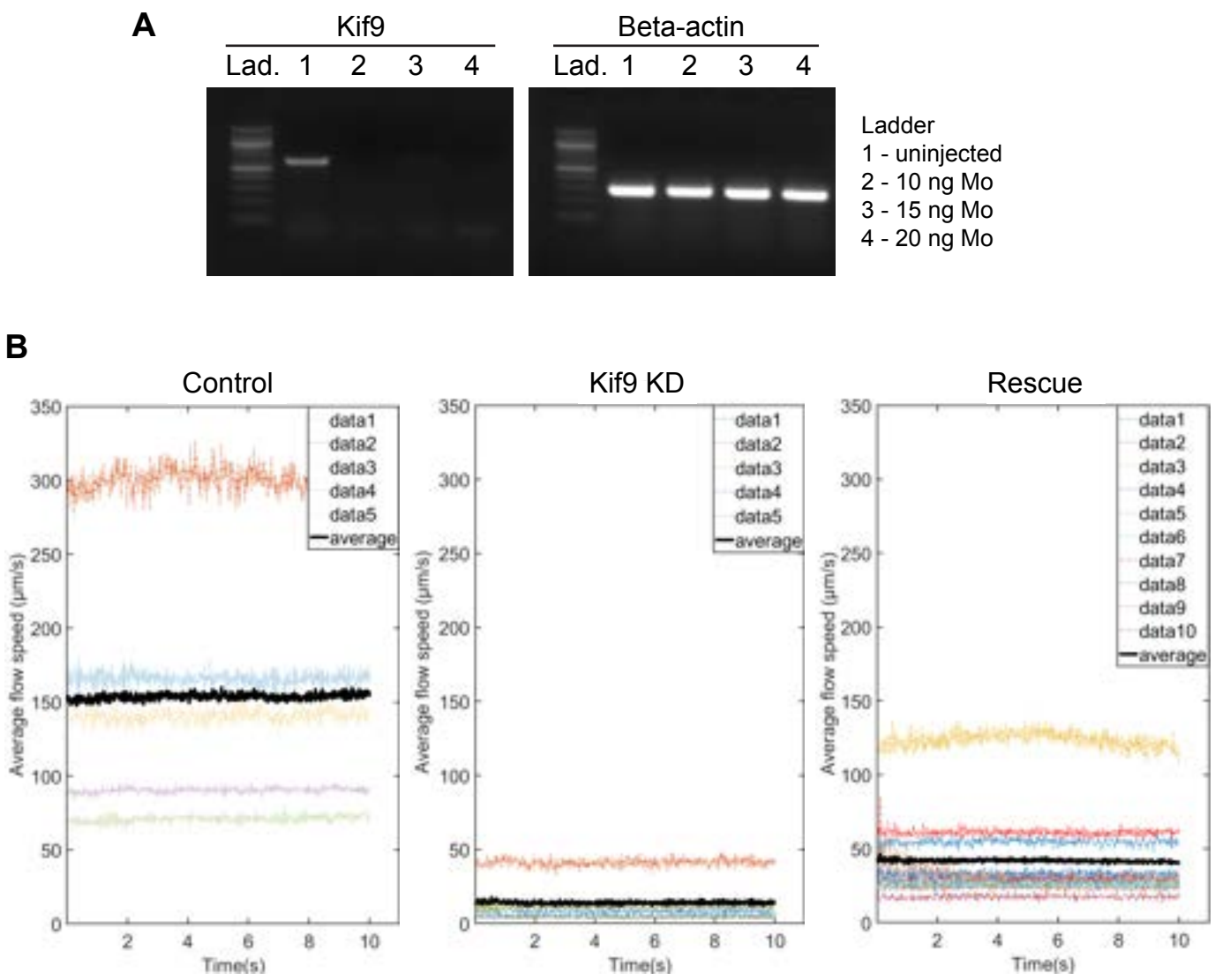


Fig. S1. A. Gel image of RT-PCR of Kif9 expression in Kif9 morpholino injected embryos at wildtype, 10 ng, 15 ng, and 20 ng doses. B. Graphs of average bead flow across the epidermis of stage 24 *Xenopus* embryos in Control, Kif9 morpholino, and Rescue injected embryos.

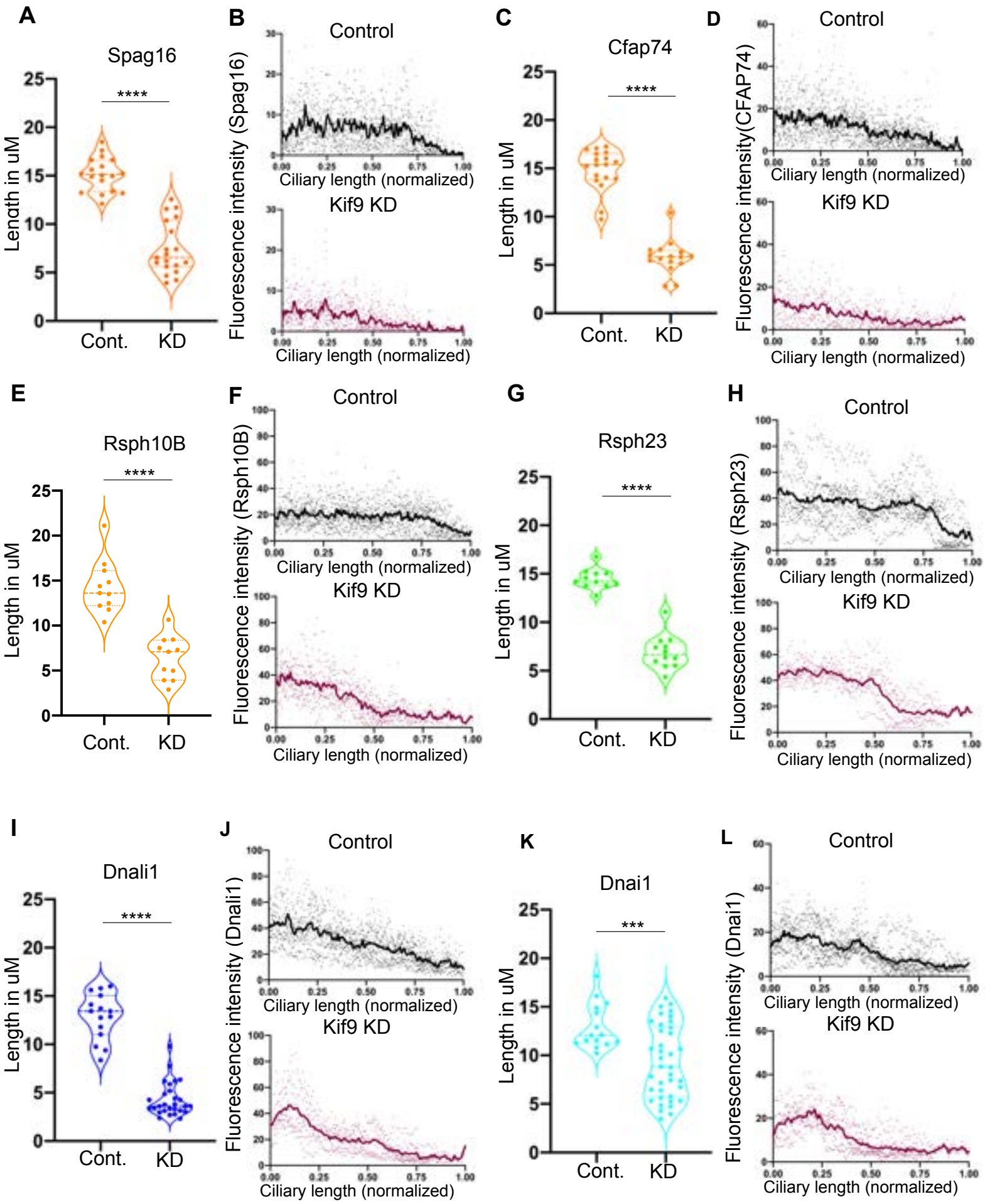


Fig. S2. A. Raw quantification of C2 bridge central pair component GFP-Spag16 length in Control and Morpholino injected embryos. B. Graphs of fluorescence intensity of GFP-Spag16 across the length of the cilia, normalized to 1. C. Raw quantification of C1 central pair component GFP-Cfap74 length in Control and Morpholino injected embryos. D. Graphs of fluorescence intensity of GFP-Cfap74 across the length of the cilia, normalized to 1. E. Raw quantification of GFP-Rsph10B length in Control and Morpholino injected embryos. F. Graphs of fluorescence intensity of GFP-Rsph10B across the length of the cilia, normalized to 1. G. Raw quantification of radial spoke stalk component Rsph23 length in Control and Morpholino injected embryos. H. Graphs of fluorescence intensity of GFP-Rsph23 across the length of the cilia, normalized to 1. I. Raw quantification of inner dynein arm GFP-Dnali1 length in Control and Morpholino injected embryos. J. Graphs of fluorescence intensity of GFP-Dnali1 across the length of the cilia, normalized to 1. K. Raw quantification of outer dynein arm GFP-Dnai1 length in Control and Morpholino injected embryos. L. Graphs of fluorescence intensity of GFP-Dnai1 across the length of the cilia, normalized to 1.

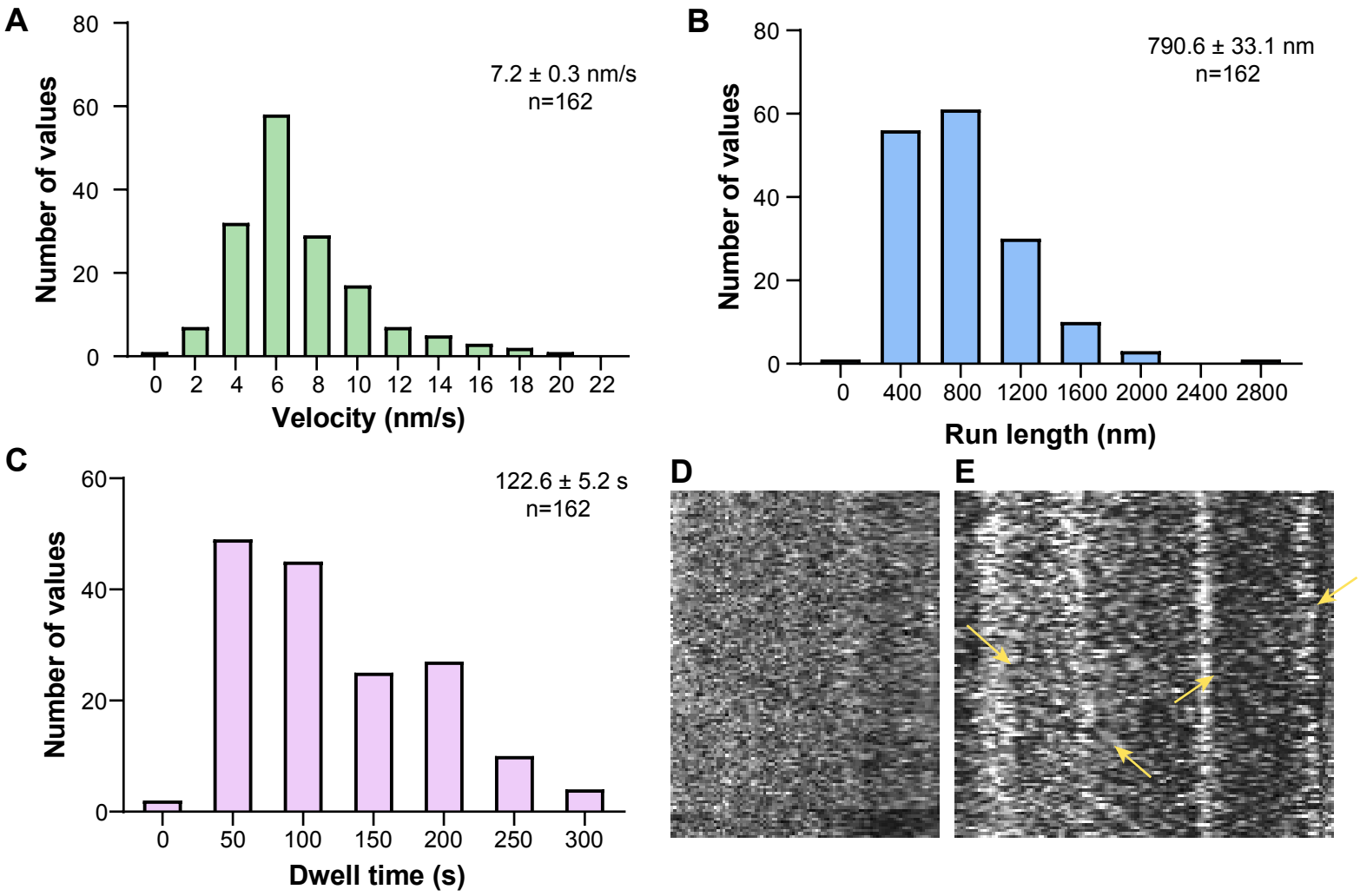
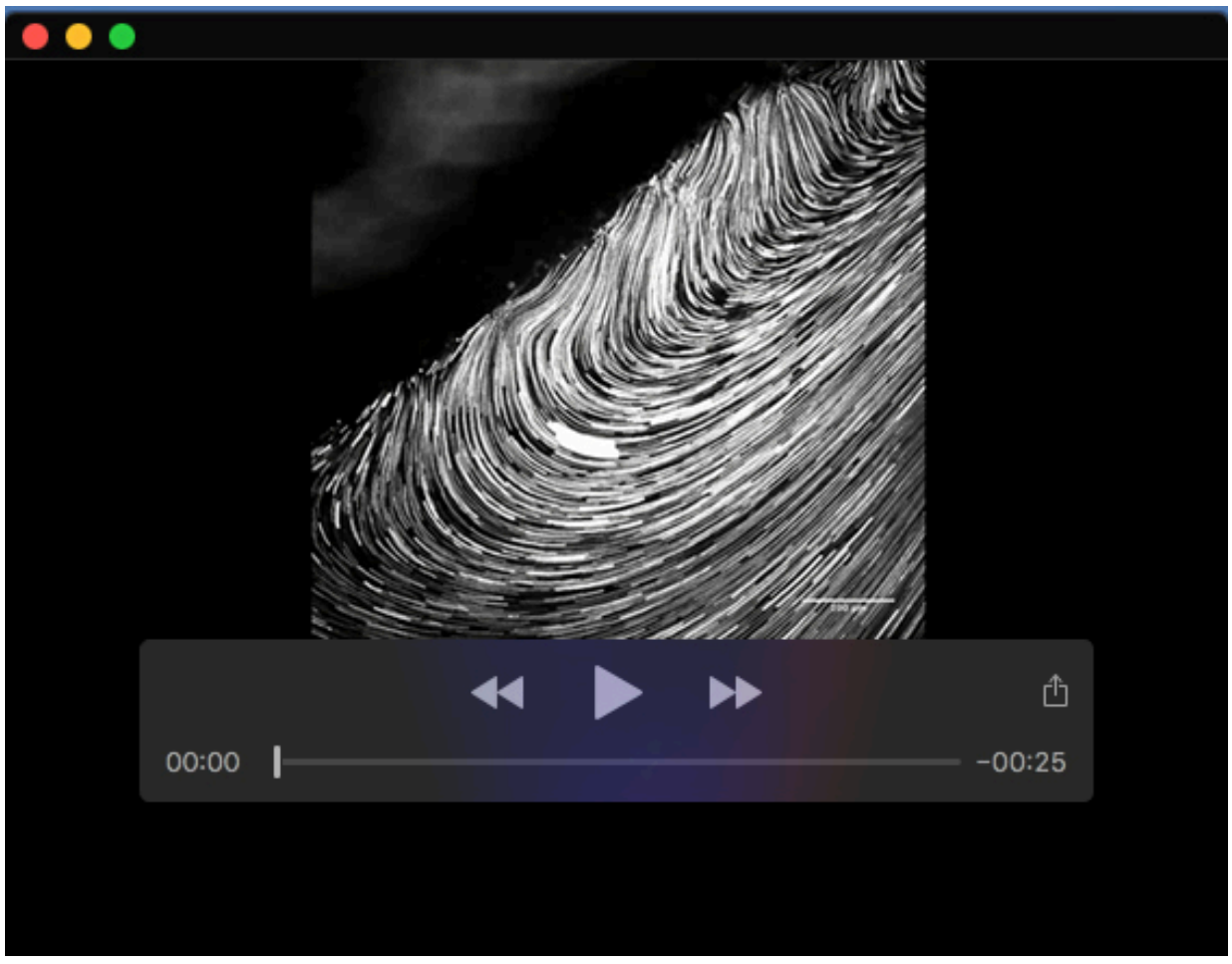
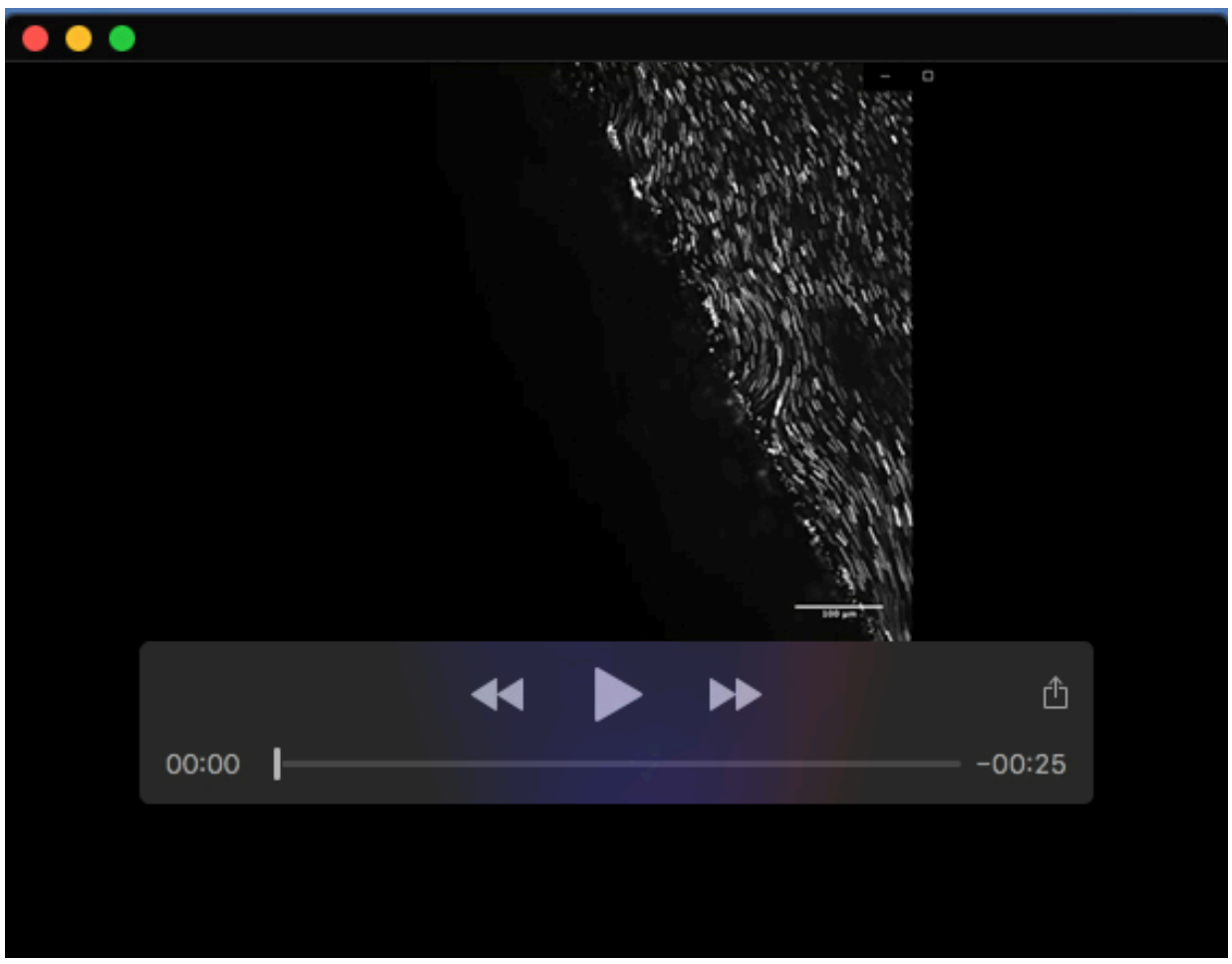


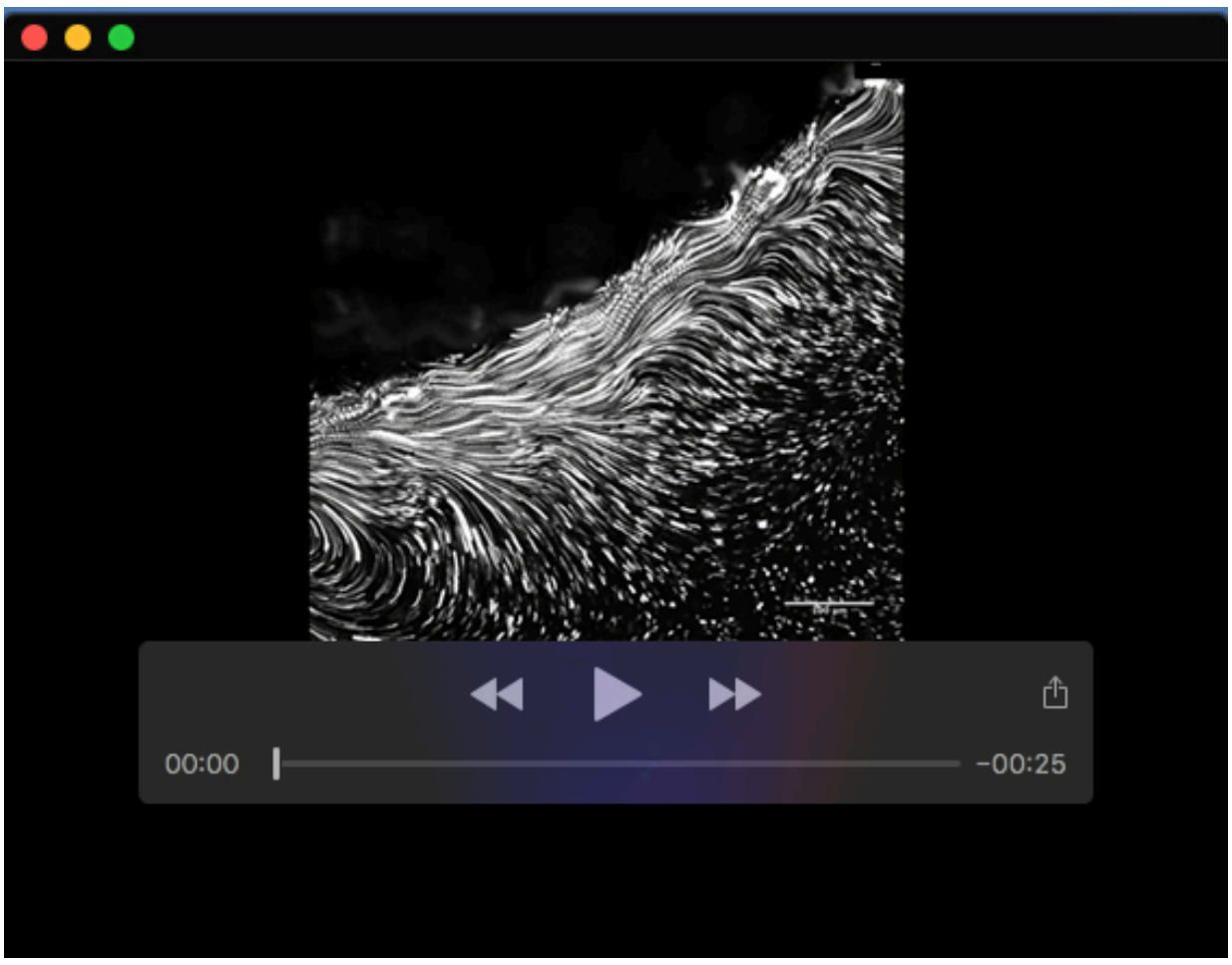
Fig. S3. A. Histogram of speed of truncated Kif9 movement along microtubules *in vitro*. Values binned to 1 nanometer/second. X-axis = velocity of molecules in nm/sec. Y-value = number of molecules at given speed. B. Histogram of run length of truncated Kif9 (X-axis) movement and number of molecules tracked (Y-axis). C. Dwell time of paused molecules (X-axis) and number of molecules tracked (Y-axis). Kymograph of live imaging of Kif9-GFP in axonemes. C. Kymograph of live imaging of Kif9-GFP in axonemes, arrows pointing to bidirectional trafficking of Kif9-GFP along the axoneme.



Movie 1. Flowtrace movies of beads flowing past epidermis in control embryos. Frame rate of 80 frames/second.

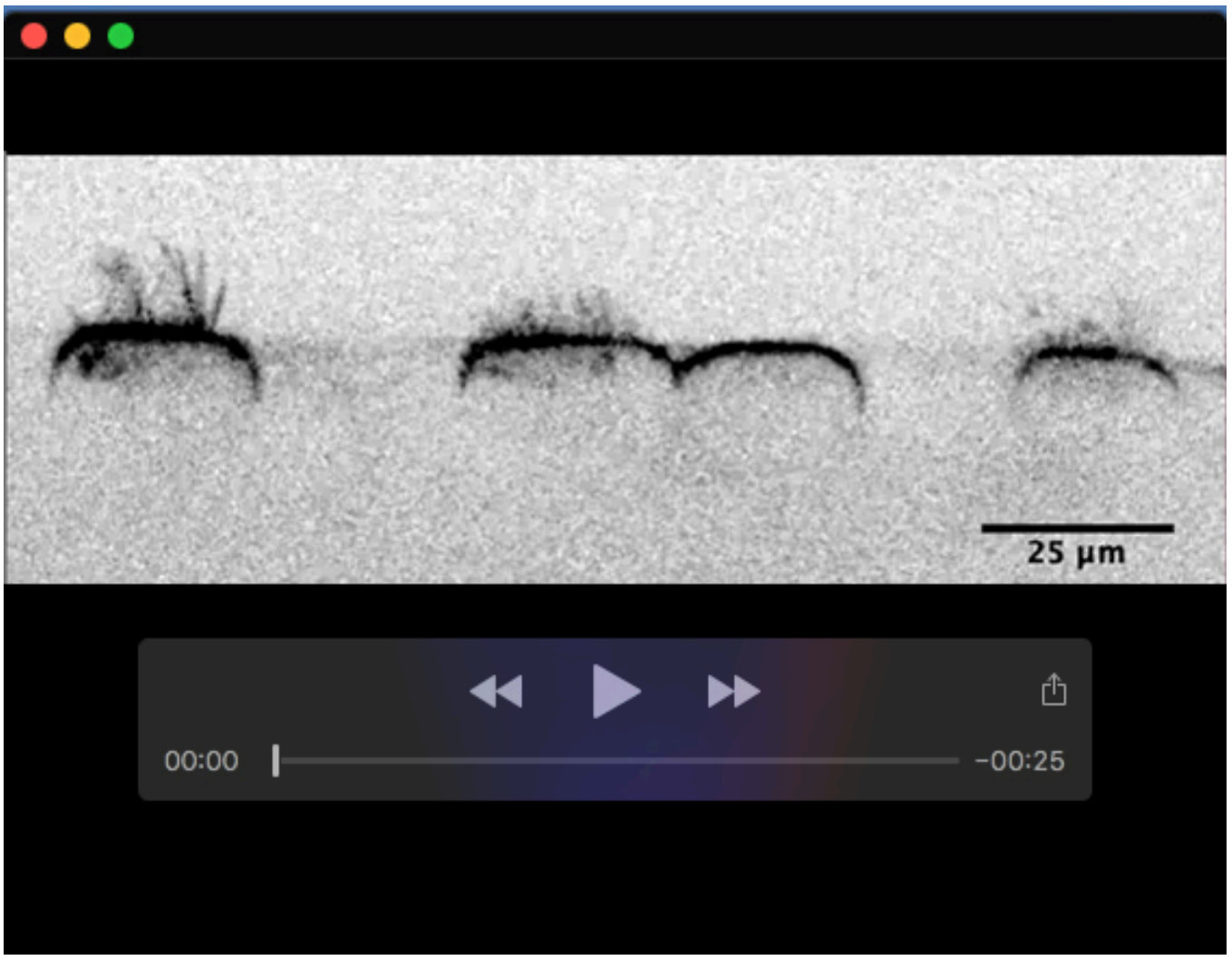


Movie 2. Flowtrace movies of beads flowing past epidermis in Kif9 knockdown embryos. Frame rate of 80 frames/second.

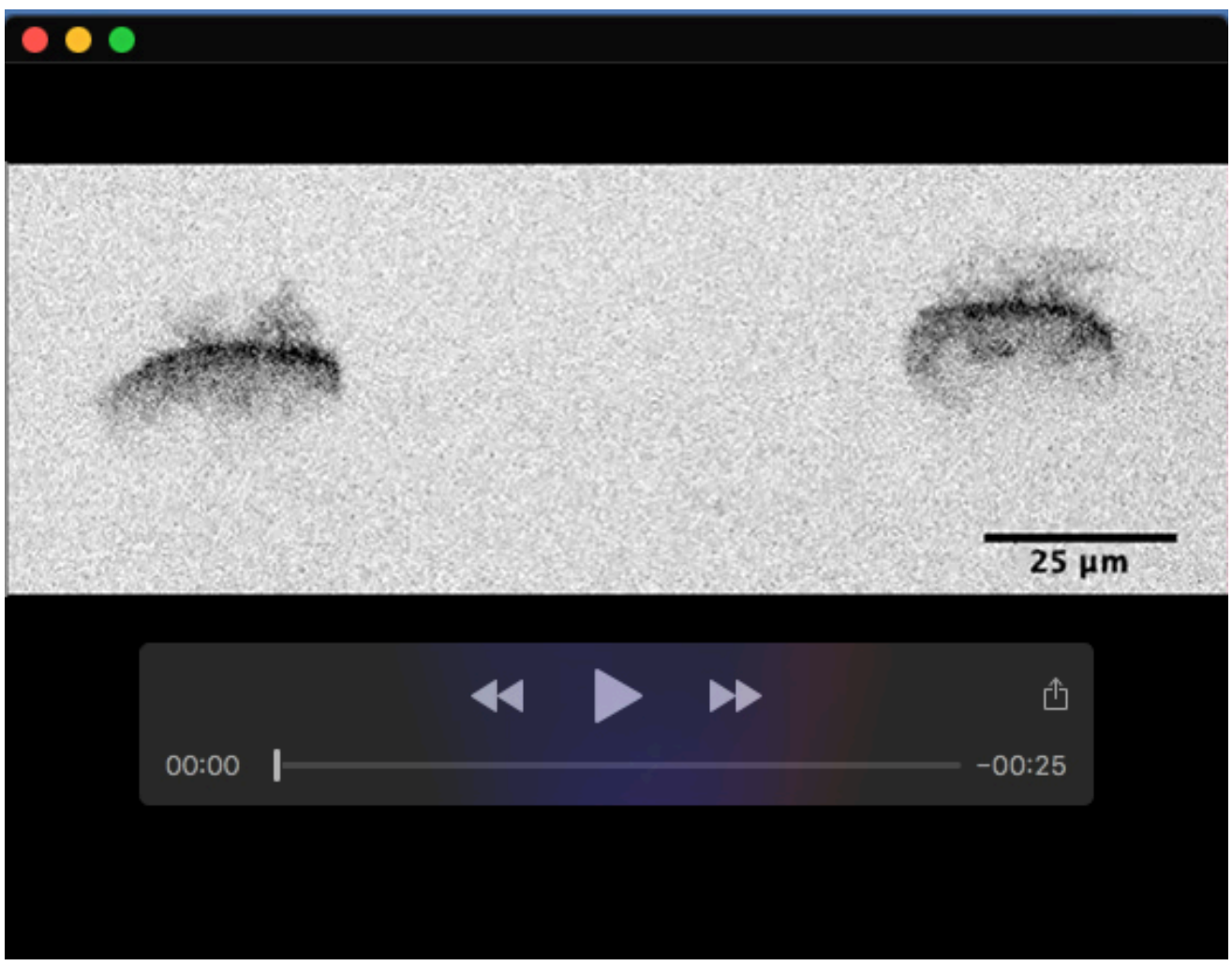


Movie 3. Flowtrace movies of beads flowing past epidermis in rescue treated embryos. Frame rate of 80 frames/second.

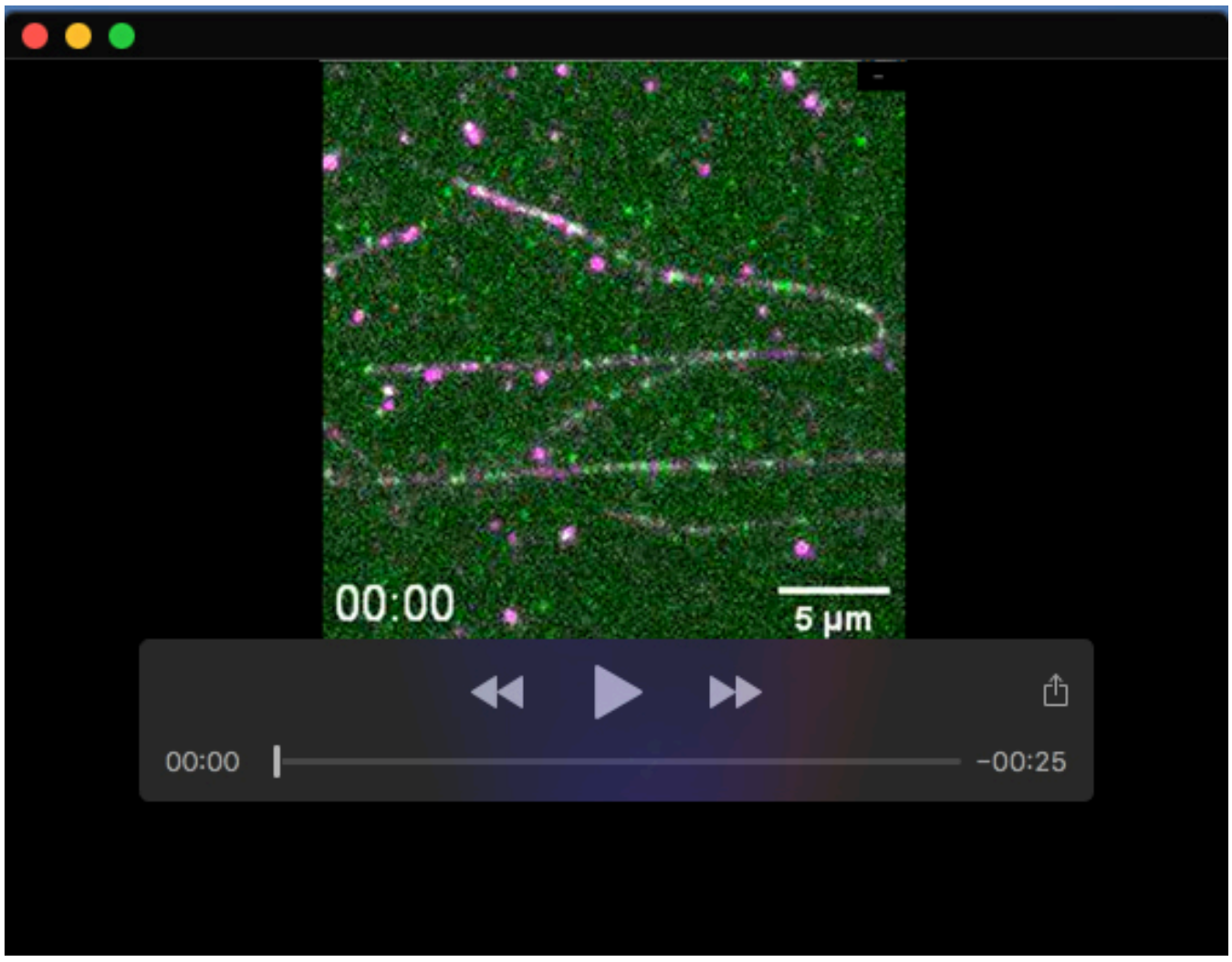
Movie 4. Multiciliated cell beating in control embryos. Frame rate of 80 frames/second.



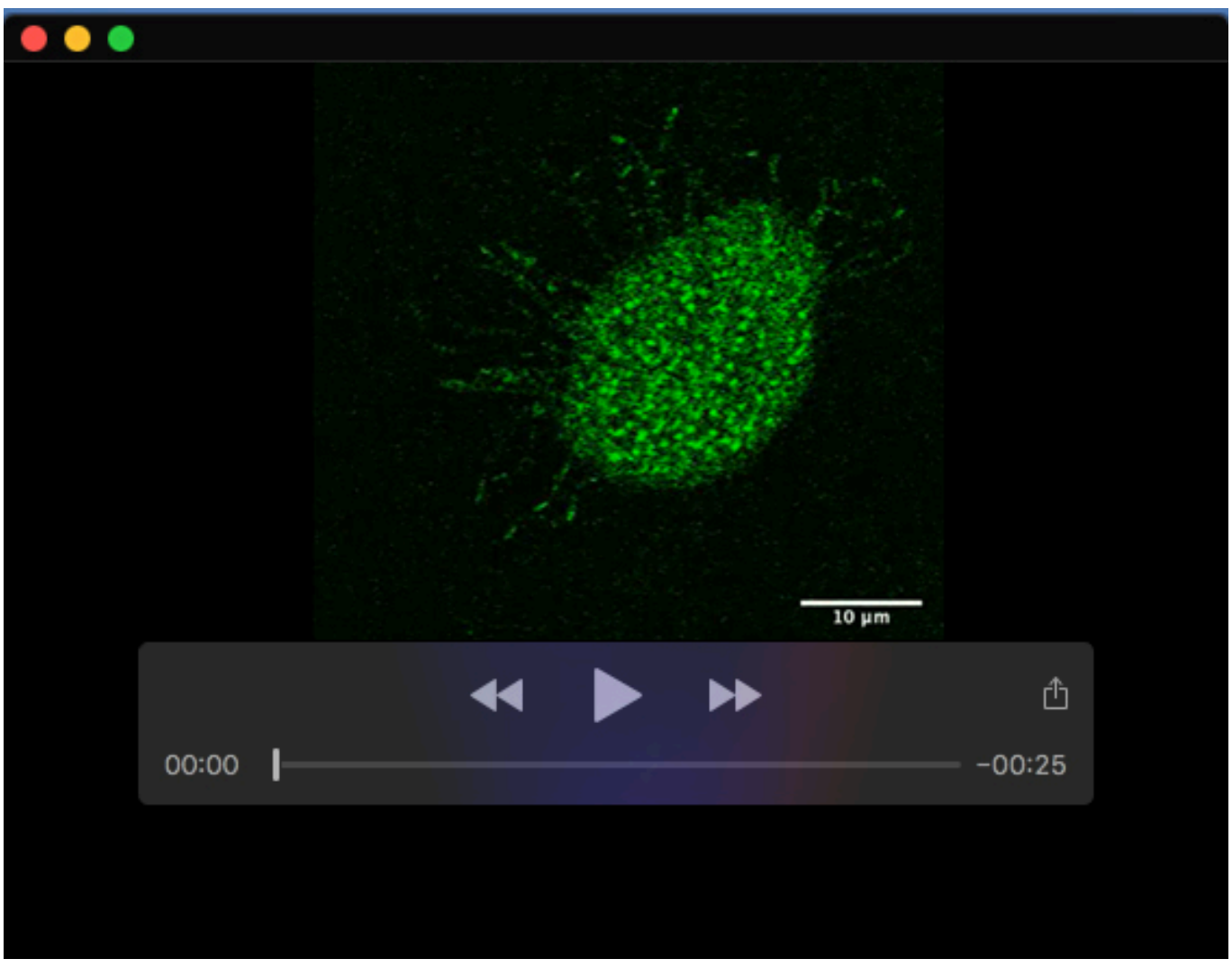
Movie 5. Multiciliated cell beating in Kif9 knockdown embryos. Frame rate of 80 frames/second.



Movie 6. Multiciliated cell beating in rescue treated embryos. Frame rate of 80 frames/second.



Movie 7. Movie of truncated version of Kif9 (Kif9 1-461 mNG) migrating on microtubules. Frame rate of 3 seconds/frame.



Movie 8. Movie of Kif9-GFP in vivo in *Xenopus* multiciliated cells. Frame rate of 3.84 frames/second.