

Supplementary Information Inventory

**Supplementary Figure Legends S1-S7; Supplementary Movie Legends S1-S7;
Supplementary Table S1; Extended Experimental Procedures; Supplementary Equations
and Discussion; Supplementary References**

The main Supplementary Information includes

Supplementary Figure Legends S1-S7- The supplementary figures show (S1) characterization of the Sdf1a-GFP and the Sdf1-signaling sensor transgenes, related to Figures 2, 3 and 4, (S2) characterization of the Sdf1-signaling sensor, related to Figures 2 and 4, (S3) response of the human and zebrafish versions of the Sdf1-signaling sensors to extracellular Sdf1 protein *in vitro*, related to Figure 3, (S4) gradient of internalized Cxcr4b across the primordium, related to Figures 3 and 4, (S5) demonstration that Sdf1 is an instructive cue during primordium migration, related to Figure 3 (S6) characterization of *cxcr7a* morpholinos and evidence that mis-expression of *cxcr7b* in the lateral line nerve rescues primordium migration defect in *cxcr7* deficient embryos, related to Figures 1 and 4 and (S7) additional evidence that *cxcr7* activity is required for the formation of Sdf1-signaling gradient, related to Figure 6.

Supplementary Movie Legends S1-S7- The supplementary movies show (Movie S1) lateral view of a migrating primordium in a wild type embryo expressing CldnB GFP in comparison to the impaired migration of *sdf1a*^{-/-} primordia, related to Figure 1, (Movie S2) confocal sections through wild type and Cxcr7 deficient primordia visualizing the tagged Sdf1a-GFP and the

primordium, related to Figure 2, (Movie S3) lateral views of migrating primordia expressing the Sdf1 signaling sensor in heat shocked wild type (left) and *tg(hsp70:sdf1a)* embryos (right) also showing the signaling fold change as an inverted heat map (bottom), related to Figure 3, (Movie S4) three examples each of *cxc7b* deficient (top) and *cxc7* deficient primordia exhibiting impaired migration, related to Figure 4, (Movie S5) lateral view of a migrating primordium in a heat-shocked embryo expressing *tg(CldnB:GFP)* and *tg(hsp70:cxc7b)*, related to Figure 4, (Movie S6) lateral views of migrating primordia in heat shocked wild type (top) and *cxc7b*^{-/-} (bottom) embryos expressing the Sdf1 signaling sensor and *tg(hsp70:sdf1a)*, related to Figure 6, (Movie S7) graphical representation of two independent observations of the recovery of the Sdf1-signaling gradient in wild-type and *cxc7b*^{-/-} embryos, related to Figure 6.

Supplementary Table S1- Confidence intervals for the slopes of the Sdf1 signaling in gradient in different genotypes

Extended Experimental Procedures- Detailed description of the zebrafish strains used, generation of transgenic fish, procedure for fluorescent imaging and quantification of Sdf1a-GFP immunofluorescence, procedure for live imaging (stills and time-lapse) and quantification of the Sdf1-signaling sensor, cloning and expression of SDF1-signaling sensor in HEK 293T cells, production of recombinant zebrafish Sdf1a, assessing the linearity of the sensor and characterizing the specificity of chemokine induced internalization *in vivo* and *in vitro*, quantification of the primordium migration defects, determining the signaling fraction of Sdf1a, mosaic analysis of *Cxcr7* function in live embryos, global and local mis-expression of Sdf1a and

list of RNA probes and antibodies used for in situ hybridization and antibody staining respectively.

Supplementary Equations and Discussion- The supplementary equations and discussion explain the derivation of moving sink model and discuss it in relation to Crick's classical source-sink model.

Supplementary References

Figure S1

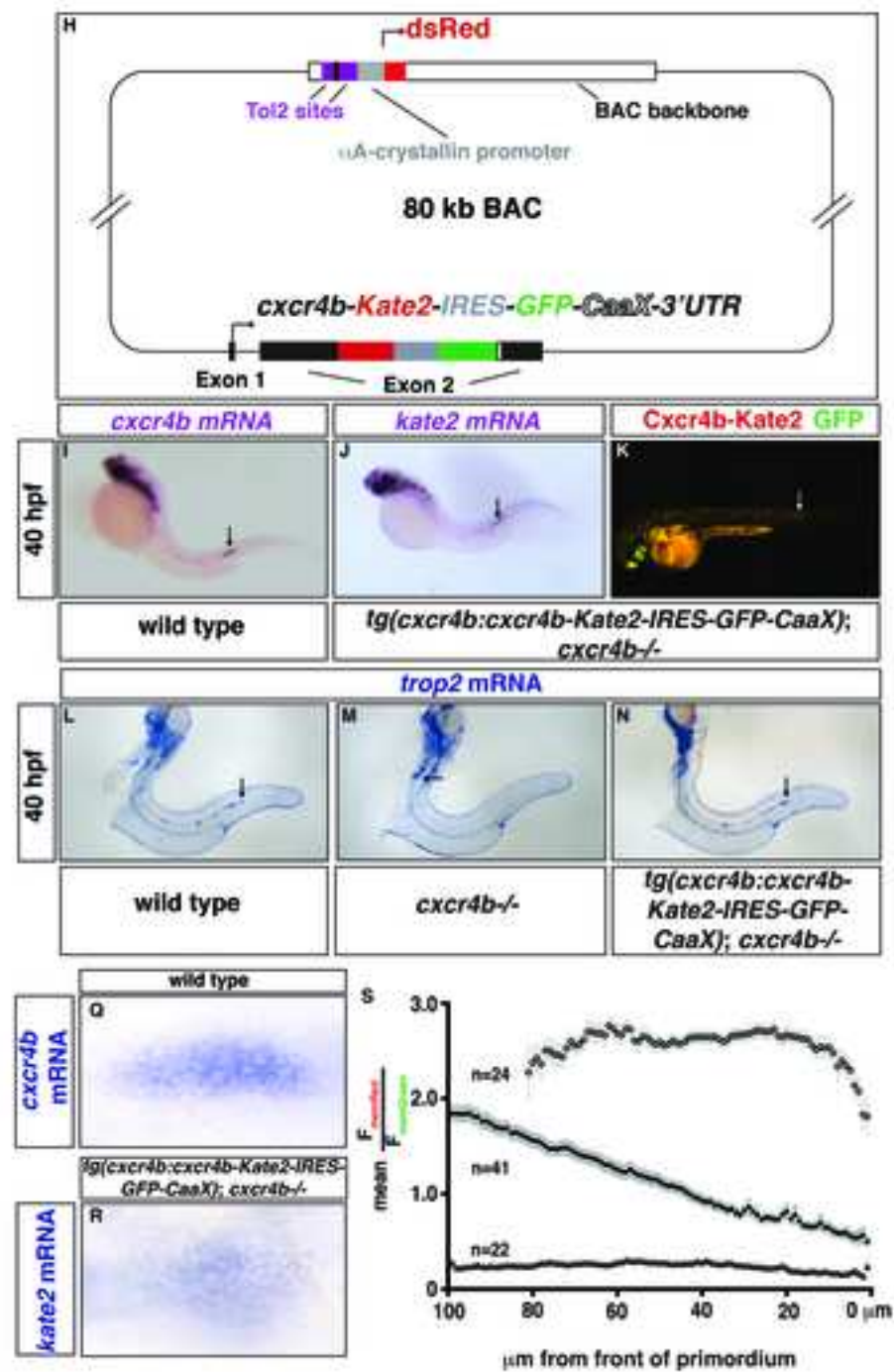
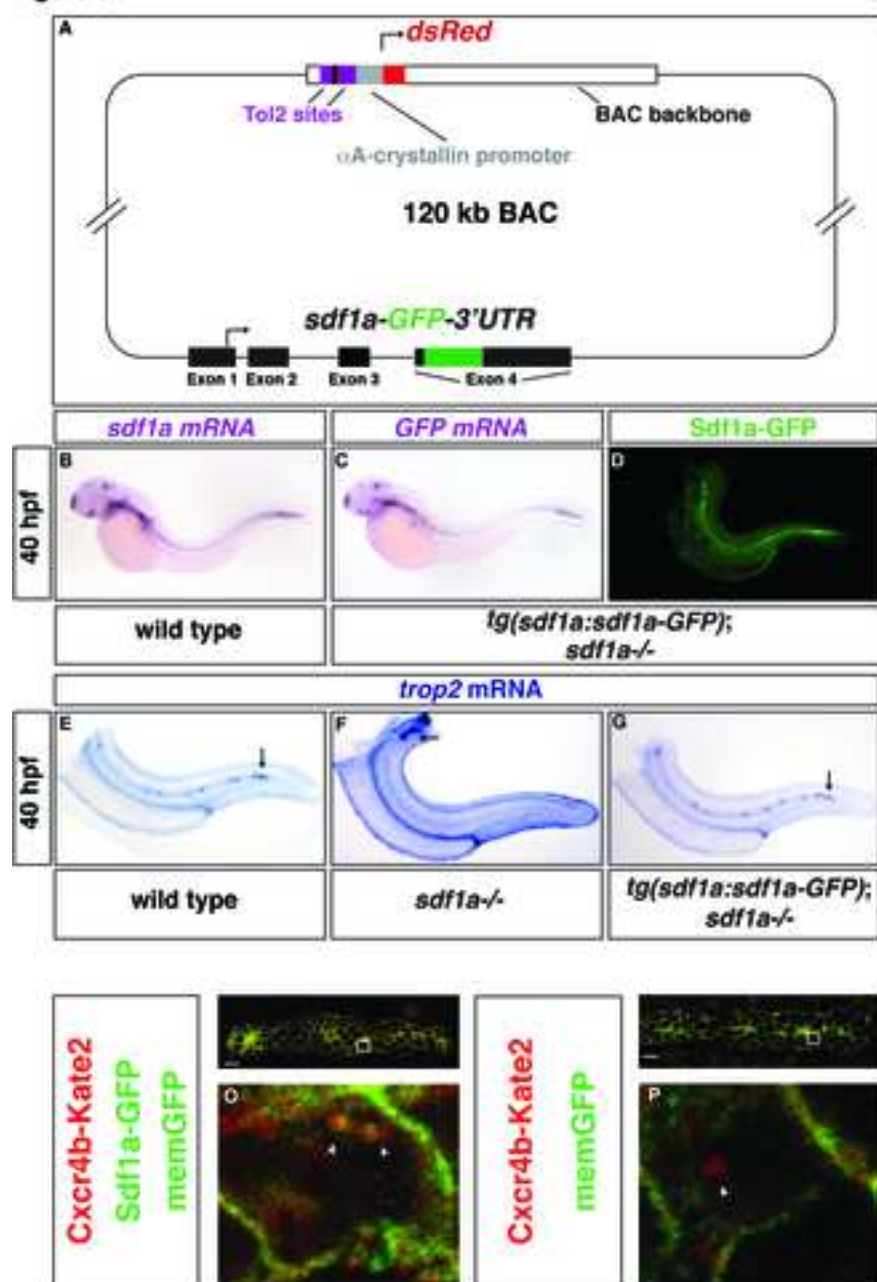


Figure S2

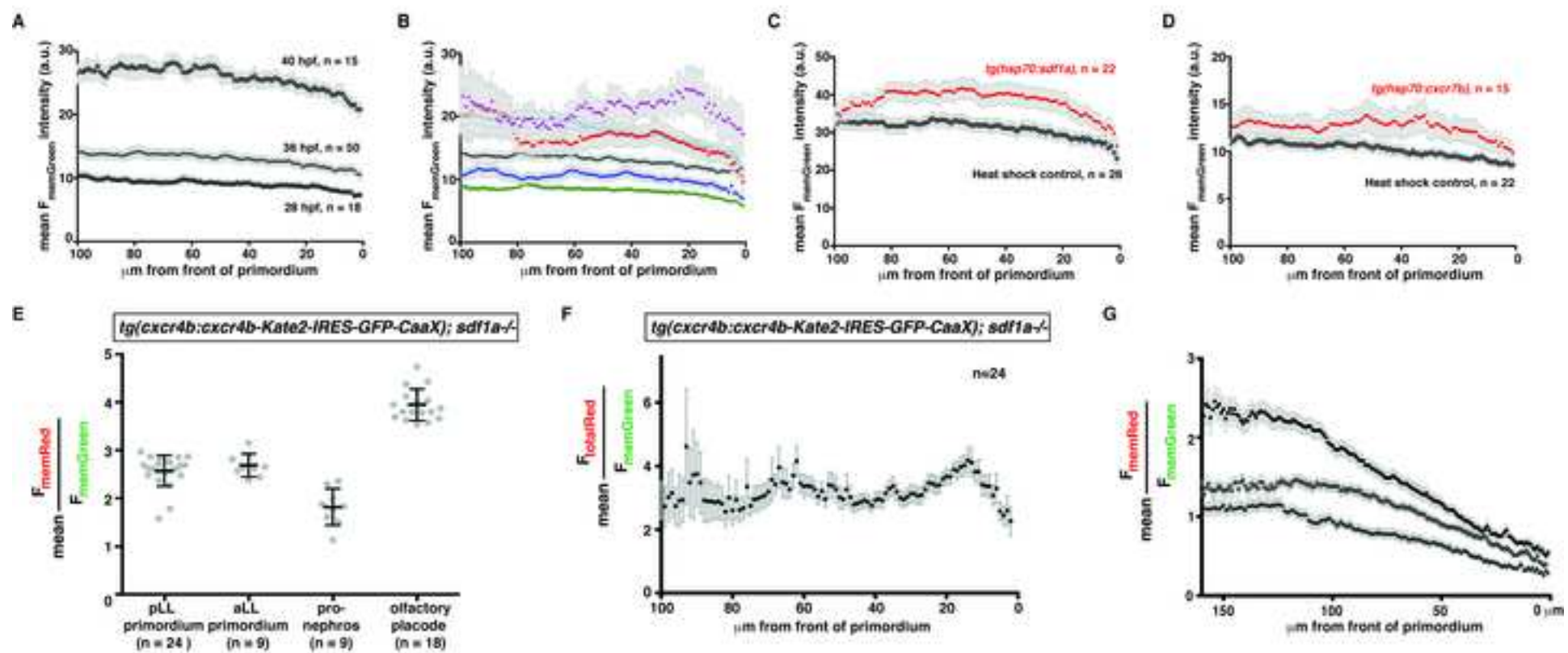


Figure S3

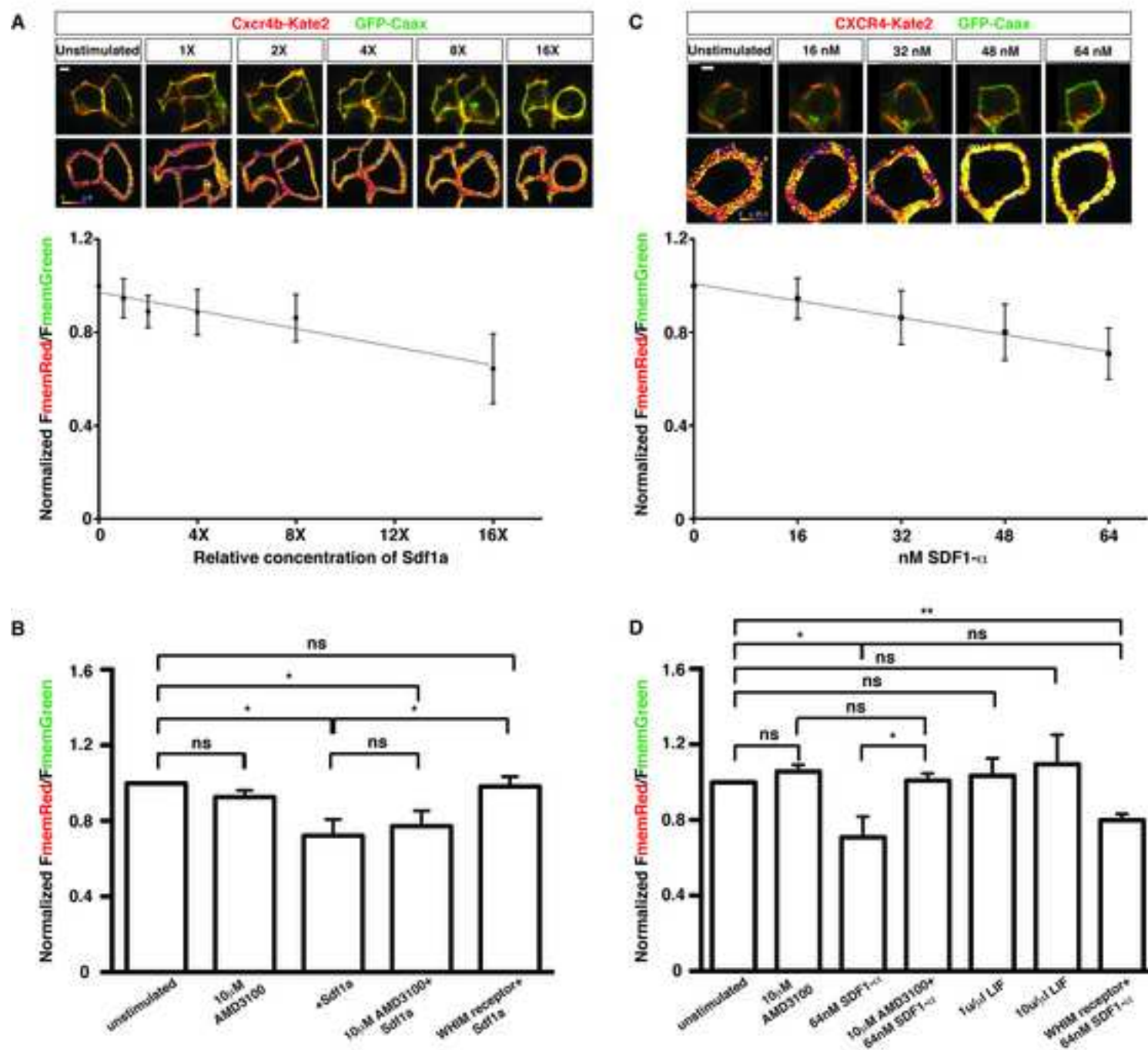


Figure S4

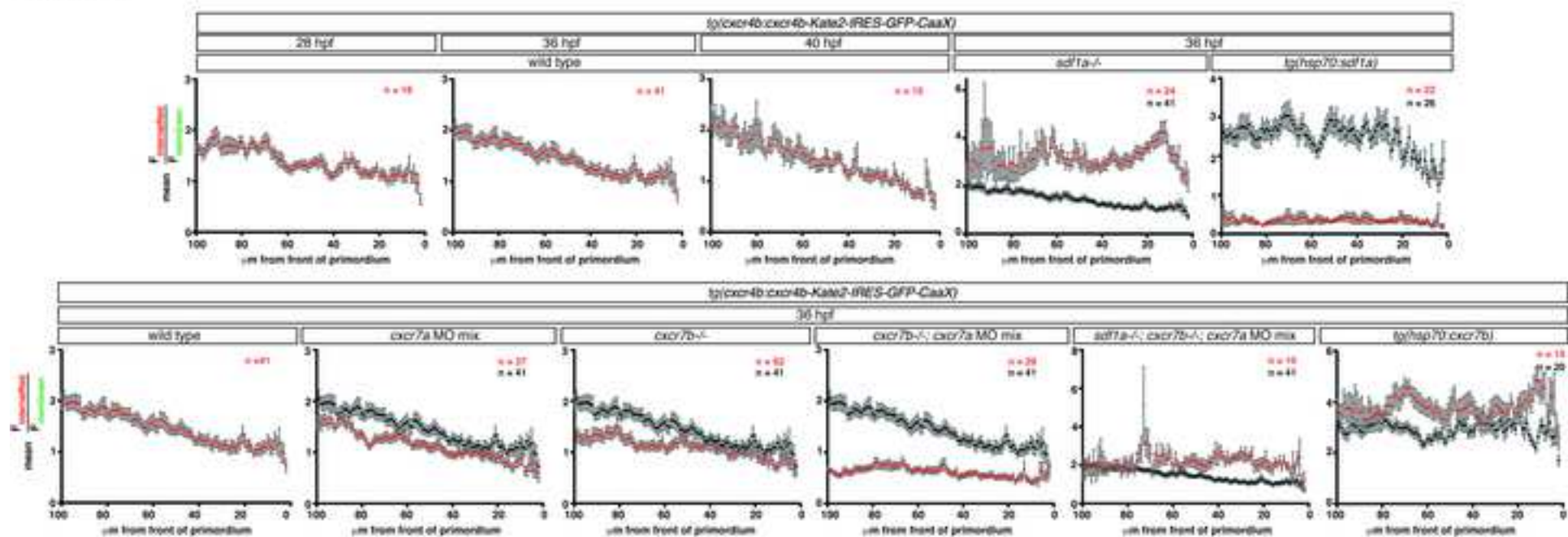


Figure S5

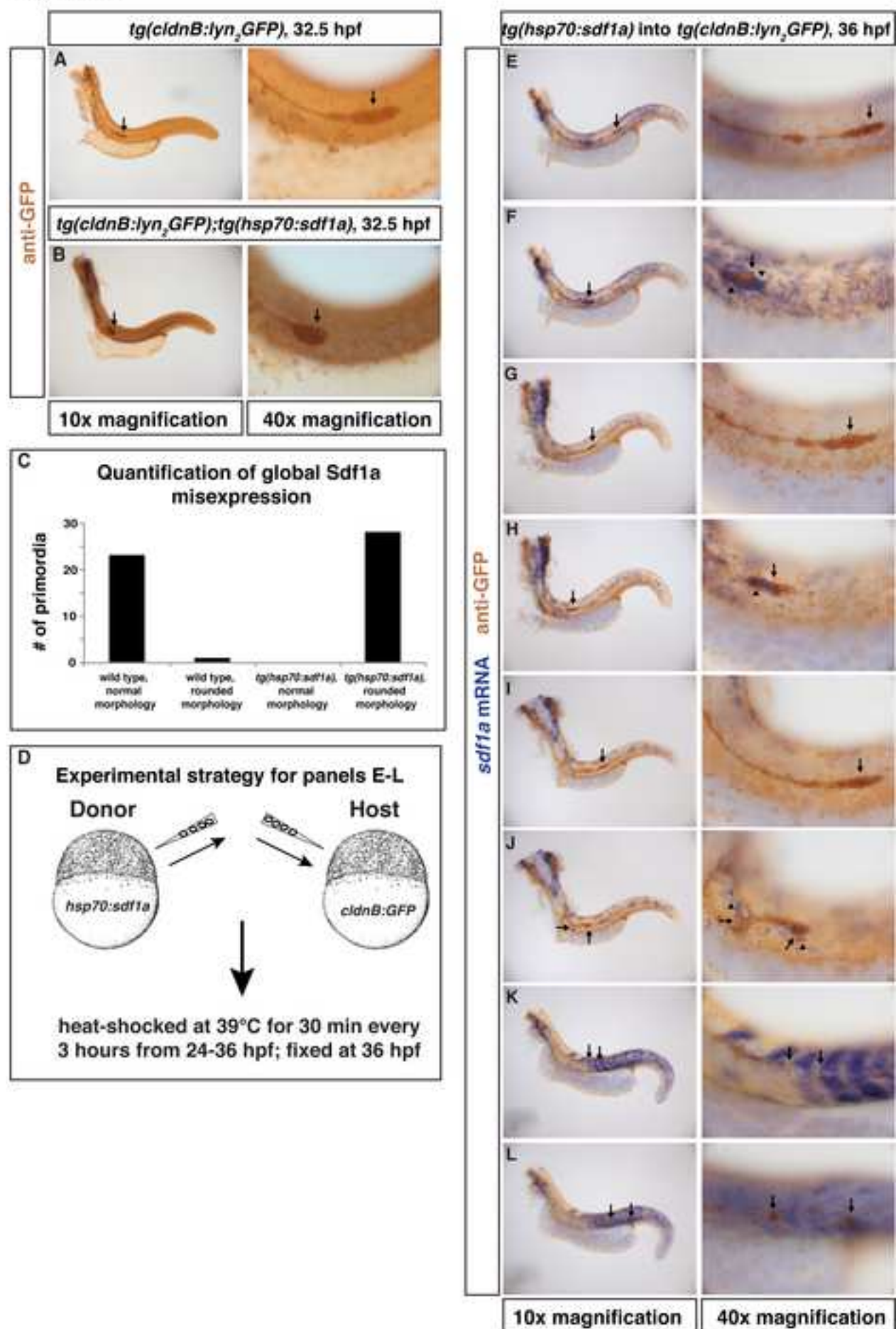


Figure S6

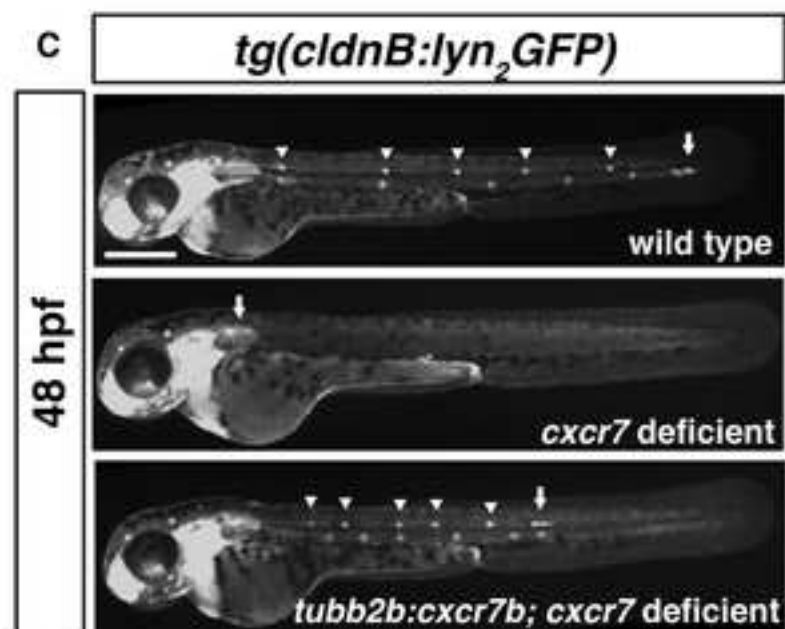
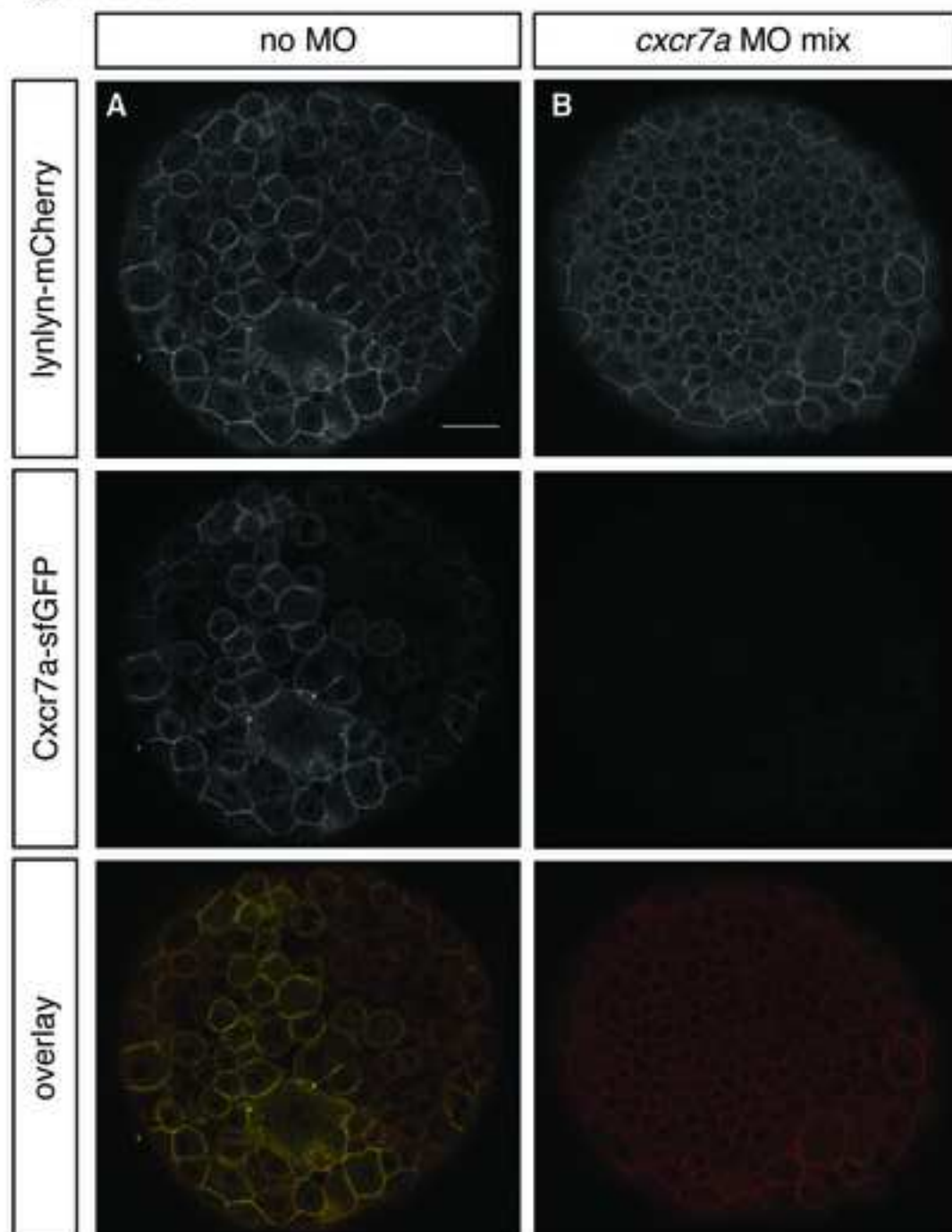


Figure S7

