# MOLECULAR AND STRUCTURAL CHARACTERIZATION OF MHC CLASS II β GENES REVEALS HIGH DIVERSITY IN THE COLD-ADAPTED ICEFISH *Chionodraco hamatus*

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atggcttctgtcctcagcgtctgcctgctcgtcctcagcgtctgctcagcagatggatat
 M  A  S  V  L  S  V  C  L  L  V  L  S  V  C  S  A  D  G  Y
ctgttttacacgagtagccgctgtgagttcaactcctctgagctgaaggacatccagtac
 L  F  Y  T  S  S  R  C  E  F  N  S  S  E  L  K  D  I  Q  Y
atcaagtcattctattacaacaagttggagttcatcaggttcgacagcagcgtgggggag
 I  K  S  F  Y  Y  N  K  L  E  F  I  R  F  D  S  S  V  G  E
tttgttggatacactgagctgggggtgaggaacgcaaagcgcttcaacaggggttctcca
 F  V  G  Y  T  E  L  G  V  R  N  A  K  R  F  N  R  G  S  P
gaactggccgcgatgagagcagagaaggagacgttctgccaaaacaacgttaagcttgaa
 E  L  A  A  M  R  A  E  K  E  T  F  C  Q  N  N  V  K  L  E
taccagtacgccctgcctttctcagcgaagccctacgtccggcttcactccacggtctcc
 Y  Q  Y  A  L  P  F  S  A  K  P  Y  V  R  L  H  S  T  V  S
cccagcggatcacacccggccatgttggtctgcagcgtctacgagttctaccccaaagtc
 P  S  G  S  H  P  A  M  L  V  C  S  V  Y  E  F  Y  P  K  V
atcaaagtgagctggatcaggaacggacaggaagtcacctctgatgtcacttcctctgaa
 I  K  V  S  W  I  R  N  G  Q  E  V  T  S  D  V  T  S  S  E
gagctggctgacagtgactggtactaccaggtccactcccacctggagtacacgcccagg
 E  L  A  D  S  D  W  Y  Y  Q  V  H  S  H  L  E  Y  T  P  R
tctggagacaagatctcctgcatggtggagcacgtcagccagggagagcctctggttact
 S  G  D  K  I  S  C  M  V  E  H  V  S  Q  G  E  P  L  V  T
gactgggacccctccatgccagagtctgagaggaacaaggtagccatcggagctgcagga
 D  W  D  P  S  M  P  E  S  E  R  N  K  V  A  I  G  A  A  G
ctgatcctgggtctgaccttatctctggccgggttcatctactacaagaggaagtcccga
 L  I  L  G  L  T  L  S  L  A  G  F  I  Y  Y  K  R  K  S  R
ggacggatcctggttcccagccactaa
 G  R  I  L  V  P  S  H  -
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**Figure S1.The nucleotide and amino acid sequence of icefish MHC class II β Chha DAB**. Start and stop codons are highlighted in red and signal peptide is in green.

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atgggtatgaagttctcgttttcactgctgtttctgatccttttttttcaagagctgat
 M  G  M  K  F  S  F  S  L  L  F  L  I  L  F  F  S  R  A  D
gctctttttggtcatgctttgttccactgccagtttacttcccctgatgactttgtttat
 A  L  F  G  H  A  L  F  H  C  Q  F  T  S  P  D  D  F  V  Y
ttgggacaacttttcttcaataaagtgctacaactccaatacaacagcactttagggaag
 L  G  Q  L  F  F  N  K  V  L  Q  L  Q  Y  N  S  T  L  G  K
tataccggctacacagagaaaacgaaagatattgcagaaggcctcaacaaaaatccaaaa
 Y  T  G  Y  T  E  K  T  K  D  I  A  E  G  L  N  K  N  P  K
tttataaaagaagaaaaaaaaaatgaactgaaatgcaagaaccacatcgcaatgtttttt
 F  I  K  E  E  K  K  N  E  L  K  C  K  N  H  I  A  M  F  F
gatgtctttttaaaaccagacctccatttggagccctctgtcagggtgaggtcagtacaa
 D  V  F  L  K  P  D  L  H  L  E  P  S  V  R  V  R  S  V  Q
gcagcgagcagtcgacacccaggcatgctcgtctgcagtgtgcactacttctttcccaaa
 A  A  S  S  R  H  P  G  M  L  V  C  S  V  H  Y  F  F  P  K
ccaatccgagtgacttggctgaggaacggaaaggaggtgacatctgatgtgacgtccact
 P  I  R  V  T  W  L  R  N  G  K  E  V  T  S  D  V  T  S  T
gagaaactgtccaatggggattggcattatcagatccactcctacctggagttcacacct
 E  K  L  S  N  G  D  W  H  Y  Q  I  H  S  Y  L  E  F  T  P
gtacctggagagaaaatcacctgcatggtggagcacgcccacctcatgaagcccaagctt
 V  P  G  E  K  I  T  C  M  V  E  H  A  H  L  M  K  P  K  L
tgcgagtgggatccgagaactgatcgagagtcagagaacaacaagattgctgtcgggaca
 C  E  W  D  P  R  T  D  R  E  S  E  N  N  K  I  A  V  G  T
gcggggctgctgctgggtctggtgtttttgttgctgggctgatttacttcaagaagaaa
 A  G  L  L  L  G  L  V  F  F  V  A  G  L  I  Y  F  K  K  K
acttatggacgagagttggtgccaactaattctattaa
 T  Y  G  R  E  L  V  P  T  N  S  I  -
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**Figure S2.The nucleotide and amino acid sequence of icefish MHC class II β Chha DBB**. Start and stop codons are highlighted in red, signal peptide is in green, and the potential N-glycosylation site is underlined.

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ATGGGTATGAAGTTCTCGTTTTCACTGCTGTTTCTGATCCTTTTTTTTTCAAGAGCTG           Exon 1   58 bp (signal peptide)

GTGAGTTACATTAAAATAGCTGACATTTACTTTTCTAGTTGCTATAACATACTACATTACATCTGTGGCATTTTATTGGAGTGTGCAATGCTTTATTCTA
CATTTTAGTAATACTTGTTGGCTTTGTGTTACAG                          Intron 1   134 bp

ATGCTCTTTTTGGTCATGCTTTGTTCCACTGCCAGTTTACTTCCCCTGATGACTTTGTTTATTTGGGACAACTTTTCTTCAATAAAGTGCTACAACTCCA
ATACAACAGCACTTTAGGGAAGTATACCGGCTACACAGAGAAAACGAAAGATATTGCAGAAGGCCTCAACAAAAATCCAAAATTTATAAAAGAAGAAAAA
AAAAATGAACTGAAATGCAAGAACCACATCGCAATGTTTTTTGATGTCTTTTTAAAACCAG     Exon 2   261 bp (β-1 domain)

GTGATTGTGTGTATTGAAACTCTGTTAATAATTTAAATTACATATTGCATAATTATTTCGTAATTATGGGGTTTAAGTAACAGACTTTTAATCATATTTC
TGTGAAAAGTGTGCATAGAAAATACTAAATATACCCACTGTAATATTTTTGTTTTAACCTAAATATATCCAGAGAATTACTTGTGAAAACATTGAAGAGT
TGTTGTTTCATGCCAATTTGTTTCGTCTATAG                      Intron 2    232 bp

ACCTCCATTTGGAGCCCTCTGTCAGGGTGAGGTCAGTACAAGCAGCGAGCAGTCGACACCCAGGCATGCTCGTCTGCAGTGTGCACTACTTCTTTCCCAA
ACCAATCCGAGTGACTTGGCTGAGGAACGGAAAGGAGGTGACATCTGATGTGACGTCCACTGAGAAACTGTCCAATGGGGATTGGCATTATCAGATCCAC
TCCTACCTGGAGTTCACACCTGTACCTGGAGAGAAAATCACCTGCATGGTGGAGCACGCCCACCTCATGAAGCCCAAGCTTTGCGAGTGGG
                                                     Exon 3   291 bp (β-2 domain)

GTGGGGTAGGAAAAGTGACCGCTTGTTTTGAGTTAAATGTTATCCAGCCACATTTGTATTGATTAGAGTTATAGAAATGTGTGCTAAATGTGTTTTCAG
                                                                      Introne 3 99 bp

ATCCGAGAACTGATCGAGAGTCAGAGAACAACAAGATTGCTGTCGGGACAGCGGGGCTGCTGCTGGGTCTGGTGTTTTTTGTTGCTGGGCTGATTTACTT
CAAGAAGAAAACTTATG                                           Exon 4 117 bp (connecting peptide +
transmembrane region)

GTGAGAGACACATACACTTTACCAAATTCTACCATCTTATCTCAAGACTATCAAGACACAAACATACAGTCTGTCACAAACTGTCTGTTTTTTTTTGGTC
ACCCCCTGTGTTAGGCTACGTTTGTTTTTACTGCTTGTCCCTGTGTTTTCCCTCCTGTTTGATTACCTTTCTGTTTTGCCTTCCCTCTTGTGTCCTGTCC
TTGGGATTAGTCTTGCATGTATTTAAGGTCTGGTTTTTTGTCAATTGTTGTCAGATCCTGTTCATTGTTCAATGGTGAGGTTTGTTCTGTTTTTGTATTT
AGAGATTTTCAACTTATTTTTTTGTGTCTTACCCTGCTCAGCCTGATTACCTGAAATTAAAGTTTTTTTGCTGTTCAAACCTTGTGCGTCCTGCTTTTGG
GTTCACCTTGCTCTGCTTTCAATCGTGAGAGTCTGCTTTTGATGAAACTGTTTAAAGATTGTATCACTGTTGTCTGAAGTCATAAACTCTCTGTTAATAA
TTTTGTCAAAATATTCTTTAGATAACAAAAAGCAACACGACCAGTGATTTCTTTCTTAAAGATCAGTTAAAGTAGCATTTTAAGTTTTGACATGAGCCTC
TAAGGCTTTGCTTAAAACAACATTAGTGGGACTCAAACTCAACTACAAGTATGTGTGACTTTGTTTTTCTTTTTGTTTCTTATTCTAG
                      Intron 4 688 bp

GACGAGAGTTGGTGCCAACTAATTCTATTTAA                                  Exon 5   32 bp (cytoplasmic tail)
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**Figure S3. The exon-intron organization of the Chha-DBB sequence.** The size of each intron and exon is reported.

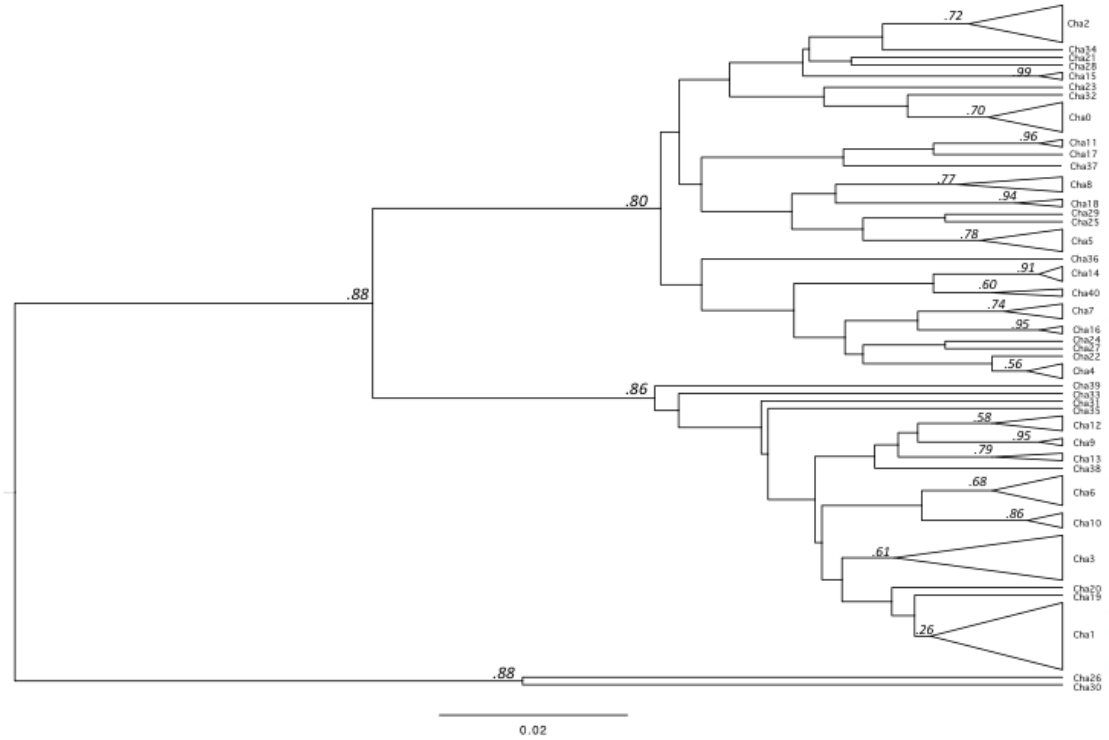


**Figure S4. UPGMA dendrogram showing the genetic relationships among the 92 nucleotide sequences of DAB exon 2 recovered.** Each triangle represent 2 to 9 genetically close sequences and labels correspond to the 41 peptide clusters obtained by grouping sequences differing by less than 3 aminoacids out of 68 (95%). Bootsrap values over 1000 replicates are reported at each relevant node. 0.02 represents the genetic distance.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 4 | 6 | 12 | 15 | 6 | 17 | 21 | 7 | 8 | 14 | 14 | 14 | 20 | 15 | 11 | 11 | 9 | 10 | 11 | 10 | 15 | 13 | 17 | 12 | 25 | 21 | 24 | 21 | 22 | 23 | 22 | 20 | 24 | 23 | 24 | 29 | 21 | 24 | 28 | 26 |
| 2 | 94,12 | | 10 | 14 | 14 | 10 | 15 | 19 | 6 | 9 | 16 | 12 | 12 | 17 | 15 | 7 | 9 | 9 | 10 | 9 | 12 | 14 | 14 | 15 | 12 | 25 | 21 | 24 | 21 | 23 | 21 | 22 | 21 | 20 | 21 | 22 | 26 | 19 | 21 | 28 | 25 |
| 3 | 91,18 | 85,29 | | 7 | 12 | 4 | 14 | 18 | 7 | 6 | 12 | 11 | 15 | 19 | 17 | 12 | 10 | 10 | 10 | 13 | 12 | 15 | 14 | 17 | 12 | 21 | 22 | 23 | 21 | 20 | 21 | 21 | 22 | 24 | 23 | 21 | 24 | 21 | 21 | 27 | 28 |
| 4 | 82,35 | 79,41 | 89,71 | | 5 | 11 | 7 | 17 | 12 | 11 | 7 | 6 | 10 | 13 | 12 | 11 | 15 | 13 | 13 | 12 | 8 | 10 | 11 | 10 | 18 | 20 | 19 | 19 | 17 | 16 | 15 | 17 | 19 | 18 | 19 | 17 | 19 | 15 | 16 | 26 | 23 |
| 5 | 77,94 | 79,41 | 82,35 | 92,65 | | 14 | 5 | 15 | 11 | 8 | 4 | 5 | 9 | 12 | 11 | 10 | 13 | 11 | 14 | 8 | 10 | 9 | 8 | 10 | 15 | 17 | 16 | 16 | 14 | 13 | 12 | 14 | 16 | 15 | 18 | 18 | 20 | 12 | 15 | 26 | 20 |
| 6 | 91,18 | 85,29 | 94,12 | 83,82 | 79,41 | | 16 | 20 | 9 | 8 | 13 | 15 | 15 | 21 | 16 | 14 | 8 | 6 | 10 | 11 | 12 | 16 | 13 | 18 | 8 | 23 | 21 | 24 | 21 | 22 | 23 | 19 | 21 | 23 | 21 | 23 | 28 | 21 | 24 | 28 | 26 |
| 7 | 75,00 | 77,94 | 79,41 | 89,71 | 92,65 | 76,47 | | 11 | 15 | 12 | 7 | 7 | 8 | 11 | 9 | 9 | 13 | 15 | 14 | 8 | 7 | 11 | 9 | 9 | 14 | 19 | 14 | 14 | 15 | 13 | 11 | 14 | 16 | 16 | 15 | 16 | 18 | 10 | 15 | 26 | 19 |
| 8 | 69,12 | 72,06 | 73,53 | 75,00 | 77,94 | 70,59 | 83,82 | | 19 | 16 | 17 | 18 | 19 | 22 | 19 | 14 | 18 | 20 | 19 | 13 | 17 | 21 | 19 | 17 | 18 | 10 | 22 | 22 | 23 | 22 | 20 | 22 | 25 | 24 | 23 | 24 | 26 | 21 | 23 | 17 | 28 |
| 9 | 89,71 | 91,18 | 89,71 | 82,35 | 83,82 | 86,76 | 77,94 | 72,06 | | 4 | 11 | 10 | 11 | 17 | 13 | 9 | 7 | 7 | 9 | 10 | 14 | 10 | 10 | 15 | 12 | 22 | 21 | 22 | 20 | 19 | 19 | 21 | 20 | 19 | 20 | 19 | 24 | 18 | 19 | 27 | 25 |
| 10 | 88,24 | 86,76 | 91,18 | 83,82 | 88,24 | 88,24 | 82,35 | 76,47 | 94,12 | | 9 | 11 | 14 | 18 | 15 | 10 | 7 | 8 | 9 | 9 | 15 | 12 | 9 | 15 | 11 | 19 | 18 | 19 | 17 | 16 | 17 | 18 | 18 | 20 | 20 | 22 | 25 | 17 | 20 | 27 | 24 |
| 11 | 79,41 | 76,47 | 82,35 | 89,71 | 94,12 | 80,88 | 89,71 | 75,00 | 83,82 | 86,76 | | 7 | 10 | 14 | 8 | 12 | 12 | 10 | 13 | 10 | 10 | 7 | 7 | 9 | 15 | 21 | 14 | 14 | 14 | 13 | 13 | 14 | 13 | 15 | 18 | 19 | 22 | 14 | 16 | 25 | 21 |
| 12 | 79,41 | 82,35 | 83,82 | 91,18 | 92,65 | 77,94 | 89,71 | 73,53 | 85,29 | 83,82 | 89,71 | | 7 | 10 | 11 | 10 | 13 | 10 | 12 | 12 | 12 | 8 | 9 | 11 | 16 | 20 | 17 | 18 | 16 | 15 | 14 | 16 | 17 | 15 | 18 | 16 | 18 | 13 | 11 | 27 | 20 |
| 13 | 79,41 | 82,35 | 77,94 | 85,29 | 86,76 | 77,94 | 88,24 | 72,06 | 83,82 | 79,41 | 85,29 | 89,71 | | 6 | 4 | 7 | 11 | 9 | 9 | 9 | 7 | 7 | 10 | 9 | 13 | 24 | 14 | 16 | 14 | 14 | 14 | 12 | 15 | 15 | 12 | 12 | 17 | 11 | 13 | 28 | 20 |
| 14 | 70,59 | 75,00 | 72,06 | 80,88 | 82,35 | 69,12 | 83,82 | 67,65 | 75,00 | 73,53 | 79,41 | 85,29 | 91,18 | | 10 | 10 | 17 | 15 | 13 | 14 | 13 | 11 | 16 | 12 | 18 | 27 | 18 | 19 | 18 | 18 | 17 | 16 | 19 | 20 | 18 | 17 | 11 | 16 | 16 | 31 | 24 |
| 15 | 77,94 | 77,94 | 75,00 | 82,35 | 83,82 | 76,47 | 86,76 | 72,06 | 80,88 | 77,94 | 88,24 | 83,82 | 94,12 | 85,29 | | 10 | 13 | 12 | 11 | 10 | 8 | 7 | 9 | 5 | 14 | 25 | 11 | 14 | 13 | 15 | 14 | 11 | 13 | 14 | 13 | 14 | 19 | 12 | 15 | 25 | 18 |
| 16 | 83,82 | 89,71 | 82,35 | 83,82 | 85,29 | 79,41 | 86,76 | 79,41 | 86,76 | 85,29 | 82,35 | 85,29 | 89,71 | 85,29 | 85,29 | | 9 | 8 | 5 | 5 | 10 | 11 | 15 | 10 | 13 | 22 | 16 | 18 | 17 | 17 | 15 | 16 | 18 | 18 | 17 | 18 | 20 | 15 | 16 | 24 | 24 |
| 17 | 83,82 | 86,76 | 85,29 | 77,94 | 80,88 | 88,24 | 80,88 | 73,53 | 89,71 | 89,71 | 82,35 | 80,88 | 83,82 | 75,00 | 80,88 | 86,76 | | 6 | 6 | 8 | 13 | 14 | 11 | 15 | 9 | 25 | 18 | 19 | 20 | 18 | 18 | 17 | 19 | 18 | 17 | 19 | 24 | 16 | 19 | 30 | 22 |
| 18 | 86,76 | 86,76 | 85,29 | 80,88 | 83,82 | 91,18 | 77,94 | 70,59 | 89,71 | 88,24 | 85,29 | 85,29 | 86,76 | 77,94 | 82,35 | 88,24 | 91,18 | | 6 | 8 | 14 | 12 | 11 | 16 | 9 | 23 | 17 | 20 | 17 | 18 | 19 | 15 | 17 | 17 | 17 | 19 | 24 | 17 | 18 | 28 | 22 |
| 19 | 85,29 | 85,29 | 85,29 | 80,88 | 79,41 | 85,29 | 79,41 | 72,06 | 86,76 | 86,76 | 80,88 | 82,35 | 86,76 | 80,88 | 83,82 | 92,65 | 91,18 | 91,18 | | 9 | 11 | 12 | 15 | 13 | 11 | 25 | 16 | 19 | 18 | 18 | 18 | 15 | 17 | 20 | 17 | 19 | 22 | 18 | 17 | 26 | 24 |
| 20 | 83,82 | 86,76 | 80,88 | 82,35 | 88,24 | 83,82 | 88,24 | 80,88 | 85,29 | 86,76 | 85,29 | 82,35 | 86,76 | 79,41 | 85,29 | 92,65 | 88,24 | 88,24 | 86,76 | | 9 | 14 | 13 | 11 | 9 | 20 | 17 | 19 | 16 | 16 | 15 | 16 | 18 | 18 | 17 | 20 | 24 | 13 | 20 | 24 | 22 |
| 21 | 85,29 | 82,35 | 82,35 | 88,24 | 85,29 | 82,35 | 89,71 | 75,00 | 79,41 | 77,94 | 85,29 | 82,35 | 89,71 | 80,88 | 88,24 | 85,29 | 80,88 | 79,41 | 83,82 | 86,76 | | 12 | 12 | 11 | 13 | 25 | 16 | 18 | 17 | 17 | 17 | 16 | 18 | 20 | 15 | 16 | 21 | 15 | 20 | 27 | 24 |
| 22 | 77,94 | 79,41 | 77,94 | 85,29 | 86,76 | 76,47 | 83,82 | 69,12 | 85,29 | 82,35 | 89,71 | 88,24 | 89,71 | 83,82 | 89,71 | 83,82 | 79,41 | 82,35 | 82,35 | 79,41 | 82,35 | | 6 | 6 | 18 | 23 | 14 | 16 | 14 | 15 | 16 | 14 | 14 | 15 | 16 | 17 | 20 | 17 | 13 | 25 | 22 |
| 23 | 80,88 | 79,41 | 79,41 | 83,82 | 88,24 | 80,88 | 86,76 | 72,06 | 85,29 | 86,76 | 89,71 | 86,76 | 85,29 | 76,47 | 86,76 | 77,94 | 83,82 | 83,82 | 77,94 | 80,88 | 82,35 | 91,18 | | 10 | 15 | 22 | 12 | 13 | 14 | 13 | 15 | 14 | 14 | 13 | 16 | 17 | 22 | 13 | 14 | 29 | 17 |
| 24 | 75,00 | 77,94 | 75,00 | 85,29 | 85,29 | 73,53 | 86,76 | 75,00 | 77,94 | 77,94 | 86,76 | 83,82 | 86,76 | 82,35 | 92,65 | 85,29 | 77,94 | 76,47 | 80,88 | 83,82 | 83,82 | 91,18 | 85,29 | | 16 | 24 | 10 | 13 | 12 | 14 | 12 | 10 | 13 | 13 | 14 | 15 | 17 | 15 | 14 | 23 | 19 |
| 25 | 82,35 | 82,35 | 82,35 | 73,53 | 77,94 | 88,24 | 79,41 | 73,53 | 82,35 | 83,82 | 77,94 | 76,47 | 80,88 | 73,53 | 79,41 | 80,88 | 86,76 | 86,76 | 83,82 | 86,76 | 80,88 | 73,53 | 77,94 | 76,47 | | 23 | 18 | 21 | 20 | 20 | 20 | 16 | 19 | 22 | 19 | 20 | 25 | 19 | 23 | 27 | 25 |
| 26 | 63,24 | 63,24 | 69,12 | 70,59 | 75,00 | 66,18 | 72,06 | 85,29 | 67,65 | 72,06 | 69,12 | 70,59 | 64,71 | 60,29 | 63,24 | 67,65 | 63,24 | 66,18 | 63,24 | 70,59 | 63,24 | 66,18 | 67,65 | 64,71 | 66,18 | | 30 | 30 | 28 | 28 | 27 | 28 | 31 | 29 | 31 | 31 | 33 | 27 | 27 | 13 | 33 |
| 27 | 69,12 | 69,12 | 67,65 | 72,06 | 76,47 | 69,12 | 79,41 | 67,65 | 69,12 | 73,53 | 79,41 | 75,00 | 79,41 | 73,53 | 83,82 | 76,47 | 73,53 | 75,00 | 76,47 | 75,00 | 76,47 | 79,41 | 82,35 | 85,29 | 73,53 | 55,88 | | 4 | 4 | 6 | 7 | 4 | 5 | 7 | 6 | 9 | 12 | 9 | 9 | 32 | 12 |
| 28 | 64,71 | 64,71 | 66,18 | 72,06 | 76,47 | 64,71 | 79,41 | 67,65 | 67,65 | 72,06 | 79,41 | 73,53 | 76,47 | 72,06 | 79,41 | 73,53 | 72,06 | 70,59 | 72,06 | 72,06 | 73,53 | 76,47 | 80,88 | 80,88 | 69,12 | 55,88 | 94,12 | | 6 | 5 | 6 | 6 | 8 | 7 | 8 | 9 | 11 | 8 | 10 | 34 | 12 |
| 29 | 69,12 | 69,12 | 69,12 | 75,00 | 79,41 | 69,12 | 77,94 | 66,18 | 70,59 | 75,00 | 79,41 | 76,47 | 79,41 | 73,53 | 80,88 | 75,00 | 70,59 | 75,00 | 73,53 | 76,47 | 75,00 | 79,41 | 79,41 | 82,35 | 70,59 | 58,82 | 94,12 | 91,18 | | 4 | 6 | 4 | 8 | 6 | 5 | 8 | 11 | 8 | 12 | 33 | 14 |
| 30 | 67,65 | 66,18 | 70,59 | 76,47 | 80,88 | 67,65 | 80,88 | 67,65 | 72,06 | 76,47 | 80,88 | 77,94 | 79,41 | 73,53 | 77,94 | 75,00 | 73,53 | 73,53 | 73,53 | 76,47 | 75,00 | 77,94 | 80,88 | 79,41 | 70,59 | 58,82 | 91,18 | 92,65 | 94,12 | | 4 | 6 | 7 | 8 | 7 | 8 | 11 | 6 | 9 | 34 | 12 |
| 31 | 66,18 | 69,12 | 69,12 | 77,94 | 82,35 | 66,18 | 83,82 | 70,59 | 72,06 | 75,00 | 80,88 | 79,41 | 79,41 | 75,00 | 79,41 | 77,94 | 73,53 | 72,06 | 73,53 | 77,94 | 75,00 | 76,47 | 77,94 | 82,35 | 70,59 | 60,29 | 89,71 | 91,18 | 91,18 | 94,12 | | 7 | 6 | 7 | 8 | 9 | 11 | 4 | 9 | 32 | 13 |
| 32 | 67,65 | 67,65 | 69,12 | 75,00 | 79,41 | 72,06 | 79,41 | 67,65 | 69,12 | 73,53 | 79,41 | 76,47 | 82,35 | 76,47 | 83,82 | 76,47 | 75,00 | 77,94 | 77,94 | 76,47 | 76,47 | 79,41 | 79,41 | 85,29 | 76,47 | 58,82 | 94,12 | 91,18 | 94,12 | 91,18 | 89,71 | | 8 | 8 | 6 | 8 | 11 | 9 | 11 | 32 | 13 |
| 33 | 70,59 | 69,12 | 67,65 | 72,06 | 76,47 | 69,12 | 76,47 | 63,24 | 70,59 | 73,53 | 80,88 | 75,00 | 77,94 | 72,06 | 80,88 | 73,53 | 72,06 | 75,00 | 75,00 | 73,53 | 73,53 | 79,41 | 79,41 | 80,88 | 72,06 | 54,41 | 92,65 | 88,24 | 88,24 | 89,71 | 91,18 | 88,24 | | 11 | 10 | 13 | 16 | 10 | 9 | 32 | 13 |
| 34 | 64,71 | 70,59 | 64,71 | 73,53 | 77,94 | 66,18 | 76,47 | 64,71 | 72,06 | 70,59 | 77,94 | 77,94 | 77,94 | 70,59 | 79,41 | 73,53 | 73,53 | 75,00 | 70,59 | 73,53 | 70,59 | 77,94 | 80,88 | 80,88 | 67,65 | 57,35 | 89,71 | 89,71 | 91,18 | 88,24 | 89,71 | 88,24 | 83,82 | | 6 | 7 | 11 | 6 | 9 | 34 | 11 |
| 35 | 66,18 | 69,12 | 66,18 | 72,06 | 73,53 | 69,12 | 77,94 | 66,18 | 70,59 | 70,59 | 73,53 | 73,53 | 82,35 | 73,53 | 80,88 | 75,00 | 75,00 | 75,00 | 75,00 | 75,00 | 77,94 | 76,47 | 76,47 | 79,41 | 72,06 | 54,41 | 91,18 | 88,24 | 92,65 | 89,71 | 88,24 | 91,18 | 85,29 | 91,18 | | 4 | 9 | 8 | 12 | 35 | 14 |
| 36 | 64,71 | 67,65 | 69,12 | 75,00 | 73,53 | 66,18 | 76,47 | 64,71 | 72,06 | 67,65 | 72,06 | 76,47 | 82,35 | 75,00 | 79,41 | 73,53 | 72,06 | 72,06 | 72,06 | 70,59 | 76,47 | 75,00 | 75,00 | 77,94 | 70,59 | 54,41 | 86,76 | 86,76 | 88,24 | 88,24 | 86,76 | 88,24 | 80,88 | 89,71 | 94,12 | | 6 | 9 | 10 | 36 | 15 |
| 37 | 57,35 | 61,76 | 64,71 | 72,06 | 70,59 | 58,82 | 73,53 | 61,76 | 64,71 | 63,24 | 67,65 | 73,53 | 75,00 | 83,82 | 72,06 | 70,59 | 64,71 | 64,71 | 67,65 | 64,71 | 69,12 | 70,59 | 67,65 | 75,00 | 63,24 | 51,47 | 82,35 | 83,82 | 83,82 | 83,82 | 83,82 | 83,82 | 76,47 | 83,82 | 86,76 | 91,18 | | 13 | 12 | 38 | 18 |
| 38 | 69,12 | 72,06 | 69,12 | 77,94 | 82,35 | 69,12 | 85,29 | 69,12 | 73,53 | 75,00 | 79,41 | 80,88 | 83,82 | 76,47 | 82,35 | 77,94 | 76,47 | 75,00 | 73,53 | 80,88 | 77,94 | 75,00 | 80,88 | 77,94 | 72,06 | 60,29 | 86,76 | 88,24 | 88,24 | 91,18 | 94,12 | 86,76 | 85,29 | 91,18 | 88,24 | 86,76 | 80,88 | | 9 | 34 | 10 |
| 39 | 64,71 | 69,12 | 69,12 | 76,47 | 77,94 | 64,71 | 77,94 | 66,18 | 72,06 | 70,59 | 76,47 | 83,82 | 80,88 | 76,47 | 77,94 | 76,47 | 72,06 | 73,53 | 75,00 | 70,59 | 70,59 | 80,88 | 79,41 | 79,41 | 66,18 | 60,29 | 86,76 | 85,29 | 82,35 | 86,76 | 86,76 | 83,82 | 86,76 | 86,76 | 82,35 | 85,29 | 82,35 | 86,76 | | 31 | 13 |
| 40 | 58,82 | 58,82 | 60,29 | 61,76 | 61,76 | 58,82 | 61,76 | 75,00 | 60,29 | 60,29 | 63,24 | 60,29 | 58,82 | 54,41 | 63,24 | 64,71 | 55,88 | 58,82 | 61,76 | 64,71 | 60,29 | 63,24 | 57,35 | 66,18 | 60,29 | 80,88 | 52,94 | 50,00 | 51,47 | 50,00 | 52,94 | 52,94 | 52,94 | 50,00 | 48,53 | 47,06 | 44,12 | 50,00 | 54,41 | | 38 |
| 41 | 61,76 | 63,24 | 58,82 | 66,18 | 70,59 | 61,76 | 72,06 | 58,82 | 63,24 | 64,71 | 69,12 | 70,59 | 70,59 | 64,71 | 73,53 | 64,71 | 67,65 | 67,65 | 64,71 | 67,65 | 64,71 | 67,65 | 75,00 | 72,06 | 63,24 | 51,47 | 82,35 | 82,35 | 79,41 | 82,35 | 80,88 | 80,88 | 80,88 | 83,82 | 79,41 | 77,94 | 73,53 | 85,29 | 80,88 | 44,12 | |

**Figure S5. Pairwise comparison showing the divergence among the 41 aminoacid sequences of DAB exon 2.** The number of amino acid differences and the percentage of similarities per sequence from between sequences of the 41 highly divergent peptides is shown. The overall average differences is 14.84 out of a total length of 68 aminoacids