

Figure S1. Transcriptomes of medaka, zebrafish and zebrafish plotted on the zebrafish genome

(A, Top) Transcriptomes from medaka are in the upper compartment, from zebrafish in the middle and from zebrafish at the bottom. The image shows an example of a peak obtained using the medaka transcriptome. (A, Bottom) A detail of the region shows a different morphology for the medaka peak, different from the zebrafish or zebrafish peaks that span along the entire set of exons of PCNA. Also note that the medaka peak consist of just one read, different from the >7K in zebrafish or >250 in zebrafish.

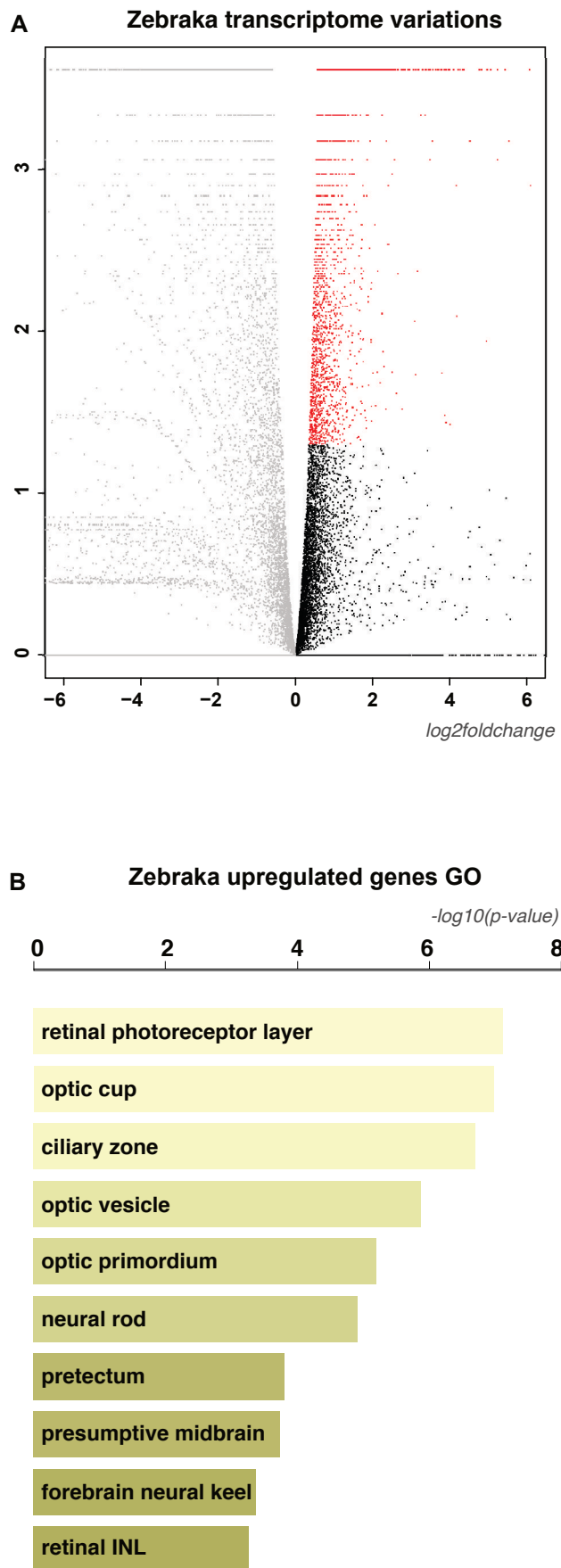


Figure S2. ZebraKa transcriptomic landscape at 48 hpf.

(A) Volcano plot illustrating the up-regulated genes in the zebraKa cells if compared with the zebrafish WT transcriptome. Each dot corresponds to a gene. Black dots indicate not significant variations; whereas red dots correspond to genes significantly up-regulated in the zebraKa cells (2434 genes). Grey dots indicate zebraKa down-regulated genes. (B) GO terms enriched in the zebraKa up-regulated genes ordered by significance.

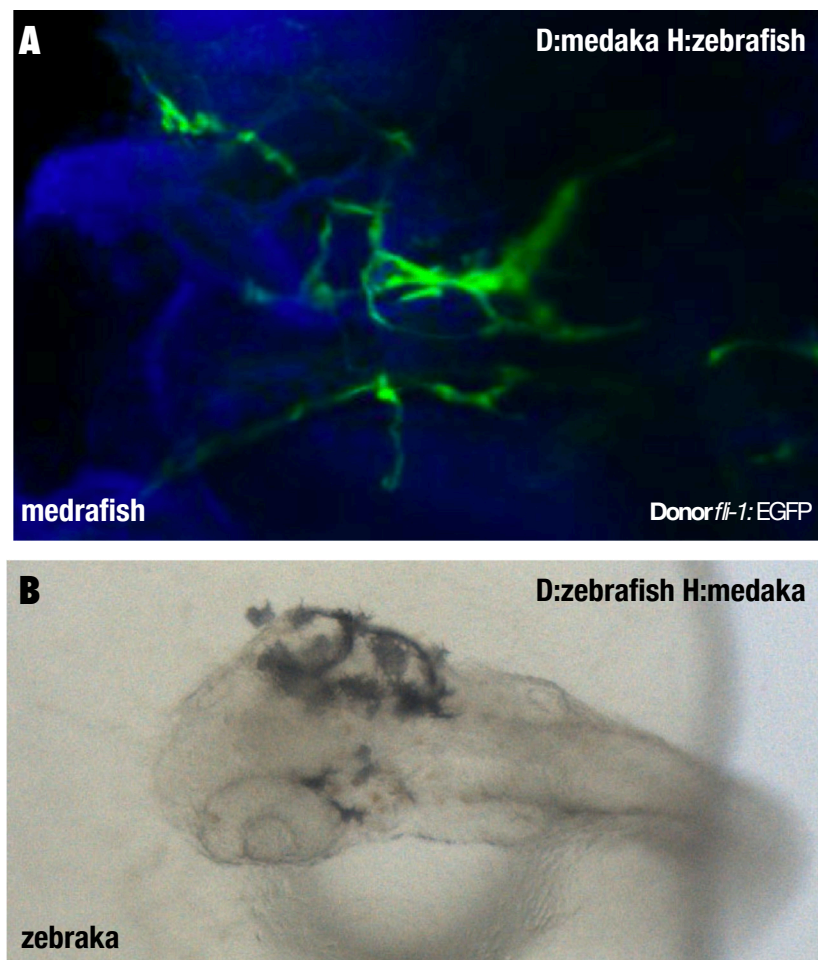


Figure S3. Differentiation of donor cells in inter-species transplantations.

(A) Confocal image of 3 dpf medafish using a Tg(*fli1*:EGFP) medaka donor. (B) Binocular picture of a 2.5 dpf zebraka using a pigmented zebrafish donor and a wild type medaka host.

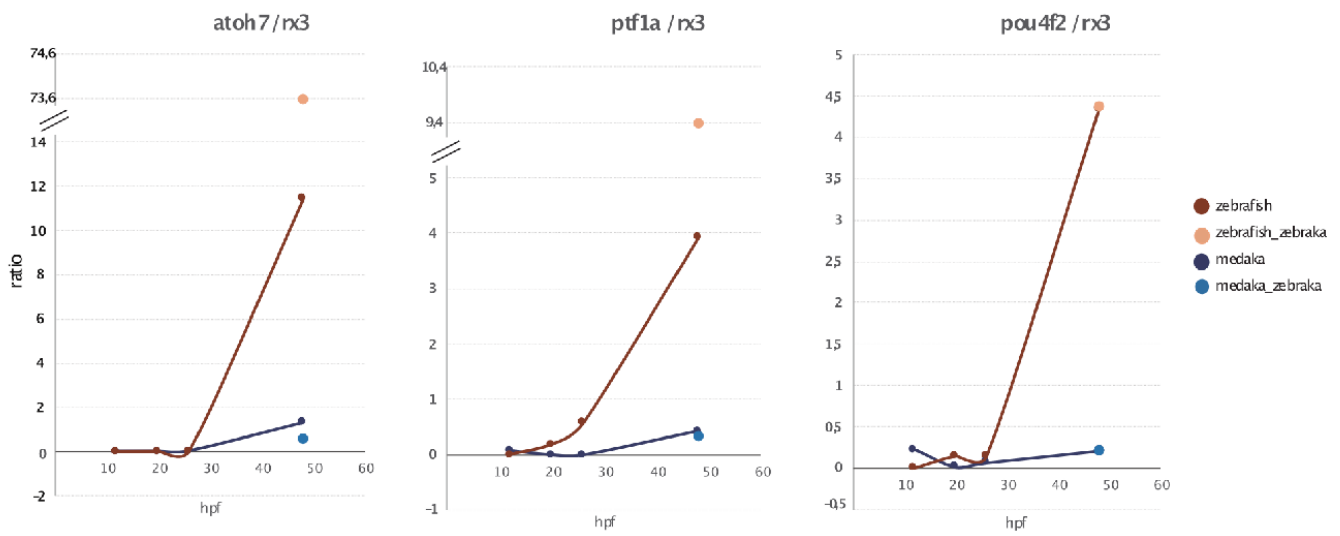


Figure S4. Ratios of progenitor / differentiation retinal genes in zebrakas.

Plots show lines for the specified ratio during early embryonic development in zebrafish and medaka. The dots at 50hpf correspond to samples used in this study.

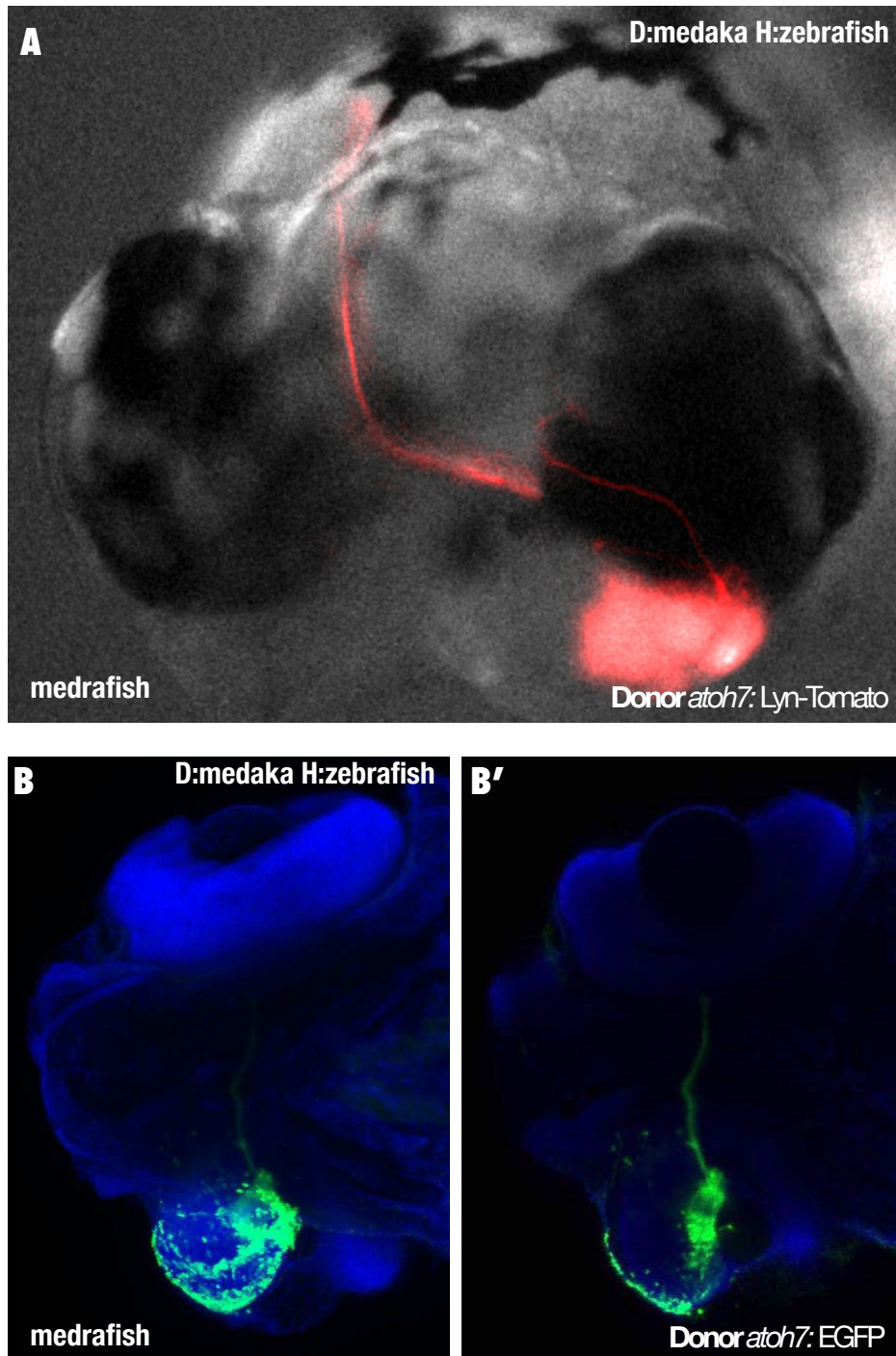


Figure S5. Differentiation of RGCs is an ectopic medrafish retina.

(A, B) Confocal images of a 4 dpf medrafish using Tg(*atoh7*:LynTomato) (A) or Tg(*atoh7*:EGFP) (B) medaka as a donor and a non-transgenic zebrafish host. RGCs differentiate in the ectopic retina and form an optic nerve that projects to the host tectum. (A) Frontal view showing that axons of medaka RGCs travel to the contralateral host tectum. (B) Confocal section on medrafish ectopic retina showing EGFP+ cells (presumably RGCs). Deeper planes (B') show a proper organization of RGCs in the most inner layer (ganglion cell layer).

D: <i>D.r. OIβactin2:EGFP</i>	Survival	Cluster formation	Ectopic retina	Notes
H: <i>O.I, Cab</i>				
zebraka 1	Y	Y	Y	
zebraka 2	N			
zebraka 3	Y	Y	Y	
zebraka 4	Y	Y	Y	
zebraka 5	Y	Y	Y	
zebraka 6	Y	Y	Y	
zebraka 7	Y	Y	Y	

D: <i>D.r. OIβactin2:EGFP</i>	Survival	Cluster formation	Ectopic retina	Notes
H: <i>O.I, LoxPOUT</i>				
zebraka 8	N			
zebraka 9	N			
zebraka 10	N			
zebraka 11	Y	N	N	No GFP +

D: <i>D.r. OIβactin2:EGFP</i>	Survival	Cluster formation	Ectopic retina	Notes
H: <i>O.I, GaudiRSG, cmlc2:ECFP</i>				
zebraka 12	Y	Y	Y	
zebraka 13	N			
zebraka 14	Y	Y	Y	
zebraka 15	Y	Y	Y	
zebraka 16	Y	N	N	No GFP +
zebraka 17	Y	N	N	No GFP +

D: <i>D.r. OIβactin2:EGFP</i>	Survival	Cluster formation	Ectopic retina	Notes
H: <i>O.I, atoh7:lyntdTomato</i>				
zebraka 18	Y	Y	Y	
zebraka 19	N			
zebraka 20	Y	Y	Y	
zebraka 21	Y	Y	N/A	
zebraka 22	N			
zebraka 23	N			
zebraka 24	Y	Y	Y	
zebraka 25	N			

D: <i>D.r. atoh7:GFP, ef1:lynTomato</i>	Survival	Cluster formation	Ectopic retina	Notes
H: <i>O.I, atoh7:lyntdTomato</i>				
zebraka 26	Y	Y	Y	

D: <i>D.r. atoh7:GFP, ef1:lynTomato</i>	Survival	Cluster formation	Ectopic retina	Notes
H: <i>O.I, Cab</i>				
zebraka 27	Y	Y	Y	
zebraka 28	Y	Y	Y	
zebraka 29	Y	Y	Y	

D: <i>D.r. OIβactin2:lyntdTomato</i>	Survival	Cluster formation	Ectopic retina	Notes
H: <i>O.I, atoh7:EGFP</i>				
zebraka 30	Y	N/A	N/A	No Red +

Table S1. Zebbraka transplantation experiments

List of transplantation experiments using zebrafish donor blastomeres to transplant into medaka blastulae. Genotypes of donor and hosts are indicated; each experiment is a different transplantation day (zebraka 1, zebraka 2, etc). Black cells represent cases in which no embryo survive beyond day 1; Y/N stands for Yes/No; N/A represents cases in which cluster formation or ectopic retina could not be assessed due to the lack of the reporter protein (typically, heterozygote donors)

D: <i>O.l.</i> LoxPout	Survival	Cluster formation	Ectopic retina	Notes
H: <i>D.r.</i> WIK/AB				
medrafish 1	Y	Y	Y	
medrafish 2	Y	Y	N	
medrafish 3	Y	Y	Y	
medrafish 4	Y	Y	Y	
medrafish 5	Y	Y	N	
medrafish 6	Y	Y	N/A	
medrafish 7	Y	Y	Y	
medrafish 8	Y	Y	Y	
medrafish 9	Y	Y	Y	
medrafish 10	Y	Y	Y	
medrafish 11	Y	Y	Y	
medrafish 12	Y	Y	Y	
medrafish 13	Y	Y	Y	

D: <i>O.l.</i> wimbledon	Survival	Cluster formation	Ectopic retina	Notes
H: <i>D.r.</i> WIK/AB				
medrafish 14	Y	Y	Y	

D: <i>O.l.</i> fl/1:EGFP, rx2:H2B-mRFP	Survival	Cluster formation	Ectopic retina	Notes
H: <i>D.r.</i> WIK/AB				
medrafish 15	Y	Y	Y	
medrafish 16	Y	Y	Y	
medrafish 17	Y	Y	Y	
medrafish 18	Y	Y	N/A	
medrafish 19	Y	Y	Y	
medrafish 20	Y	N/A	N/A	No RFP +
medrafish 21	Y	N/A	N/A	No RFP +
medrafish 22	Y	N/A	N/A	No RFP +

D: <i>O.l.</i> atoh7:EGFP	Survival	Cluster formation	Ectopic retina	Notes
H: <i>D.r.</i> WIK/AB				
medrafish 23	Y	Y	Y	
medrafish 24	Y	Y	Y	
medrafish 25	Y	Y	Y	
medrafish 26	Y	Y	Y	
medrafish 27	Y	Y	Y	
medrafish 28	Y	Y	Y	
medrafish 29	Y	Y	Y	
medrafish 30	Y	Y	Y	
medrafish 31	Y	Y	Y	

D: <i>O.l.</i> atoh7:lyntdTomato	Survival	Cluster formation	Ectopic retina	Notes
H: <i>D.r.</i> WIK/AB				
medrafish 32	Y	N/A	N/A	No Red +
medrafish 33	Y	Y	Y	
medrafish 34	Y	Y	Y	
medrafish 35	Y	Y	Y	
medrafish 36	Y	Y	Y	
medrafish 37	N			
medrafish 38	Y	Y	Y	

Table S2. Medrafish transplantation experiments

List of transplantation experiments using medaka donor blastomeres to transplant into zebrafish blastulae. Genotypes of donor and hosts are indicated; each experiment is a different transplantation day (medrafish 1, medrafish 2, *etc*). Black cells represent cases in which no embryo survive beyond day 1; Y/N stands for Yes/No; N/A represents cases in which cluster formation or ectopic retina could not be assessed due to the lack of the reporter protein (typically, heterozygote donors)

<i>sample</i>	<i>species</i>	alignment vs <i>OryLat2</i>			alignment vs <i>danRer10</i>		
		<i>n reads tot</i>	% <i>alignment</i>	<i>n reads aligned</i>	<i>n reads tot</i>	% <i>alignment</i>	<i>n reads aligned</i>
1	medaka	52712186	92,65 %	48837840,3	52712186	0,58 %	305730,679
2	medaka	47861284	88,28 %	42251941,5	47861284	0,52 %	248878,677
3	zebrafish	65650278	0,42 %	275731,168	65650278	90,45 %	59380676,5
4	zebrafish	93625821	0,37 %	346415,538	93625821	92,20 %	86323007
5	zebraka	83057736	88,08 %	73157253,9	83057736	2,24 %	1860493,29
6	zebraka	65423949	90,39 %	59136707,5	65423949	2,21 %	1445869,27
7	zebraka	73869239	88,06 %	65049251,9	73869239	2,24 %	1654670,95

Table S3. Number of reads and alignment of transcriptomes to medaka and zebrafish genomes

Alignments of medaka, zebrafish and zebraka full transcriptomes to the genomes of medaka (version *OryLat2*) and zebrafish (version *danRer10*). Alignments are shown for each single transcriptome.

Organ	tracking_id	gene_short_name	medaka	zebrafish	zebraka
eye	ENSDARG00000002445	prdm1a	0	5,65089	4,94264
	ENSDARG00000003732	mitfa	0	5,50327	0,746289
	ENSDARG00000005574	vsx2	0	21,43285	103,344
	ENSDARG00000007480	rpe65a	0	2,077465	0
	ENSDARG00000014479	ptf1a	0	5,30958	21,0451
	ENSDARG00000039077	tyr	0	5,09426	2,16854
	ENSDARG00000040321	rx2	0	5,374545	21,0656
	ENSDARG00000052893	rx3	0	2,708445	2,24017
	ENSDARG00000054420	rpe65c	0	4,768605	0,741695
	ENSDARG00000056292	vsx1	0	6,713195	87,2205
	ENSDARG00000069552	atoh7	0	10,729815	164,963
	ENSDARG00000069737	pou4f2	0	2,10973	9,8081
	ENSDARG00000071684	rx1	0	9,31434	43,2672
	ENSDARG00000094752	rpe65b	0	27,16545	0,310149
	ENSDARG00000103379	pax6a	0	37,95835	284,621
	ENSDARG00000102047	mab21l1	0,803865	42,9119	136,364
	ENSDARG00000098925	prdm1b	0	5,21996	121,93
	ENSDARG00000019335	hes6	0	86,2615	194,179
	ENSDARG00000011235	otx2	0	20,428	152,552
	ENSDARG00000011989	crx	0	1,44177	41,3936
heart/muscle	ENSDARG00000032976	cmlc1	0	32,5024	0
	ENSDARG00000042018	fhl2a	0	6,662425	0
	ENSDARG00000098952	gata4	0	1,96555	0
	ENSDARG00000103589	gata6	0	14,02775	0
	ENSDARG00000037995	gdf3	0	0,612672	0
	ENSDARG00000099974	ldb3b	0	103,601	0
	ENSDARG00000035322	myh7bb	0	6,0762	0
	ENSDARG00000057317	nexn	0	27,1057	0
	ENSDARG00000005841	tnni2a.2	0	6,567225	0
	ENSDARG00000011400	tnnc1a	0	7,840665	0
	ENSDARG00000020610	tnnt2a	0	21,735	0
	ENSDARG00000029069	tnni2a.4	0	1569,055	0
	ENSDARG00000029995	tnni2b.2	0	19,1463	0
	ENSDARG00000035958	tnni2b.1	0	177,3585	0
	ENSDARG00000036671	tnni1a1	0	93,67895	0
	ENSDARG00000042559	tnni1c	0	55,94625	0
	ENSDARG00000052708	tnni1b	0	17,72405	0
	ENSDARG00000002589	mylpfb	0	1381	0
	ENSDARG00000005629	smyd2b	0	20,64005	0
	ENSDARG00000007277	myf5	0	5,70612	0
	ENSDARG00000009133	myo1eb	0	11,5902	0
	ENSDARG00000011615	mybpc3	0	55,03795	0
	ENSDARG00000019096	myl7	0	30,3915	0
	ENSDARG00000021265	mybpc2b	0	54,02825	0
	ENSDARG00000061249	myom1a	0	58,81685	0
	ENSDARG00000062592	myl10	0	618,9045	0
	ENSDARG00000075433	myom2a	0	46,72825	0
	ENSDARG00000091099	myom2b	0	21,4495	0
	ENSDARG00000091253	smyd1b	0	24,88595	0
	ENSDARG00000099959	smyhc1	0,337096	168,427	0

Table S4. Transcriptional profile of ectopic cluster in zebrakas

List of zebrafish transcripts (and their ID) corresponding to retina genes (upper section) and heart genes (bottom section). The different columns show the count number of their respective sequences in transcriptomes from medaka, zebrafish and zebraka.