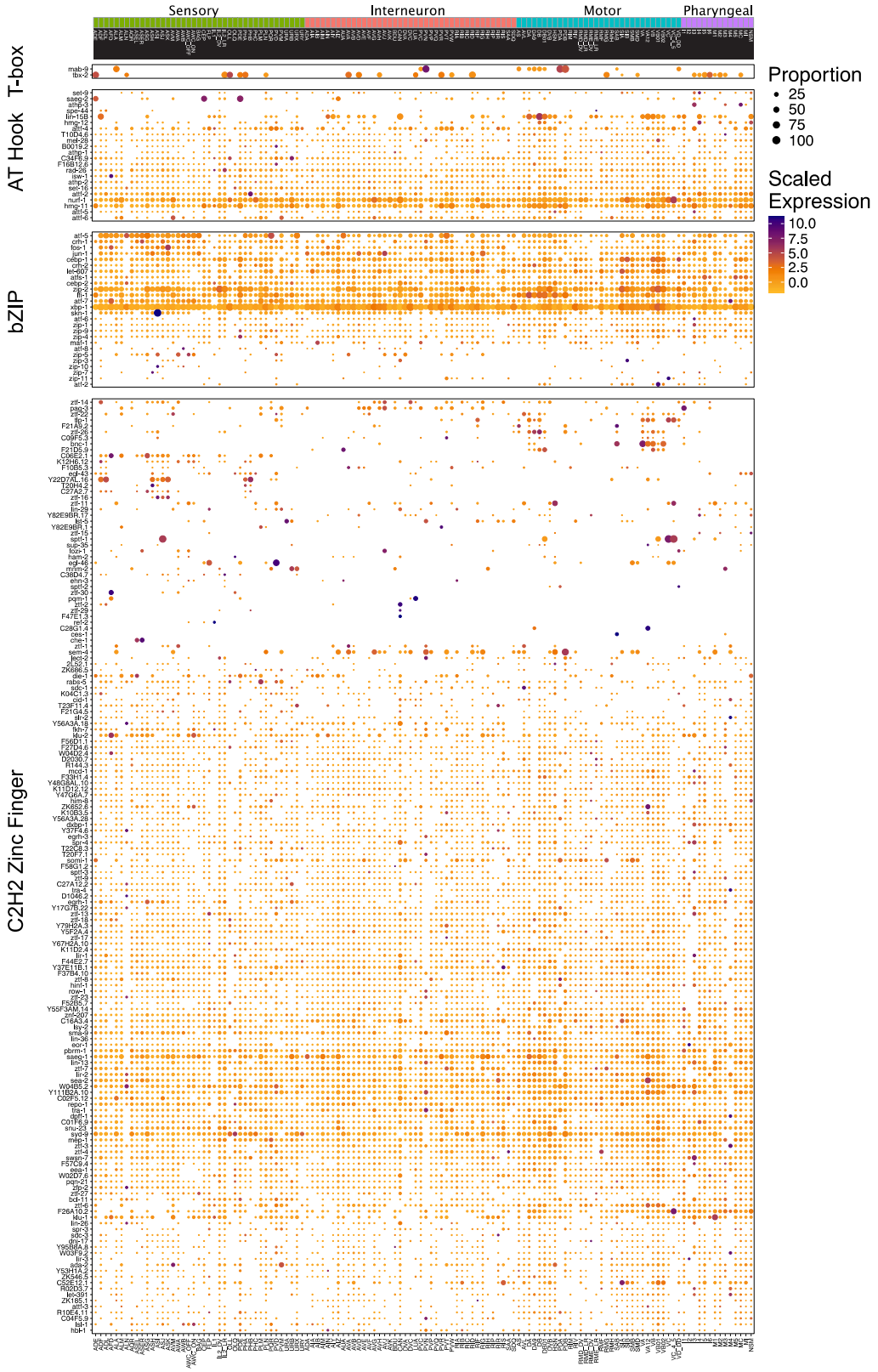
We next analyzed the expression of chemosensory GPCRs and downstream signaling pathways, including encoding heterotrimeric G-proteins, arrestin-like (*arrd*) proteins and RGS genes.



Data S1 VI. Chemoreceptor GPCR and downstream signaling pathways. A) Number of chemoreceptor GPCRs per neuron. B) Expression of G-alpha (top), arrestin (middle) and regulator of G-protein signaling (RGS) families. C) Number of chemoreceptor GPCRs (left) and G-alpha genes (right) per neuron, by modality. D) Cumulative distribution plot of neurons expressing each gene of selected gene families.



Data S1 VII. bHLH, Homeodomain and *nhr* transcription factor families. Expression patterns of all members of bHLH, homeodomain and nuclear hormone receptor families. See Figure 4.



Data S1 VIII. Additional transcription factor families. Expression patterns of T-box, AT Hook, bZIP and C2H2 zinc finger transcription factor families. See Figure 4.