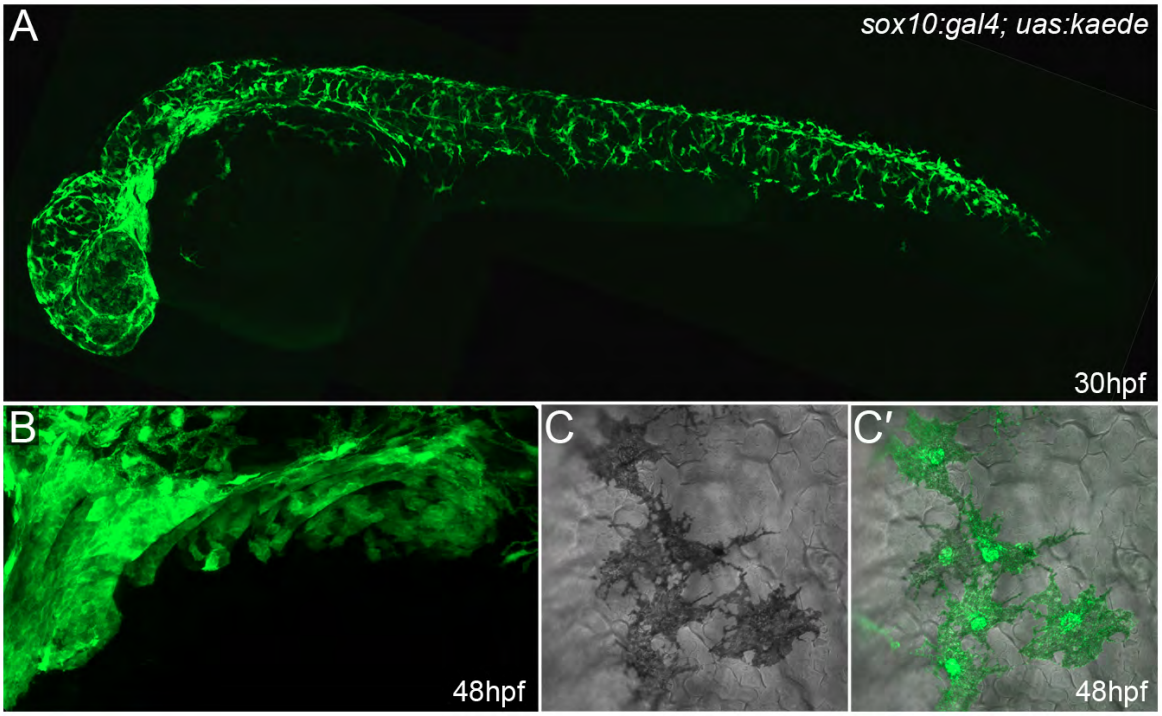


Fig. S1. Neural crest cells are well labelled in *sox10:gal4; uas:kaede* embryos. Lateral confocal images of 30-hpf (A,C,C′) and 48-hpf (B) *sox10:gal4; uas:kaede* transgenic embryos immunostained with an antibody detecting Kaede. (**A**) Broad and robust neural crest labelling along the entire axis can be seen at 30 hpf. (**B**) Lateral view of the branchial arches at 48 hpf showing extensive labelling of presumptive ectomesenchymal neural crest. (**C**,**C**′) Images showing DIC alone (C) or overlaid on a fluorescent image of Kaede expression demonstrates labelling of melanophores in *sox10:gal4; uas:kaede* transgenic embryos (C′). In this image, it can be seen that all five melanocytes express Kaede. Quantification of five 30-hpf *sox10:gal4; uas:kaede* transgenic embryos showed that at least 93.0% of melanophores are labelled by Kaede (a total of 545 melanophores was counted).

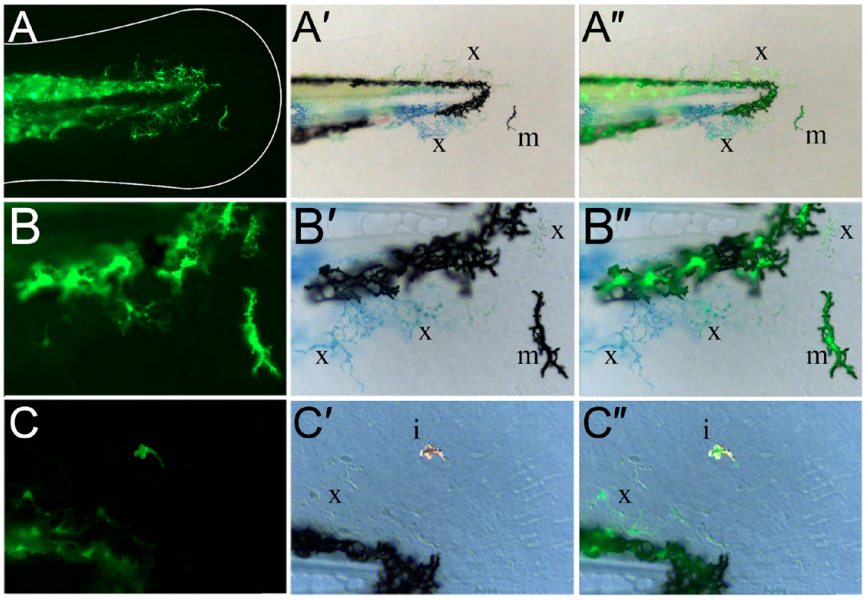


Fig. S2. Kaede-positive cells in the fin are chromatophores. (**A-C**″) Lateral views of the fin region of three 3-dpf *sox10:gal4; uas:kaede* transgenic embryos displaying Kaede green fluorescence (A,B,C) and brightfield views (A′,B′,C′). An overlay of the fluorescence image on the brightfield image is also shown (A″,B″,C″). At both low (A-A″) and high (B-C″) magnification, it can be observed that the Kaede-positive cells in the fin (A,B,C) correspond to black melanophores (m; A′,A″,B′,B″), xanthophores with characteristic yellow/blue colouration (x; A′,A″,B′,B″,C′,C″) or reflective iridophores (i; C′,C″).

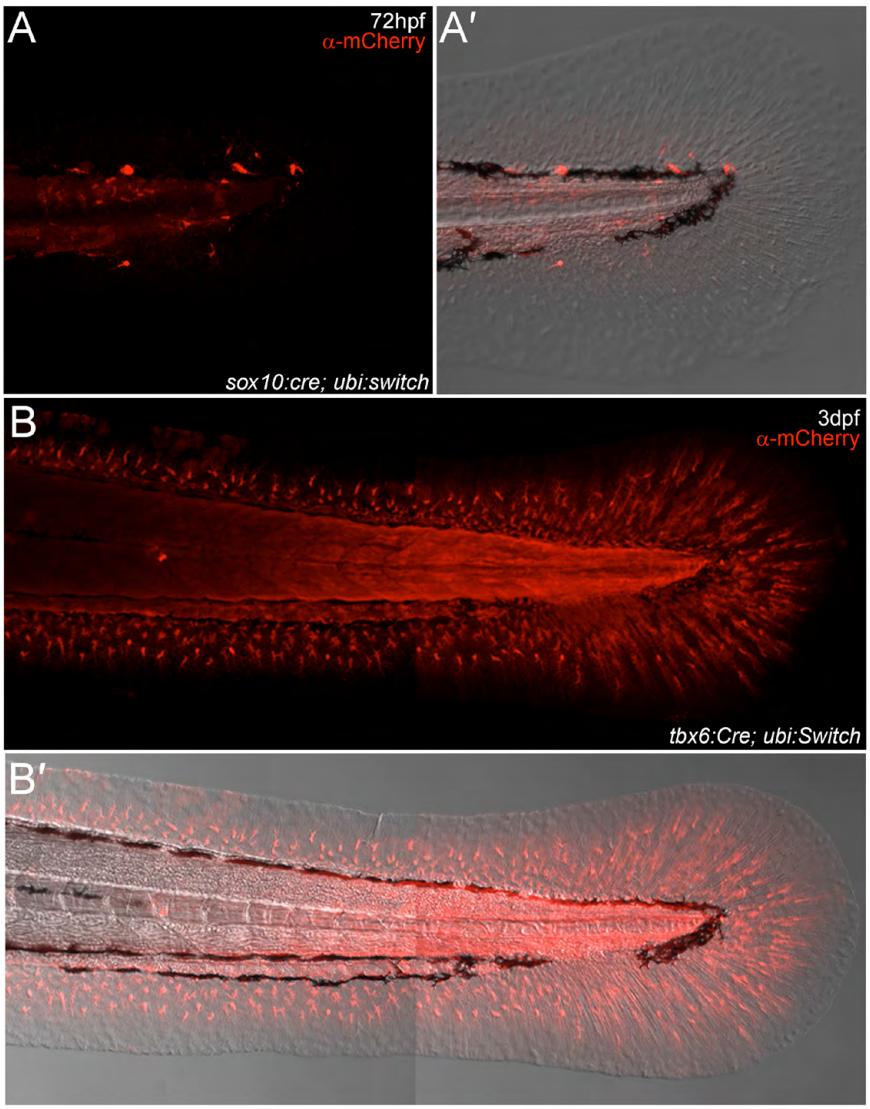


Fig. S3. Permanent lineage analysis confirms the origin of embryonic fin mesenchyme. (**A**,**A′**) Lateral confocal images of 72-hpf *sox10:Cre; ubi:switch* embryos fluorescently immunostained with an antibody detecting mCherry. Image of mCherry expression within the posterior trunk and fin (A) and also superimposed on a Nomarski view to show limited cells within the fin (A′). These embryos have neural crest lineages permanently labelled with mCherry, and show labelled cells within the trunk in locations and with morphology consistent with described neural crest derivatives. Fin mesenchyme is unlabelled. (**B**,**B′**) Lateral confocal images of 3-dpf *tbx6:Cre; ubi:switch* embryos fluorescently immunostained with an antibody detecting mCherry. (B) mCherry expression within the posterior trunk and fin with widespread expression visible in the fin mesenchyme and muscle of trunk. (B′) Fluorescent image superimposed on a Nomarski view outlining expression domains within the fin.

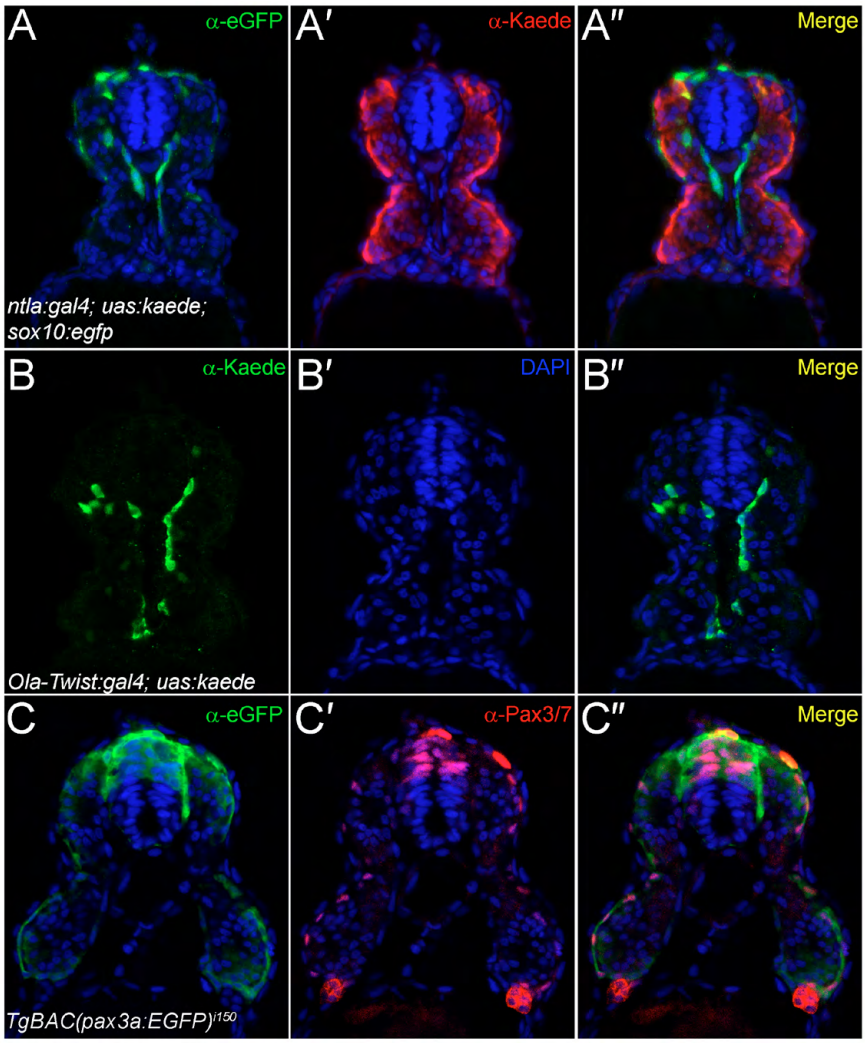


Fig. S4. Analysis of transgenic lines used to define the origin of fin mesenchyme. Transverse cryosections of the trunk region of the *ntla:gal4; uas:kaede* (A-A″), the *Ola-Twist:gal4; uas:kaede* (B-B″) and the *TgBAC(pax3a:EGFP)*^{i150} (C-C″) transgenic lines at 24 hpf, imaged by confocal microscopy following fluorescent immunostaining with antibodies against eGFP (A-A″,C-C″), Kaede (A-A″,B-B″) and Pax3/7 (C-C″). All sections were counterstained with DAPI (blue). (**A-A″**) To demonstrate exclusion of Kaede expression from neural crest, the *ntla:gal4; uas:kaede* line was crossed to the *sox10:egfp*^{ba2} line and immunostained for eGFP (A) and Kaede (A′). Restriction of Kaede to the mesoderm and exclusion from the neural crest can be seen in the superimposed image (A″). (**B-B″**) Expression of Kaede in the *Ola-Twist:gal4; uas:kaede* line is largely restricted to the sclerotomal compartment of the somites as seen by immunostaining for Kaede expression (B), which can be seen in a medial somitic location (B″) and far removed from the superficial dermomyotome domain. Occasional myotome expression can be observed in this line (B″). (**C-C″**) The *TgBAC(pax3a:EGFP)*^{i150} line faithfully recapitulates Pax3 expression in the dermomyotome as shown by comparing eGFP immunofluorescence (C) with Pax3/7 immunoreactivity (C′). By superimposition of the two confocal images, eGFP-positive dermomyotome cells at the somite surface have Pax3/7-positive nuclei, with strong eGFP and Pax3/7 colabelling in the dorsal neural tube and neural crest also apparent (C″).

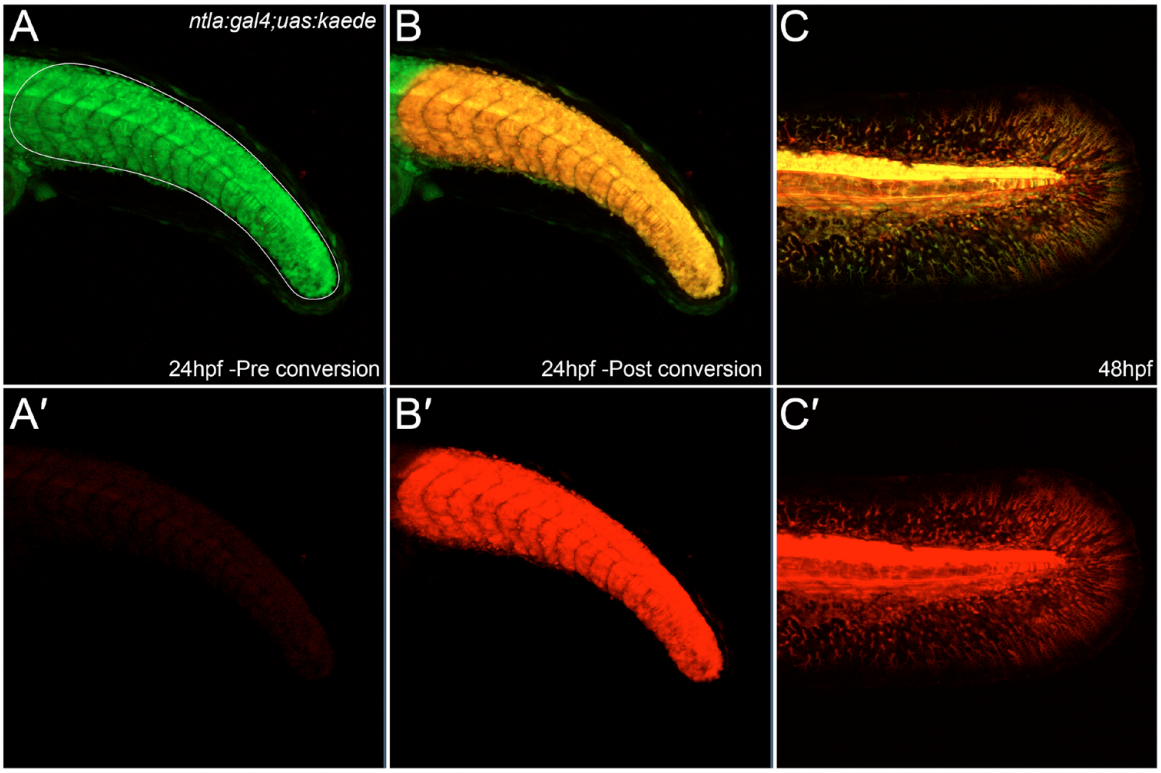
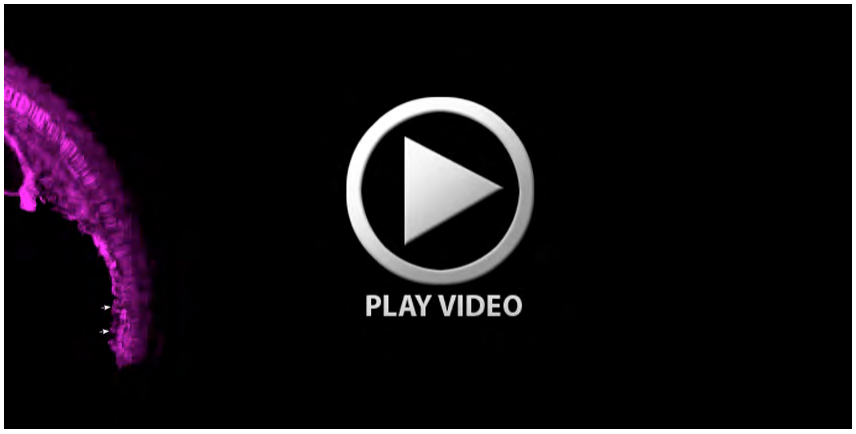


Fig. S5. Photoconversion of Kaede demonstrates that fin mesenchyme derives from earlier *ntla* mesoderm expression domains. (**A-C′**) The tail region of an *ntla:gal4; uas:kaede* transgenic embryo imaged at 24 hpf (A-B′) and again at 48 hpf (C,C′) both prior to (A,A′) and after (B-C′) Kaede photoconversion. Unconverted Kaede protein is shown in the green channel, which is overlaid with UV-photoconverted Kaede in the red channel (A,B,C). The red channel is additionally displayed alone for clarity (A′,B′,C′). The Kaede protein present at 48 hpf in the fin mesenchyme is photoconverted, demonstrating that it corresponds to perdurance of Kaede from the mesodermal expression domain at 24 hpf.

Movie 1. Ventral fin mesenchyme cells emerge from ventral somites. Confocal time-lapse movie of the tail region of an ET37 transgenic embryo imaged from 26 hpf for ~20 hours at 10-minute intervals. A fin mesenchyme cell is highlighted (arrow) leaving the ventral somite and taking up location in the ventral fin.

Movie 2. Dorsal fin mesenchyme cells emerge from dorsal somites. Confocal time-lapse movie of the tail region of an ET37 transgenic embryo imaged from 29 hpf for ~18 hours and 20 minutes at 8-minute intervals. A fin mesenchyme cell is highlighted (arrow) leaving the dorsal somite and taking up location in the dorsal fin.



Movie 3. Fin mesenchyme emerges from an *ntla:lyn-tdtomato*-expressing somitic domain. Confocal time-lapse movie of the tail region of an *ntla:lyn-tdtomato* ET37 transgenic embryo, imaged from 22 hpf for ~12 hours at 8-minute intervals. The ET37 eGFP signal is shown in green, with membrane-tethered tdTomato driven by the *ntla* promoter in magenta. The first frame omits the GFP signals to highlight the epithelial nature of the tdTomato-expressing cells. Two cells, initially epithelial and expressing tdTomato, are indicated by arrows and followed out into the fin where they rapidly lose tdTomato expression and gain strong eGFP expression.

Movie 4. Fin mesenchyme derives from the *pax3a*-expressing dermomyotome. Confocal time-lapse movie of the tail region of a *TgBAC(pax3a:EGFP)*^{i150} transgenic embryo, imaged from 24 hpf for ~16 hours at 8-minute intervals. This line labels the neural crest, the dorsal neural tube and the dermomyotome, the latter being distinguishable from the former two as it has a less intense GFP signal. Fin mesenchyme cells can be tracked from the somite into the fins (two examples are indicated by arrows). Neural crest cells also invade the fins but show both increased intensity of GFP and migratory behaviour in comparison to the fin mesenchyme cells.