**Appendix 2.**

**The taxon character matrix is published on Morphobank (Project 682) at** [www.morphobank.org](http://www.morphobank.org).

*Prokennalestes trofimovi*

???1??????001001231100??????10000011000002001011

00011110022001000100000001000?

*Adelodelphys muizoni*

??????????????110?0100?????????000??000002001001

0001110???2????0?011?0?0?1?00?

*Aenigmadelphys archeri*

????????????0011230000??????00000000100000000011

000111010010000110111000010?00

*Albertatherium primum*

??????????????1121010010001000100001001100101001

0001110?????????????????????10

*Albertatherium secundum*

??????????????11230100??????001000000?1100101001

0001110?????????????????????1?

*Alphadon attaragos*

????????????001121010000010000000001??0000101101

000111?1122010011011?0?0010?0?

*Alphadon halleyi*

???0????????001121010010[0/1]1[0/1]0001000010012

02101101000111011210100110111000010000

*Alphadon marshi*

??????????????1121010010011000100001001202101101

000111011110100110111000010010

*Alphadon perexiguus*

??????????????1121010010111000100001?01202101101

000111011??010011011?0?0010?00

*Alphadon sahnii*

??????????????1121010010011000100001001202101101

00011101111010011011?0?0010?10

*Alphadon wilsoni*

????????????001121010010011000100001011202101101

00011101111010011011?0?0010?10

*Anchistodelphys archibaldi*

??????????????101[1/3]01000000000000001001110000

100100011101121000011011?0?0010?00

*Anchistodelphys delicatus*

????????????????0??????????????000?1??000000????

????110112100001?011?0?0010?0?

*Apistodon exiguus*

??????????????1121010110101000110001100002100001

0001110?????????????????????0?

*?Aquiladelphis laurae*

???????????????1211?1112001000110??????1??101?01

110111?????????????1????????2?

*Aquiladelphis incus*

????????????0211211?1120101000110110110122101111

12011101120011021011?0?001112?

*Aquiladelphis minor*

??????????????11211?1120111000120??01?01111011?1

100111??02?010021011?0?0011?10

*Armintodelphys blacki*

????????????????????????????????????????????????

???????00[0/1]10100001101010011100

*Armintodelphys dawsoni*

??????????????1121110020?010000001110?1100100011

00011000011010000111?0?0011?00

*Asiatherium reshetovi*

??101?????00001123?010??????00001??1001102001001

0?0111011120100111111000011110

*Atokatherium boreni*

??????????????100?0110?????????01010000002000010

00011000100010000??00??000??01

*Bistius bondi*

???????????????1210?0010101010101011??0021101001

0?01100?????????????????????2?

*Copedelphys innominata*

??????????????1121010010000000000011003200111001

1001101102201002012110?0011?10

*Dakotadens morrowi*

??????????????112[1/3]0100101000000011101?[0/1][

0/1]01100011000110011110100211100000011?1?

*Deltatheridium pretrituberculare*

10100?????0000100?10?0?????????00000000002000?10

00011010100010000100000000??11

*Deltatheroides cretacicus*

??10???????000100?0?10?????????00???000002000010

0001101?????????????????????11

*Didelphodon coyi*

00?01?????00021123?120??????00001010??2222101101

0001?0?10001111210111100011?22

*Didelphodon vorax*

0?101[1/2]0100000211231120??????0000111001222210

1101000110010001111210111100012122

*Ectocentrocristus foxi*

???????????????1210100200000?0000011??2200111011

101110?????0100?????1??001?01?

*Eoalphadon clemensi*

????????????00112101001011[0/1]00010000100000210

10110001110112201001101110?0010?00

*Eoalphadon lillegraveni*

??????????????112[1/3]01000001000010000100000210

10110001110111[1/2]01001?011?0?0010?1?

*Eoalphadon woodburnei*

??????????????11210100000100001000010?0002101011

0001110111201002?011?0?0010?1?

*Eodelphis browni*

0010??????000211230120??????00000010??2222101101

000110?1000111121?11?1?0011?22

*Eodelphis cutleri*

???01?????000211230120??????00000010012222101101

00011001000111121011?1?0011?22

*Glasbius intricatus*

??????????0?001121110000[0/1]1000010111111222210

11111101120?1220100210111001012111

*Glasbius twitchelli*

?????01100??001121110000010000101111112222101111

1101120?122010021011?0?1012111

*Hatcheritherium alpha*

???????????????12101000011?0?01?1011??2200121101

0?0111??????????????????????1?

Goler Formation taxon

???????????????1210100100010001000111?3200110011

00011011022010121011?0?0011?1?

*Herpetotherium comstocki*

??????????????112101?0000000111001111?3200111011

100110110220100211211001011110

*Herpetotherium edwardi*

??????????????11210110100000011001111?3200111001

100110110220100211211000011110

*Herpetotherium fugax*

10101?????0?001121011010000001100111103200111001

100110110220100211210000011010

*Herpetotherium knighti*

??????????????112[1/3]01101010100110011111320011

1001100110110220100211211000011110

*Herpetotherium marsupium*

?????20100??00112101?0[1/2]010100110011100320011

1001100110?10220100201211001011?10

*Holoclemensia texana*

???????????????121100020?010001011111?0002000010

00011?10022000110100?0?000??00

*Iqualadelphis lactea*

??????????????11231111??????00010101002100001101

0101120?????????????????????00

*Iugomortiferum thoringtoni*

???????????????001010010111010001011??0022000011

000111?11220100110111010010000

*Kokopellia juddi*

10?0????????00110?0000?????????00000000002000001

000110010110000100011000010?00

*?Leptalestes cooki*

????????????001120?0?1??????10021?11001201001101

1101120?022010021011?0?0011?1?

*Leptalestes krejcii*

?????10100??001120?0?1??????10021?11002201000001

1001120?012010011011?0?0011?0?

*Leptalestes prokrejcii*

????????????001120?0?1??????10021?11001101000001

1001120?012010011011?1?0011?0?

*Leptalestes toevsi*

??????????????11231011??????00011?110???0?100111

10011201?120100????1???0011?00

*Maastrichtidelphys meurismeti*

???????????????1211010200010?00?0011??2200111011

000110??????????????????????0?

*Mimoperadectes houdei*

??1?1?????00??112[1/3]11000000000000011100222210

00110001100?????????????????????10

*Mimoperadectes labrus*

???0????????001121110000000000000111111222100011

00011000100010010111001[0 1]011010

*Nanocuris improvida*

???????????????0230110??????000?10111?0002000?10

00011010100010000000001000??21

*Nortedelphys jasoni* comb. nov.

????????????001121010010010000100001001200111101

0001110?1220100210111000010?10

*Nortedelphys magnus*

????????????001121010010010000100001002200111101

0001110?1220100210111010010010

*Nortedelphys minimus*

??????????????11210100100100001000?10?1200111101

0001110?????????????????????0?

*Oklatheridium szalayi*

???????????????10?0110?????????00000010102001010

00011010?00010???????????10?0?

*Pappotherium pattersoni*

???????????????1??1000?????????000100?0022000010

0001100001201001011000?0?10?00

*Pariadens kirklandi*

???????????????12101001001000010111???1122101011

00011??10001100210110000011012

*Pariadens mckennai*

????????????????????????????????????????????????

???????10011100???11?0?0010012

*Pediomys elegans*

???0????????00112210?121101000121111002211101111

110112020220111210111100112110

*Peradectes californicus*

?????1001???0011231100??????00001011112200100011

000110??1?201001011110?0011?00

*Peradectes chesteri*

??????????????110?1100?????????00011001100100011

000110?112201001011110?0011100

Peradectes elegans

???01???????001121110000000000000011102200100011

00011001122010010111100[0 1]011100

*Peradectes gulottai*

??????????000011231100??????00000111002200100011

0001100?????????????????????00

*Peradectes coproxeches*

??????????????1121110010[0/1]0000000011100220010

1011000110011220100200111000011100

*Peradectes minor*

??????????????1121110010000000000111002200101011

000110011220100100111010011000

*Peradectes protinnominatus*

????????????001121110000000000000111101100100011

0001100112201001011110?1011?00

*Protalphadon foxi*

??????????????112[1/3]01000000[0/1]01010001100[0

/1]1001110010001100?????????????????????1?

*Protalphadon lulli*

???0??????????112[1/3]01000000001010001100010010

1001000110?1011010021011?0?1010?0?

*?Protolambda clemensi*

????????????011120?0????????01021?1?1010111011?1

1001120?122011021011?000011100

*Protolambda florencae*

????????????011120?0????????00021?1?1111111011?1

10011202011010021011?000011110

*Protolambda hatcheri*

?????[1/2]0100??011120?0????????00021?1?11121110

11?1100112020110100210111000012110

*Pucadelphys andinus*

11101?????00001121100010001000100000002100111001

000110010220100101111010011100

*Roberthoffstetteria nationalgeographica*

????1?????000?1121110010010000100111112222121011

1011120102200102111000?0011112

*Sinbadelphys schmidti*

???????????????10?0100?????????00000001102001001

0001110102101001?0111000010000

*Sulestes karakshi*

???????????????1??0100?????????00000110002000010

00011010100010000100?0?000??0?

*Swaindelphys cifellii*

??????????????1121110010100000000111102200111011

000110010220100110111000011110

*Swaindelphys encinensis*

??????????????1121110010000000000111102200111011

000110010220100110111010011110

*Swaindelphys johansoni*

?????21000????1121110010000000000111102200111011

000110010220100110111010011110

*Szalinia gracilis*

1110??????0000112[1/3]10000000000010000100220011

0011000110000220100001110010011100

*Thylacodon pusillus*

????????????001121110010000000000111102200101011

000110010220100210111000011110

*Thylacodon montanensis* sp. nov.

?????211????001121110010000000000111002200101011

000110010220100210111010011110

*Turgidodon lillegraveni*

????????????00112101201001010000100??11122101101

0001110?????????????????????1?

*Turgidodon madseni*

????????????01112101201001110000000?111122101101

00011101022010021011?0?0010?1?

*Turgidodon petiminis*

????????????01112101201001110000000?001122101101

00011101022010021011?0?0010?10

*Turgidodon praesagus*

????????????01112101201001[0/1]10000000100112210

110101011101022010021011?0?0010?10

*Turgidodon rhaister*

?????00000????1121012000010000000000001122101101

01011101022010021011?0?0010?10

*Turgidodon russelli*

?????00000??001121012010011100000000002122101101

0[0/1/2]0111010220100210111000010010

*Varalphadon crebreforme*

??????????????1?23?100??????000010????120210????

???????101201002001110?0010?1?

*Varalphadon creber*

??????????????112[1/3]01000?00000010101110120210

11010001100?????????????????????0?

*Varalphadon wahweapensis*

????????????00112[1/3]01000?00000010101110120210

110100011001022000021011?0?0010?0?