fish_gene_name	fish_acc_num	mouse_gene_name	mouse_acc_num
actb2	NM_181601.3	*Actb2*	NM_007393.5
alx1	NM_001045074.1	*Alx3*	NM_007441.3
alx3	XM_690238.3	*Alx4*	NM_007442.3
alx4a	XM_001340930.4	*Atp11a*	NM_001293667.1
alx4b	NM_001089357.1	*Axin2*	NM_015732.4
axin2	NM_131561.1	*Barx1*	NM_007526.4
barx1	NM_001024949.1	*Bmp4*	NM_007554.3
bmp4	NM_131342.2	*Bmpr1a*	NM_009758.4
bmpr1ab	NM_001004585.1	*Cart1*	X92346.1
bmpr1ba	NM_131457.2	*Cdc42*	NM_009861.3
bmpr1bb	NM_001145996.1	*Chtop*	NM_023215.6
brf1a	NM_199898.1	*Cited1*	NM_007709.4
cdc42	NM_200632.2	*Dkk1*	NM_010051.3
cited1	NM_001114891.1	*Dlx1*	NM_010057.2
dkk1b	NM_131003.1	*Dlx2*	NM_010054.2
dlx2a	NM_131311.2	*Dlx3*	NM_010055.3
dlx3b	NM_131322.2	*Dlx4*	NM_007867.4
dlx4a	NM_131300.2	*Dlx5*	NM_010056.3
dlx4b	NM_131318.1	*Dlx6*	NM_010057.2
dlx5a	NM_131306.2	*Dlx6os1*	NR_015388.1
dlx6a	NM_131323.1	*Edn1*	NM_010104.4
edn1	NM_131519.1	*Ednra*	NM_010332.2
ednraa	NM_001099445.1	*Epha4*	NM_007936.3
ednrab	NM_212930.1	*Eya1*	NM_010164.2
efnb2a	NM_131023.1	*Fgf3*	NM_008007.2
epha4b	NM_153658.1	*Fgf8*	NM_010205.2
eya1	NM_131193.1	*Foxd3*	NM_010425.3
fgf3	NM_131291.1	*Frzb*	NM_011356.4
fgf8a	NM_131281.2	*Fzd6*	NM_008056.3
foxd3	NM_131290.1	*Fzd7*	NM_008057.3
frzb	NM_130943.2	*Gbx2*	NM_010262.3
furina	NM_001045106.2	*Gdf5*	NM_008109.2
fzd6	NM_200561.2	*Gpc4*	NM_008150.2
fzd7a	NM_131139.1	*Grem2*	NM_011825.1
gbx2	NM_152964.1	*Gsc*	NM_010351.1
gdf5	XM_002662541.3	*Hand1*	NM_008213.2
gpc4	NM_131860.2	*Hand2*	NM_010402.4
grem2b	NM_001017704.1	*Hey1*	NM_010423.2
gsc	NM_131017.1	*Irx5*	NM_018826.2
hand2	NM_131626.3	*Jag1*	NM_013822.5
hey1	NM_212561.1	*Kat6a*	NM_001081149.1
hoxa2b	NM_131106.1	*Lef1*	NM_010703.4
hoxb2a	NM_131116.2	*Mef2*	NM_001170537.1
irx7	NM_131881.1	*Msx1*	NM_010835.2
jag1b	NM_131863.1	*Msx2*	NM_013601.2

kat6a	NM_001123312.4
lef1	NM_131426.1
mef2ca	NM_131312.2
msx1a	NM_131273.1
msx1b	NM_131260.1
msx3	NM_131272.2
mycn	NM_212614.2
nkx2.3	NM_131423.1
nkx2.5	NM_131421.1
nkx2.7	NM_131419.1
nkx3.2	NM_178132.2
notch2	NM_001115094.1
pak2a	NM_001002717.1
pcdh19	NM_001127519.2
pitx1	NM_001040346.2
pitx2	NM_130975.2
plcb3	NM_001122773.1
prrx1a	NM_214734.1
rbms3	NM_001076716.1
rgs4	NM_199274.1
rgs5a	NM_199962.1
ror2	XM_684589.7
rpl37	NM_001002069.2
rspo2	NM_001281990.1
runx2b	NM_212862.2
satb2	NM_001128532.1
sfrp2	NM_001077384.2
shha	NM_131063.1
six1b	NM_207095.1
sox10	NM_131875.1
sox9a	NM_131643.1
sox9b	NM_131644.1
stau2	NM_200925.1
tbx18	NM_153665.1
tfap2a	NM_176859.2
ubb	NM_001013272.2
vangl2	NM_153674.1
wnt11	NM_001144804.1
wnt11r	NM_131076.2
wnt4a	NM_001040387.1
wnt5b	NM_130937.1
wnt9a	NM_001045363.1
wnt9b	NM_001137660.2

Nkx2.3	NM_008699.2
Nkx2.5	NM_008700.2
Nkx3.2	NM_007524.3
Notch2	NM_010928.2
Pcdh19	NM_001105245.1
Pitx1	NM_011097.2
Pitx2	NM_001042504.2
Plcb3	NM_001290349.1
Prxx1	NM_175686.3
Rgs4	NM_009062.3
Rgs5	NM_009063.4
Ror2	NM_013846.3
Rpl37	NM_026069.3
Rspo2	NM_172815.3
Runx2	NM_001146038.2
Satb2	NM_139146.2
Sfrp2	NM_009144.2
Shh	NM_009170.3
Six1	NM_009189.3
Sox10	NM_011437.1
Sox9	NM_011448.4
Stau2	NM_001111272.1
Tbx18	NM_023814.4
Tfap2a	NM_011547.4
Ubb	NM_011664.4
Vangl2	NM_033509.4
Wnt11	NM_001285792.1
Wnt3	NM_009521.2
Wnt4	NM_009523.2
Wnt5a	NM_009524.3
Wnt9	NM_011719.4

Reaction rates		GRN parameters	
d_{hand2}	1	p_1	0.0044
d_{dlx3b}	4	$p2$	0.003
d_{dlx5a}	4	p_3	0.0005
d_{jag1b}	0.25	p_4	0.007
d_{hey1}	12.5	p_5	0.5
vM_{hand2}	1	p_6	0.25
vM_{dlx3b}	4	p_7	0.17
vM_{dlx5a}	4	p_8	0.17
vM_{jag1b}	0.25	p_9	0.85
vM_{hey1}	12.5	p_{10}	0.007
vB	0.000001		

Zebrafish gene	**Regulation**	**Reference**
barx1	Up by Bmp and Edn	Barske et al., 2016; Nichols et al., 2013
bmpr1ab	Up by Wnt	Alexander et al., 2014
bmpr1ba	Up by Wnt	Alexander et al., 2014
dlx3b	Up by Bmp and Edn	Alexander et al., 2011; Zuniga et al., 2010; Zuniga et al., 2011
dlx4a	Up by Bmp and Edn	Alexander et al., 2011; Zuniga et al., 2010; Zuniga et al., 2011
dlx4b	Up by Bmp and Edn	Alexander et al., 2011; Zuniga et al., 2010; Zuniga et al., 2011
dlx5a	Up by Bmp and Edn	Alexander et al., 2011; Zuniga et al., 2010; Zuniga et al., 2011
dlx6a	Up by Bmp and Edn	Alexander et al., 2011; Zuniga et al., 2010; Zuniga et al., 2011
ednraa	Up by Edn	Nair et al., 2007
ednrab	Up by Edn	Nair et al., 2007
epha4b	Up by Bmp and Edn	Zuniga et al., 2010; Zuniga et al., 2011
grem2b	Up by Jag/Notch	Zuniga et al., 2011
hand2	Up by Bmp and Edn	Alexander et al., 2011; Miller et al., 2003; Zuniga et al., 2010; Zuniga et al., 2011
hey1	Up by Jag/Notch	Zuniga et al., 2010
jag1b	Up by Jag/Notch	Zuniga et al., 2010
msx1	Up by Bmp and Edn	Alexander et al., 2011; Miller et al., 2003; Zuniga et al., 2010; Zuniga et al., 2011
mycn	Up by Wnt	Alexander et al., 2014
notch2	Up by Edn	Zuniga et al., 2010
prrx1a	Up by Bmp, down by Edn	Barske et al., 2016
satb2	Up by Bmp	Sheehan-Rooney et al., 2013
sox9a	Up by Edn	Barske et al., 2016
Mouse gene	**Regulation**	
Dlx3	Up by Edn	Clouthier et al., 2000; Tavares et al., 2012
Dlx5	Up by Bmp	Charité et al., 2001; Merlo et al., 2002; Panganiban and

	and Edn	Rubenstein, 2002; Ruest et al., 2004; Tavares et al., 2012; Vincentz et al., 2016
Dlx6	Up by Bmp and Edn	Ruest et al., 2004; Tavares et al., 2012; Vincentz et al., 2016
Gsc	Up by Edn	Clouthier et al., 1998
Hand1	Up by Bmp and Edn	Charité et al., 2001; Clouthier et al., 2000; Liu et al., 2004; Vincentz et al., 2016
Hand2	Up by Bmp and Edn	Charité et al., 2001; Clouthier et al., 2000; Liu et al., 2004
Hey1	Up by Jag/Notch	Tavares et al., 2017
Jag1	Up by Jag/Notch	Tavares et al., 2017
Msx1	Up by Bmp	Liu et al., 2005
Msx2	Up by Bmp	Liu et al., 2005
Satb2	Up by Bmp	Bonilla-Claudio et al., 2012

- Alexander, C., Zuniga, E., Blitz, I. L., Wada, N., Pabic, P. L., Javidan, Y., Zhang, T., Cho, K. W., Crump, J. G. and Schilling, T. F. (2011). Combinatorial roles for BMPs and Endothelin 1 in patterning the dorsal-ventral axis of the craniofacial skeleton. Development 138, 5135–5146.
- Alexander, C., Piloto, S., Le Pabic, P. and Schilling, T. F. (2014). Wnt Signaling Interacts with Bmp and Edn1 to Regulate Dorsal-Ventral Patterning and Growth of the Craniofacial Skeleton. PLoS Genet 10, e1004479.
- Barske, L., Askary, A., Zuniga, E., Balczerski, B., Bump, P., Nichols, J. T. and Crump, J. G. (2016). Competition between Jagged-Notch and Endothelin1 Signaling Selectively Restricts Cartilage Formation in the Zebrafish Upper Face. PLOS Genet 12, e1005967.
- Bonilla-Claudio, M., Wang, J., Bai, Y., Klysik, E., Selever, J. and Martin, J. F. (2012). Bmp signaling regulates a dose-dependent transcriptional program to control facial skeletal development. Development 139, 709–719.
- Charité, J., McFadden, D. G., Merlo, G., Levi, G., Clouthier, D. E., Yanagisawa, M., Richardson, J. A. and Olson, E. N. (2001). Role of Dlx6 in regulation of an endothelin-1-dependent, dHAND branchial arch enhancer. Genes Dev. 15, 3039–3049.
- Clouthier, D. E., Hosoda, K., Richardson, J. A., Williams, S. C., Yanagisawa, H., Kuwaki, T., Kumada, M., Hammer, R. E. and Yanagisawa, M. (1998). Cranial and cardiac neural crest defects in endothelin-A receptor-deficient mice. Development 125, 813–824.
- Clouthier, D. E., Williams, S. C., Yanagisawa, H., Wieduwilt, M., Richardson, J. A. and Yanagisawa, M. (2000). Signaling Pathways Crucial for Craniofacial Development Revealed by Endothelin-A Receptor-Deficient Mice. Dev. Biol. 217, 10–24.

- Liu, W., Selever, J., Wang, D., Lu, M.-F., Moses, K. A., Schwartz, R. J. and Martin, J. F. (2004). Bmp4 signaling is required for outflow-tract septation and branchial-arch artery remodeling. Proc. Natl. Acad. Sci. 101, 4489–4494.
- Liu, W., Selever, J., Murali, D., Sun, X., Brugger, S. M., Ma, L., Schwartz, R. J., Maxson, R., Furuta, Y. and Martin, J. F. (2005). Threshold-specific requirements for Bmp4 in mandibular development. Dev. Biol. 283, 282–293.
- Merlo, G. R., Paleari, L., Mantero, S., Zerega, B., Adamska, M., Rinkwitz, S., Bober, E. and Levi, G. (2002). The Dlx5 Homeobox Gene Is Essential for Vestibular Morphogenesis in the Mouse Embryo through a BMP4-Mediated Pathway. Dev. Biol. 248, 157–169.
- Miller, C. T., Yelon, D., Stainier, D. Y. R. and Kimmel, C. B. (2003). Two endothelin 1 effectors, hand2 and bapx1, pattern ventral pharyngeal cartilage and the jaw joint. Development 130, 1353–1365.
- Nair, S., Li, W., Cornell, R. and Schilling, T. F. (2007). Requirements for Endothelin type-A receptors and Endothelin-1 signaling in the facial ectoderm for the patterning of skeletogenic neural crest cells in zebrafish. Development 134, 335–345.
- Nichols, J. T., Pan, L., Moens, C. B. and Kimmel, C. B. (2013). barx1 represses joints and promotes cartilage in the craniofacial skeleton. Development 140, 2765–2775.
- Panganiban, G. and Rubenstein, J. L. R. (2002). Developmental functions of the Distal-less/Dlx homeobox genes. Development 129, 4371–4386.
- Ruest, L.-B., Xiang, X., Lim, K.-C., Levi, G. and Clouthier, D. E. (2004). Endothelin-A receptor-dependent and -independent signaling pathways in establishing mandibular identity. Development 131, 4413–4423.
- Sheehan-Rooney, K., Swartz, M. E., Lovely, C. B., Dixon, M. J. and Eberhart, J. K. (2013). Bmp and Shh Signaling Mediate the Expression of satb2 in the Pharyngeal Arches. PLOS ONE 8, e59533.
- Tavares, A. L. P., Garcia, E. L., Kuhn, K., Woods, C. M., Williams, T. and Clouthier, D. E. (2012). Ectodermal-derived Endothelin1 is required for patterning the distal and intermediate domains of the mouse mandibular arch. Dev. Biol. 371, 47–56.
- Tavares, A. L. P., Cox, T. C., Maxson, R. M., Ford, H. L. and Clouthier, D. E. (2017). Negative regulation of endothelin signaling by SIX1 is required for proper maxillary development. Development 144, 2021–2031.
- Vincentz, J. W., Casasnovas, J. J., Barnes, R. M., Que, J., Clouthier, D. E., Wang, J. and Firulli, A. B. (2016). Exclusion of Dlx5/6 expression from the distal-most mandibular arches enables BMP-mediated specification of the distal cap. Proc. Natl. Acad. Sci. 113, 7563–7568.
- Zuniga, E., Stellabotte, F. and Crump, J. G. (2010). Jagged-Notch signaling ensures dorsal skeletal identity in the vertebrate face. Development 137, 1843–1852.
- Zuniga, E., Rippen, M., Alexander, C., Schilling, T. F. and Crump, J. G. (2011). Gremlin 2 regulates distinct roles of BMP and Endothelin 1 signaling in dorsoventral patterning of the facial skeleton. Development 138, 5147–5156.

zebrafish_gene	mouse_gene	adjustment (hpf)
dr_axin2	*mm_Axin2*	-10
dr_dlx4b	*mm_Dlx4*	-6
dr_ednraa	*mm_Ednra*	-5
dr_fzd6	*mm_Fzd6*	-4
dr_hand2	*mm_Hand2*	-5
dr_hey1	*mm_Hey1*	10
dr_jag1b	*mm_Jag1*	10
dr_mef2ca	*mm_Mef2*	-7
dr_prrx1a	*mm_Prrx1*	1
dr_satb2	*mm_Satb2*	-7
dr_tfap2a	*mm_Tfap2a*	-5
	Global	**-2.545454545**