Supplementary Material

Identification, Molecular Characterization and Expression Pattern Analysis of *SoxD* Subgroup Genes in Yellow River Carp (*Cyprinus carpio*)

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1	GTGAGGTTCGGTGTGAGAGTGTGTGTGCACGGAGAGAACAGAACAGTCTTTGGTTT TGCGAGAGGTTAGAGGAGCACCAGGCAGCGTGTGCGTGTATGTGTGTG
121	GATCCCTGGGTATCGGACGCGAATGTTGTCTTGGAAGGACTGCTGCATCTCAGACCCCTT
181 1	GTTTCAGCATGCTTACTGAGCCTGAGCTTCCTCAGGAGTTTTAACAGGATGTCTTCCAAGC M L T E P E L P Q E F N R M S S K R
241	GACCAGCCTCTCCATATGGGGGAACAGATGGAGAGGTAGTCATGGCGACGACGAGCAGACAGC P A S P Y G G T D G E V V M A T S R Q R
301	GATTGGAGGATGAAGAGGTTGACGGACATGCTGTCATTCACTTGCCCCTGAGTTCGTACT
39	L E D E E U D G H A V I H L P L S S V C
361 59	GCAGCAAAGTGTCCCCGCGATCTCCACGACTGCTCGACAGCCCCCCCAACACTACACGCAA
9 421	S K V S P R S P R L L D S P P T L H A N ACATGGATCAGGAAGGCAGTAAAGGCCTGGCCCTAAGCCCCTACCCCCAGCACAACTCGT
79	M D Q E G S K G L A L S P Y P Q H N S S
481 99	CTACCTCACCCAGTAAACAGCAGCAGCAGGAGGGGGGGGG
541	CCAGCTCCGCTTCAGCTCTGGGCACCCCGGAGAGACGCAAAAGGCAGCCTGGCCGACGTGG
119	S S A S A L G T P E R R K G S L A D V V TCGACACGCTCAAACAGCGCAGAGGAGGAGCTCATCAAGAACGAGCCAGAGGAGGCCC
601 139	TCGACACGCTCAAACAGCGCAAGATGGAGGAGCTCATCAAGAACGAGCCAGAGGAGGCCC D T L K Q R K M E E L I K N E P E E A P
661	CCAGTATTGAAAGGCTGTTGTCTAAGGACTGGAAGGACAAGCTATTGGCCATGGGTTCTG
159 721	S I E R L L S K D W K D K L L A M G S G GCAACTTTGGAGAGATCAAAGTGAAGCAAGGCACCCAGGACAGCCTGGTGGAGAAAGAGC
179	N F G E I K V K O G T O D S L V E K E R
781	GCCAGCTGATGGGGATGATCACGCAACTCAGCAGTCTCAGAGAGCAGCTACTGGCCGCCC
199	Q L M G M I T Q L S S L R E Q L L A A H ATGAGGAGCAGAAAAACTGGCCGCTTCGCAGATCGAAAAACAGCGCCCAACAAATGGAGT
219	E E O K K L A A S O I E K O R O O M E L
901 239	TAGCGAAACAGCAACAGGACCAGATTGCACGACAACAGCAGCAACTTCTGCAGCAACAAC
961	A K Q Q D Q I A R Q Q Q L L Q Q H ACAAAATCAACCTCCTGCAGCAACAGATCCAGGAGGTCCAGGGTCAGTTGCCTCCACTGA
259	K I N L L Q Q Q I Q Q V Q G Q L P P L M TGATACCTGTGTTCCCTCCAGATCAGAGAACTCTGGCGGCCGCTGCAGCACAACAAGGAT
1021	TGATACCTGTGTTCCCTCCAGATCAGAGAACTCTGGCGGCCGCTGCAGCACAACAAGGAT
1081	I P V F P P D Q R T L A A A A A Q Q G F TTCTACTTCCTCCAGGGTTCAACTACAAACCTGGCTGCAGTGACCCTTACCCTTTACAGC
299 1141	L L P P G F N Y K P G C S D P Y P L Q L TAATCCCTACGACTATGGCAGCGGCTGCTGCAGCGACGCCTGGCCTCGGCCCTCTTCAAC
319	I P T T M A A A A A A T P G L G P L Q L
1201	I P T T M A A A A A T P G L G P L Q L TGCATTTGGCCCACATATGGCCCCTGGGATAACAGCCCAATAAGGTCACACTTTGAAT Q F G P H M C P L D N S P I S S H F Q C GCGGAGCCACACACGAGAGAGACGAACACGAATACGGACAGACCAATACCCCAATACCGATTGGGTGACAGGGAACTCAAACCCCCAATACCGATTGGGTG
1261	GCGGAGCCACACACAGAACGAACAGGGAAACTCAAACCCCCAATACCGATCTGGTGG
359	G A T H S R T N R E T Q T P N T D L V A CATTGTCCGACCTCGATGAGCAAAGAGAGAGAGAGAGAGA
1321 379	L S D L D E O R E R V R E A S T S H D V
1381	TTGCCTTGATCAAACGTGACGAGGGCGCTCAGCCCTTGAATCTGTCGTCCAAGCCTAAGG
399 1441	A L I K R D E G A Q P L N L S S K P K A CATCCGAGAGCAAGTCACCCACCTCCCCGCTTCCCCACAGGTCCCTGAAGCTGG
419	S E S K S P T S P A S P Q V P A L K L G
1501	GCCCCGGGTCCCTGAAGCACAGCGCCCCCCCAGCATCGGAGGACCGCCGTCCAGACTCA
1561	P G S L K H S A P S S I G G P P S R L S GCTCCATAGACCTGCTATCATCCATCACCTCCGGCGGCTACCTGAACGACCATGAGGCAG
459 1621	S I D L L S S I T S G G Y L N D H E A V TGACCAAAGCTTTCCAGGAGGCCCGACAGATGAAGGAGCAGCTAAAGAGAGAG
479	T K A F Q E A R Q M K E Q L K R E Q Q V
1681 499	TTCTCGACGCCAAAGTAGCAGCAGTCAACAGCCTGAGCCTCAACAATGGTCGCTCAGAGA
1741	L D A K V A A V N S L S L N N G R S E K AGGATAAAGCTGCTCTTGAAGGCCTGAGCCAACAGTTAAAACAGTCTGAAGAGAGCAAGT
519 1801	D K A A L E S L S Q Q L K Q S E E S K F TCACTCATGCAATGATGGACTTCGGCATCAGTGGTGATTCAGATGGAAGCCCGAGTGTGT
539	T H A M M D F G I S G D S D G S P S V S
1861	T H A M M D F G I S G D S D G S P S V S CAGACTCACGGATCTTCAGGGAGGCTCGAGGGAGCAGCAGCAGACCGACACTAAAC D S R I F R E A R G R G S S E P H I K R
1921	D S R I F R E A R G R G S S E P H I K R GGCCCATGAACGCCTTTATGGTCTGGGCTAAGGACGAGGAGGAAGATCCTTCAGGCTT
579	P M N A F M V W A K D E R R K I L Q A F
1981	TCCCTGACATGCATAACTCAAACATCAGCAAGATCCTCGGTTCTCGTTGGAAGTCCATGA
599	P D M H N S N I S K I L G S R W K S M T
2041	CCAACCTGGAAAAGCAGCCATATTATGAAGAACAGGCCCGTCTTAGTAAGCAGCACCTAG
619	N L E K Q P Y Y E E Q A R L S K Q H L E
2101 639	AGAAATACCCAGACTACAAATACAAACCACGGCCCAAACGCACCTGCCTAGTGGACGGAA K Y P D Y K Y K
2161	AGAAATTGCGCATTGGTGAATATAAGGCCATCATGCGCAACCGCAGACAGGAAATGCGCC
659	K L R I G E Y K A I M R N R R Q E M R Q
2221	AGTACTTCACTGTAGGGCAGCAGCCCCAGTTGCCCTTGTCCTCAGCGGGTGTTGTGTACC
679	Y F T V G Q Q P Q L P L S S A G V V Y P
2281	CAGGCGCACTCTCTATGGCAGGAATGCCCTCTCCACAGATGCCCTCTGAGCACTCGAGCA
699 2341	G A L S M A G M P S P Q M P S E H S S M TGTCTAGTAGCCCTGAACCAGTCCCACCCAGCAGCCAGCC
719	S S S P E P V P P S S Q P S Y L T H K G
2401	GG GAGGGGC CTCGCGTT AAGGAGGAGGAGCT CCGAATGGACGACGG CAATGGC GACGCCT
739	E G P R V K E E E L R M D D G N G D A Y
2461	ACGATGACTTCGACTACGAAGACGATGATGGGGACTATGGCAGTGACAGCGAGAATCACA
759	D D F D Y E D D D G D Y G S D S E N H I
2521 779	TCACTCAGTAAAGCTGCCAATCACAGCCATCTCACCAGTCACCTGGCATCTCACGCAAGC T O *
2581	AAACTTCATTCCAAACCCCATACACCGTCCAATCAGGACTCCTCCAGAGCCAAGACCGAT
2641	AT CCACAGCAAAGCACAGGACCTGTCAATCAAAGTGACTGTTACATGGAAAGGAGGGTCT
2701	TGTAAAGGAAGTATAACACTTGCCTTGACTCCTGCTGAGCGAACGTACCGCGGCAAGTTC
2761	ACAATGAATAACGAGTAAGCTACGATGACATAGGAAAAAAAA

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61
121
181
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GAGTAGAGAGGGAAAACGCGATAAATATACTTACAACTGCTCTCAGCGGTTTTGACAGTT
CAACTTCATACAGCCAAAGCGGGATTCCCTCTTCGGTCAGTGGAAGCGATACACTTCAGT
241
               TTTTTTTTTTCTTCCCTTTCTCTCTCTCTCACATCACTTCACATCACTTACATT
               361
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ATTTTCATGAATTCAAAATCAACTCACCAGTGATCTTTGGGAGCTGGAGATAAAGTCTTT
CTGTTTATAACCCAAATGCTGAACATGGAGGGCTTTCTGCGTAGCAGCTTTTTACTGAGC
421
481
541
               M L N M E G F L R S S F L L S AGAATCATGTCTCCAAGAGCAACCTCTCCATTTCCCTCGCACCCCTCACGAGGGGGAGG R I M S S K Q A T S P F P S T P D G G E GATGGAGTGAATCAGGAGTGCATGTCCTGGGAAAAAGATGAGAACTCAGAGTCACTAATC
601
661
               D G V N Q E C M S W E K D E N S E S L I GCCCCTCAGCTTCCCCTGCACAATCTGCTCCACAACAACCTCCCCTGGAGGAGCTCCAG
721
56
781
               A P Q L P L H N L L H N K P P L E E L Q CCAATCAGCAGCAGCGGCCCGCCCGAATCCGACTGGGACAGCCTGATGTCAGCCCAGCAG
               P I S S S V P P E S D W D S L M S A Q Q CGCATGGAATCGGACAGCAATAAAGTATGTTCCTTATACTCCTTCCGGAATAACTCTACC
841
               R M E S D S N K V C S L Y S F R N N S T
TCTCCACACAAGCCAGAGGAGGGGGCCAGGGAGCGCGGTGACCTGCTGAGCAGTTCAGCC
S P H K P E E G A R E R G D L L S S S A
901
116
               TTCGGAACGCCAGAGCGCCGCAAAGGAAGCCTGGCCGATGTGGTGGACACACTGAAACAG
961
136
                                        E R
                                                     K G
1021
               AAGAAACTAGAGGAGATGACAAAGACAGAGCAAGACGAATCCTCCTGCATGGAGAAAC
156
                                       E M
                                                  T K
                                                                 E Q
1081
176
1141
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               L S K D W K E K M E R L N T G E L L G E ATTAAAGGTACTCCGGAAAGTCTCGCGGAAAGGAGCGACAGCTCTCCACCATGATCACA
               I K G T P E S L A E K E R Q L S T M I T CAGCTCATCAGCCTGCGAGAGCAACTCCTGGCCGCCCATGATTAGCAGAAGAAACTGGCC Q L I S L R E Q L L A A H D E Q K K L A GCCTCACCAGATGGAACAACCGTCAGCAAATGGAGCTGGCACCCCAACAGCAAGAGCAAGGCAG
196
1201
216
1261
               A S Q M E K Q R Q Q M E L A R Q Q Q E Q ATTGCCAGACAGCAGCAGCAACTTCTGCAGCAGCAACAGCACAAATCAACTCCTCCAGCAG I A R Q Q Q L L Q Q H K I N L L Q Q CAGATCCAGGGTCCAGGGTCACATGCCTCCGCTCATGATCCCCATTTTCCACACGACCAG
1321
256
1381
              1441
296
1501
316
1561
336
1621
1681
376
1741
396
1801
               I S P S G L K N E K R A S T P L A Q V K GAGGAGGGAACGCAGCCTCTCAACCTCTCCGCCCGGCCCAGACACAGCCGTCAGAGCCGTCAGA E E G T Q P L N L S A R P K T A E P V R TCCCCCACATCCCCGACACAGAGCCTCTTCCCAGGCAACAAGAGCAGCCCGAACAGAGCCTG
416
1861
436
1921
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               I L S S L N S T A L F G D Q D A V M K A ATCCAGGARAGGAGATGAGGAGAGATCAGAGAGAGAGAGATCACACCACA I Q E A R K M R E Q I Q R E Q L Q H H Q CAGGGAATGGAGGCCAAGCTGTCCGCCCTCACCAGCATGGCCTGAACAACTGCAGGGCT
1981
476
2041
               496
2101
516
2161
2221
               556
2281
576
2341
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GGCATGACAAACCAGGAAGCAĞCATCATTATGAGGAGCAGGCACGACTCAGCAGATC
G M T N Q E K Q P Y Y E E Q A R L S K I
CACCTGGAGAAGTATCCCAACTACAAGTACAAGCCCCGACCCAAGCGCACCTGCATCATC
2401
616
2461
               636
2521
656
2581
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2641
696
2701
               F S E H C S S H R R R S P S P P A Q S T TTCAACATGAAGATGGAACCGGGCACCATGGTGTTCTAACCACCCCGTGAACGGAGAGGAC
2761
               F N M K M E P G T M V S N H P V N G E D GAGATGGACATGTACGAGGACTTTGAGGACGAGCCCAAATCGGACTACAGCAGTGAGAAT
2821
756
2881
               2941
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Supplementary Fig. 1B. Full-length nucleotide cDNA sequence of the *CcSox6* gene. The predicted amino acid sequences are shown underneath the CDS (coding sequence). The start and stop codons are bold-typed. The HMG (high mobility group) box domain is boxed. The DNA binding site is underlined.

```
GGA AACTGAA CACCAG AAAGTCACTCTGG AGTAGT GAAGGG AGGCTGGATCGGC GAGAGT
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121
         CAGAGGCGTATTATTCAATGACACGAGAGGAAACCACATTTTGCATGCGGCGTTATCGAT
         TCTGCGGCCCAGAGACGACGAAAGACTGAAGGAATAAAGTTTAGGGAGCGCAAAGCGCA
181
241
         GCGCACAGTTTTTTTGGAGTTGAATGTGTGAGCCCAGTCCACCTGCTCTTCATCCCCAAG
                                         E.
                                              P S
                                                    P
                                   M
301
         CCAAAGGCAATGTGACCATGGTGGGTGTTGGTATCAAGCTTGAAGACGACGAATCAGGAG
13
361
         GTAGAGT CATCAA CCGAGAA TCCCAG CACTCCTCTCCAGTCACTGATTGGT CAGTTCGGC
                                    Q H S
                                                    V
33
                      N R
                             F.
                                S
                                            S
                                                P
                                                       т
                   T
                                                           D W
421
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53
         481
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GTAGAGCTCATGATAAGACTGACAGCAAATCTAATGTCAGTGAGGTGATGCCCACTATTG
73
541
93
                                      K S
                                             N V
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601
113
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         V N L K G T P E S L A E K E L Q L L L M TAAACCAGCTCTCTGGTCTGCGAGAGCAGCTGCTAGGAGCTCATTCTGAGCAGAGGAATA
133
153
                                         L
                                                G
                                                    A
                                                       H
781
173
         TGGCCGCTCTGCTGCTGGAGAAACAGCAGCAACAGATGGAACTGGCAAGGCAGCAAG
                             E
                                K
                                              0
                                                M
                                                    E
         AACAGATCGCCAAACAGCAGCAGCAGTTGATACAGCAGCAACATAAAATCAACTTACTGC
841
                          Q
                             0
                                Q
                                              Q
         AGCAĞCAAATTCAĞCAĞGTAAACATĞCCĞTATĞTTATĞATCCCTGCCTTTCATCCCAACĞ
901
213
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961
233
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GCAAACCAGTGGAATATCCCTTGCCGTTGCTGCCTAATCCACCTCCACCCCAGTCAAAA
                             T
253
                         Y
                             P
                                    P
                                       T.
                                         Τ.
                                              P
                                               N
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                                                       H
          GGTCCAGTGGTACAGTCTTTCGCCAGGATTCCAGTCAACCTCTCAACCTCACGGCTAAAC
1081
273
                                                     P
                                                           N
                                R
                                      D
                                              S
          CCAAGACCCCAAGTCCCCAGGCACTGGAAATGGCCCACTTACAAGCAGGGTACCGAGCCA
1141
293
                         P
                                                Н
                                                        Q
          GAGATCTGACCCATAGCCCTACTCGATCTGCACTCAGCCTGAGCTTCTTGGGAGAGGGTG
1201
313
                       H
1261
          ATGTTGTGACACAAGCCATTCATGATGCCCAGCAGCTGTTGCGTGGAGGACAAGGCCCGA
333
                       Q A
                                          Q
                                              Q
                                                       R
                                                           G
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          CAGGCCGAGAGAĞGGACCGTGAGAGGGGACAÃCAACAAGGCTGGAGGCATČTCGAGAGC
1321
353
             GRE
                       R D
                             R
                                E
                                    R D N
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                                                 T
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         GGATGGATGACGCCCTCCGGGATGAATGAGGACCGCCTCAGCTGTGACACTGAGGR M D D G Q S L R M N E D R L S C D T E
1381
1441
          393
                          S
                             G
                                    G
                                       S F
                                              G
                                                E
                                                     S
                                                       R
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1501
413
1561
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433
1621
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453
                M
                       N
                         0
                             E
                                K
                                       P
                                          Y
                                                    E.
                                                           A
1681
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          O H L E R Y P D Y K Y K P R P K R T C I
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473
1741
493
                                   G E Y
                                             K A
                                                    M M
                                                           K S
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1801
         E Q R V T Y P P S Q S E Q Q L P Y P P S AAGGACAGTACTCGACCACGCCGGTGTCACTGGCCCCATTGCCCTTGCACCCTGCCCTCC
513
1861
533
                             T P
                                   V S L A P
                                                    L P
1921
         \tt TGGAGCACTACCTTCCCCGGGGTCTGGAGGCCCATGAAAGGCCAAGGGAGTGAGATGCGGG
553
                             R G
                                   L E P
                                              M K
                                                    G Q
                                                            G S E
                      L P
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1981
                             Q P
573
                       PR
                                    Y S E
                                              G E
                                                    E S
2041
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593
             E G E
                       L V
                             V L
                                   T D
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2101
2161
          CAGTCTCTGCGTACAACATGATGGTGTCCAATAAATGGTATAGGTCAGTGTTTTCCAGTC
2221
          CAGTTGTGAGGCTGTTCTGGTTGCAAACTGGGTTGGTTAGGAAGGCAGCAGACATAAATG
          AAGCATAGATCTTCATTTTTCTGATTTTTCCAGTGGTGTAAGCCTAGACAGGATAGGTCT
2281
          TACATACTGACCACAGCTTGGAAAAAAAAAAAAAA
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Supplementary Fig. 1C. Full-length nucleotide cDNA sequence of the *CcSox13* gene. The predicted amino acid sequences are shown underneath the CDS (coding sequence). The start and stop codons are bold-typed. The HMG (high mobility group) box domain is boxed. The DNA binding site is underlined.