

**Bichir *HoxA* cluster sequence reveals surprising trends in
ray-finned fish genomic evolution**

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Supplement 1: Footprint Analysis

CF,SP,PFS, Mar/11/2003

List of all footprints detected by the **tacker** with default parameter settings (Prohaska *et al.* 2003).

The table on the following pages contains the complete list of footprints detected by the **tracker** program version 0.05 with default parameter settings in run 02041944STGC with the time-stamp

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The list has been modified from the raw data by (1) removing duplicate hits and multiple entries of the same cluster, (2) removing obvious repeated elements, (3) arranging clusters in linear order as a good as possible, and (4) adding annotation in the “remarks” column.

Column 1. Numbers in the first column are the clique numbers from the un-edited raw output of the **tacker** program. They have been sorted according to their positions along the sequences. Footprints that are deemed reliable are marked by ●. Reasons for considering them unreliable are indicated in the last column. Footprint clusters, defined as collections of reliable footprint cliques that are separated by less than 100nt along the sequences are separated by lines in the first column. PFC summary statistics are constructed from footprint *clusters* with at least one “reliable” footprint. Clusters that are shared by euteleosts only (‡), and by euteleosts and only one of shark (♣), human (♠), bichir (◇) are marked after the first clique in the cluster. In some cases the **program** constructs cliques from slightly different sets of pairwise alignments that eventually lead to multiple alignments of the *same* sequence fragments. Such duplicates are removed from the list, the unique representative is marked with “f” or “ff”, depending on whether this clique has been reported twice or more often.

Columns 2-9 give the *location* and *length* of footprints for each of the investigated sequences. Numbers in parenthesis indicate an unreliable match of a footprint clique with one of the involved sequences. These are not taken into account in the summary statistics.

The **remarks** column gives the nomenclature from Chiu *et al.* 2002. and the reason for considering a footprint clique as unreliable: × denotes violations of co-linearity between Hox-A13 and Hox-A1, ? marks uncertain hits based on inspection of the alignments. These entries are disregarded in the PFC statistics. Experimentally verified binding sites are given in ***bold italics***, binding sites inferred from **transfac** searches are annotated in **sans serif**.

TABLE 1. **List of all footprints** found by **tacker** with default parameter settings. See previous page for detailed caption.

#	HfM	HsA	PsA	MsA	DrAa	TrAa	DrAb	TrAb	Remarks
2						99 46	22925 46		
3							33702 74	315 74	
10			4385 46				3820 44		
11					3246 62		29283 60		
12			14118 70		4938 63				
13			17715 110		2287 70		6101 179		
14			19741 42				24118 42		
15		3222 76	21731 77						
16		4617 249	23240 257			920 253			
17		4878 57	23498 57						
4						1522 28	46640 28		
18		7024 158	24842 165			2280 92			
19			25014 13			2397 13			
20		7213 26	25039 35			2422 33			
25					7143 50	2898 22	32044 46		
21		8197 31	26090 28				33525 31		
22		8623 29	26148 40						
23		8688 43	26308 38						
24							32655 38		
		<i>Evx-1</i>			<i>Evx-1</i>		<i>Evx-1</i>		
• 1 ♣	865 23						1553 23		
• 26		13112 228	29987 229		15129 146				
27					16307 78		22716 78		×
5						6078 21	29449 21		×
• 28 ♦			33240 44		17212 41	6153 29			
6						6637 27	45312 27		×
• 7 ♣	1089 36					7484 36			
• 8 ♣	2059 22					10359 22			
9	2891 51						39450 51		×
29		13851 60	35561 60						?
• 30		14115 30	44387 30						
31		15102 41	17715 110		2283 76		7560 183		×
• 32	3734 81	20391 84							
33	3881 23				4203 23				×
• 34	3931 23		44043 23						
35	5239 44		9524 44						×
• 36 ♦			47200 86					4824 88	
37			58295 20				4899 20		×
• 38 ♦			67194 31				14262 31		cdxA SRY

#	HfM		HsA		PsA	MsA	DrAa		TrAa		DrAb		TrAb		Remarks						
● 40 ♣	5901	75	25741	38			18316	42			15607	33			×						
41			27295	29							35475	29									
● 42			28483	75																	
43			4134	23																	
● 44 ♠																					
● 45	6483	120	36430	33	94586	26	18387	55	20366	41	29824	42	5381	84	×						
● 46 ◇																29928	55				
● 47 ◇																					
● 49 ◇																31340	48				
● 50 ◇																45382	111				
● 51																48451	32				
● 52																					
● 53																					
● 60 ♠																54090	84	6334	44		
● 54 ◇																					
● 55 ◇																108304	44	9279	24		
● 56																112155	24				
57											6775	40				45433	51	123822	41	1800	99
58	11868	70	6297	99	24412	104															
59	12706	53			93728	49	10614	11	58295	121	6656	93	Upstream of 13-d								
● 61	13165	11	53810	88	128728	134								10639	149	58469	14				
● 62	13185	137					22603	170	58985	174	7315	176	13pp								
● 63	13360	13			130136	172	23420	145	11378	183											
	Hox-A13					Hox-A13										13-11-a					
● 64	19133	112	59484	135	133160	130	(25574) (24)				63519	47	8813	39							
● 65 ♣	20828	47					27080	34	14008	34											
● 66 ♠	27207	32					28565	32													
● 67 ♣								29386	61	14820	39										
● 69 ♠								29483	35	18580	56	67002			35						
● 70					139572	38	29521	38	18891	220	66363	139	?	×							
● 71	27545	177	68084	219	139764	276	28402	58													
● 72			70181	58			31057	162	20662	159	67963	189	13384	158							
● 73	29781	168	70665	161	141628	189	Hox-A11										?				
● 75H	33041	93							23147		89										
● 80	34076	42	75337	82	145837	58	33813	39	24159	40	16517	224									
81							33862	12	24213	12			16767	84							
● 82 ♠							37209	54	25259	57											
● 83 ♠							42263	64	25886	64											
84							43022	42													
● 85							33891	187	24243	245					71142	250					
● 86H							34209	58	24565	49					71440	76					
● 100							41272	55							71853	55					
101							41390	47							25206	46					
● 102 ♣																					
103			78189	21			32835	21							×						

#	HfM	HsA	PsA	MsA	DrAa	TrAa	DrAb	TrAb	Remarks					
● 104 ♠	43095 143	81613 114	149585 125			26271 31	73298 31	18624 17						
● 105						27418 163	73382 17							
● 106							73404 159							
	<i>Hox-A10</i>					<i>Hox-A10</i>								
● 109 ♠				2110 96		29223 97								
● 110				2298 28		29389 28								
111				2340 13		29422 13								
112				2436 14		29482 14								
● 113 ♠				2464 17		29505 17								
● 114				2492 50		29536 56								
● 115				2581 46		29630 51								
● 116				2644 21		29698 20								
● 117				2672 93		29719 93								
● 107	46400 43	85314 39	153511 215	2946 174	(41286) (50)	29966 175			10-9-a					
● 108	46546 24	85435 24												
● 118	46579 213	85479 187												
● 119	47542 116	86411 116	154119 122	3139 59	41556 97	30165 59	76735 115	76892 16	10-9-b					
● 120				3210 66		30238 67								
● 121				3313 20		30336 19								
● 122				3348 155		30366 155								
● 123				3556 112		30587 92								
124	48333 116	(87347) (49)		3707 22	(41872) (35)	30716 20	77044 245	21531 10	?					
● 125ff				3742 349		30746 346								
● 149				3929 96		30941 84								
● 150 ♣	50073 49		90216 44	4812 172	43707 68	31572 169	77166 94	21694 78	10-9-d					
● 151	52969 35	90123 35		5901 138		32112 62								
● 152	53030 45	90216 44		6051 15		32451 133								
● 157 ♠	53084 55	90268 55	156745 53	6076 56	43987 68	32596 15	78506 48	22196 31	10-9-pp					
● 154				6154 222		32626 55								
● 155						32692 220								
● 156														
● 153				6417 51			78594 118	22269 89						
● 158														
● 161				32953 41										
	<i>Hox-A9</i>													
● 159		92822 24	158492 24											
● 160		92882 61	158546 55											
● 162 ♠		94192 62												
● 163			7720 180											
● 164			7913 12											
● 165			7947 29											
● 166			7987 46											
● 167			8086 44											
● 168			8154 62											
● 169			8226 60											
● 170			8296 223											
● 171H	56941 111		8534 17	45766 47	34648 57	81365 83	27731 44	9-7-a						
174		158746 31	8888 225		34717 230									
175			9221 11	46679 175	52101 37									
● 176				47011 213	35441 11									
● 177	57228 226	94466 223	160242 226		9284 56				35493 54					
178	57228 226	97346 38	160242 226		9359 537				35554 531					
● 179	57682 31	94837 31		9359 537	47011 213				35554 531					
● 180 ♣	59503 39													
							87245 36		9-7-b					
									×					

#	HM	HsA	PsA	MsA	DrAa	TrAa	DrAb	TrAb	Remarks
• 185 ♢ • 186				10120 16 10199 67		36280 16 36353 68			
• 183 ♣ • 184 • 187	62154 12 62176 159	99196 28 99258 12 99280 157	162084 159	11415 223	48807 58	37137 266		26430 28	9-7-pp 9-7-pp
	<i>Hox-A7</i>			<i>Hox-A7</i>					
189 188	64887 42		162686 79 161405 42			37812 77			possible remnant of Hox-A7 ×
• 190 ◇			163492 76	14139 73					?
191 173 192	66397 22		165572 22		49660 26		88070 26		×
• 193 • 194 • 195	66439 231 66688 17 66923 24	103200 218	165611 235 165857 17	14518 34 14565 440	49926 235	39351 34 39395 379			?
197 • 198 ♢ • 199				15018 14 15098 194 15319 22		39785 14 39857 186 40077 22			?
• 200 ♢				15700 67		40338 65			
• 201 • 196 • 202	71706 57 71778 148	108022 41 108078 147	168484 58 168558 140	16398 25		40811 25			7-6-pp 7-6-pp
	<i>Hox-A6</i>			16526 139		40909 133			
• 203 • 204 ♢ • 205 • 206 ♢	74397 30	111988 29	170824 32	16856 52 16953 70 17826 70		41246 45 41310 67 41962 65			
• 207 • 208 • 209 • 210ff				18013 30 18045 145 18217 34 18269 366	50568 30 53081 39 53161 318	42174 144 42347 40 42403 356			6-5-pp
	<i>Hox-A5</i>								
• 255 • 256 • 257 • 258 • 259 • 260 • 261 • 262	76119 11 76145 22 76181 22 76215 226 76451 50 76530 47 76627 83 76740 88	114171 11 114197 22 114231 22 114264 253 114542 29 114585 62 114670 123 114894 44	172865 191 173072 51 173138 72 173231 125 173382 69 173881 21 173989 398						5-4-a 5-4-a
• 263 • 264H • 399 • 400 401	77370 22 77534 357 78818 52 79794 29	115509 408 116750 54		21536 276	55930 275	45361 265			5-4-b 5-4-c
• 403H ♢ • 412 • 413 414 • 415 • 416 • 417		117477 34		21789 23 21873 12 23483 104 23604 16 24139 181 24368 67	56180 25 56277 12 57507 118 57972 163 58179 66	45612 14 47002 61	83629 29	23956 34	?×
	81937 81 82035 16 82436 286 82749 16	119338 113 119799 284 120098 15	175417 111 175886 122						5-4-d ? 5-4-e

#	HfM		HsA		PsA		MsA		DrAa		TrAa		DrAb		TrAb		Remarks
● 418f	84824	233	121990	242	177482	244	27151	298	59797	180	47302	295	86591	27			5-4-f RARE [2]
● 422			122238	27									88770	23			
● 423	85596	41	122775	40													
● 424	85651	41	122822	41													
425	85787	19											85007	19			
426	85814	29											85029	31			
● 427 ♠							27487	42			47629	42					
● 428							27533	150			47679	146					
● 429 ♠							28379	34			48327	39					
● 430							28479	37			48460	38					
431							28648	44			48614	37					
432							28709	30			48665	27					
● 433							28787	33			48728	29					
● 434	87745	114	125173	76	179515	106	28831	274	61442	176	48768	272					
<i>Hox-A4</i>																	
● 435	91064	132	128822	129													
● 436	91515	58	129461	58													
● 437	91602	30	129556	30													
● 438	92853	91	131248	89													
● 439	93227	73	131592	77													
● 440	93311	42	131680	42													
● 441	93372	81	131766	83													
● 442 ♣	94873	34											88361	34			
● 444	98246	67	136878	77	186333	83											
● 445			136979	39	186421	41											
● 446	98414	45	137066	37	186496	41											
● 447	98476	62	137119	58													
● 448 ♠									63246	21	50977	21					
● 449 ♠									65895	19			87490	19			
● 450									65919	45	54155	47					
● 451	98855	161	137523	150	186937	113			66768	90	54889	99					
● 452									66882	24	55005	27					
● 453									67013	43	55144	42					
● 454	99108	85	137815	83	187226	61			67086	81	55209	82					
455	99140	99	137815	83	187226	61			67086	77	55209	128					
● 456 ♣	99764	29											89449	29			
● 457	100021	112			187870	109											
● 458	100163	12			188003	11											
● 460 ♠									67923	141	55758	146					
● 459 ♣	101851	29									56844	29					
● 461	101931	276	140542	277	189075	65			69137	65	56932	85					
● 462	102585	77	141732	33	189590	118			69676	74	57684	111	82326	30	24929	53	
● 463	102694	126	141955	93	189730	135					57903	24			25022	51	
464	102844	14			189892	14											
● 465ff	102907	280	142331	191	189952	253			70088	200	58074	252					
● 477f	105041	191	144086	205	191239	125			70908	76	59043	164			25595	41	
● 479f	106120	237	145095	245	192001	208			71522	205	59521	204					
<i>Hox-A3</i>																	
● 481			148228	70	196002	67			<i>Hox-A3</i>								
● 482	109890	95	148351	96	196165	44											
● 483	109999	217	148482	218	196384	62											
● 484 ♠									73712	35			87719	35			
485											62877	30	84706	30			
● 486			148901	30	196614	65			74216	62	63470	48					

#	HfM	HsA	PsA	MsA	DrAa	TrAa	DrAb	TrAb	Remarks		
● 487f	112888 123	151198 158	198551 154		75155 165	65063 173	89629 170	27397 156	? ? 3-2-a 3-2-pp ?		
489	113355 59		199175 64								
490	113534 69		199366 75								
● 491	113657 137	152783 127	199544 137								
● 492H	113929 262	153128 277	199795 267			66175 300	90511 242	28162 263			
524	114200 23		200079 23								
	Hox-A2					Hox-A2					
● 525	116088 86	155551 84	202095 55			70408 21 70953 25 70981 69 71066 56	94869 21	35682 32		? 2-1-a	
● 526	116229 30	155683 30									
527	116301 11	155747 11									
● 528	117329 209	156872 199	203123 220								
● 529	117798 31		204874 31								
● 530 ♣	118642 32										
● 531 ♠											
● 532 ◇			205312 25								
● 533	119948 59	159802 73	205344 71								
● 534	120009 125	159883 162	205446 93								
	Hox-A1					Hox-A1					
535							83630 36	73503 37 76990 70	94644 29	33838 36	?

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- [2] A. I. Packer, D. A. Crotty, V. A. Elwell, and D. J. Wolgemuth. Expression of the murine *Hoxa4* gene requires both autoregulation and a conserved retinoic acid response element. *Development*, 125:1991–1998, 1998.