

**Supplementary Tables (in .xlsx file)**

Supplementary Table 1: Organ *situs* data for mutant injections performed within 30mpf.

Supplementary Table 2: Laterality of Xnr1 expression for mutant injections performed within 30mpf.

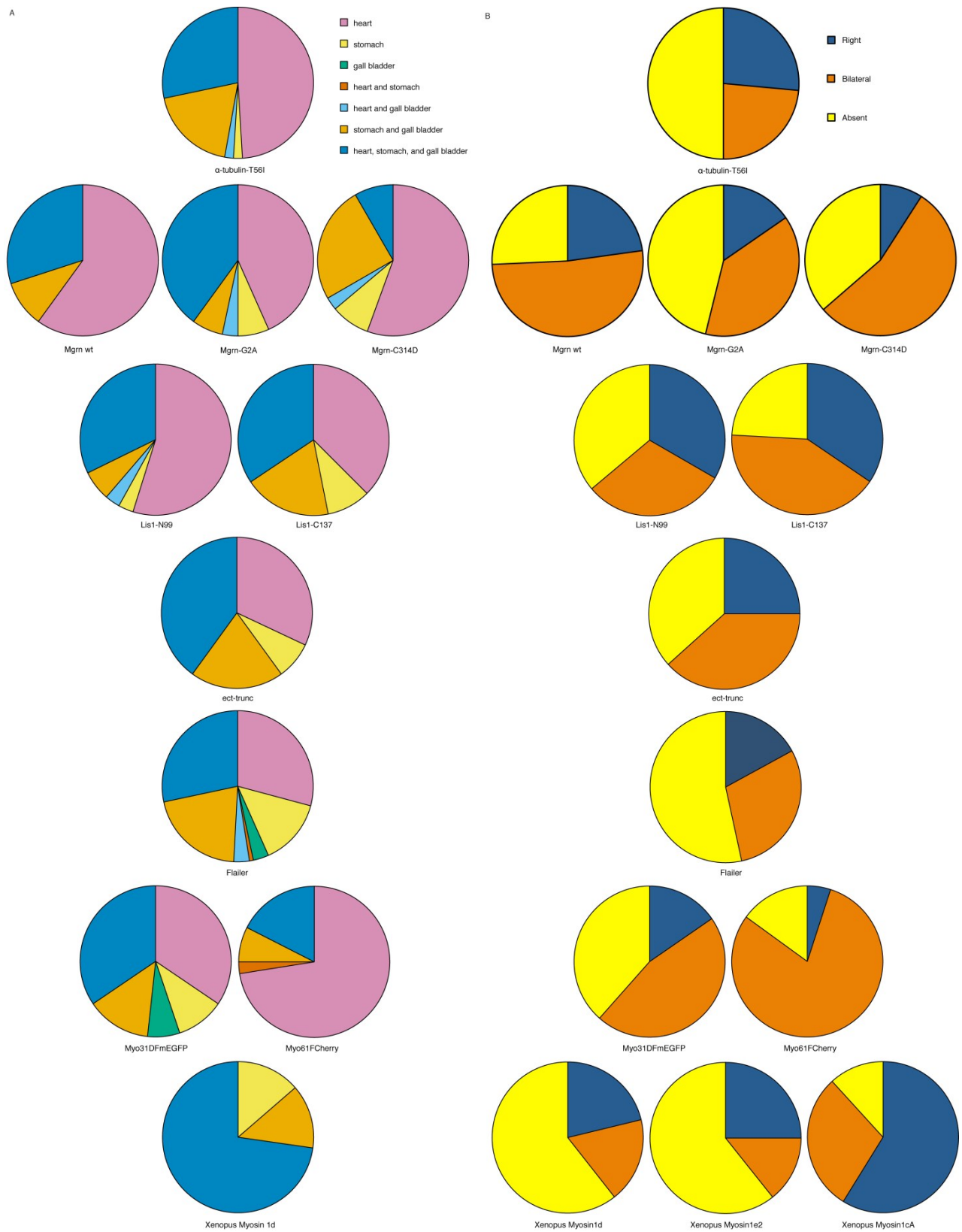
Supplementary Table 3: Laterality of Lefty expression for mutant injections.

Supplementary Table 4: Laterality of Pitx2 expression for mutant injections.

Supplementary Table 5: Raw data from axon outgrowth plus-end microtubule tracking.

Supplementary Table 6: Primers used in cloning

## Supplementary Figures



**Supplementary Figure 1: Comparison of organ heterotaxia and laterality of Xnr1 expression.**

(A) Organs incorrectly positioned in embryos injected within 30mpf. (B) Laterality of observed abnormal Xnr1 expression.



Supplementary Figure 2: Examples of craniofacial defects observed for  $\alpha$ -tubulin-T56I-injected embryos