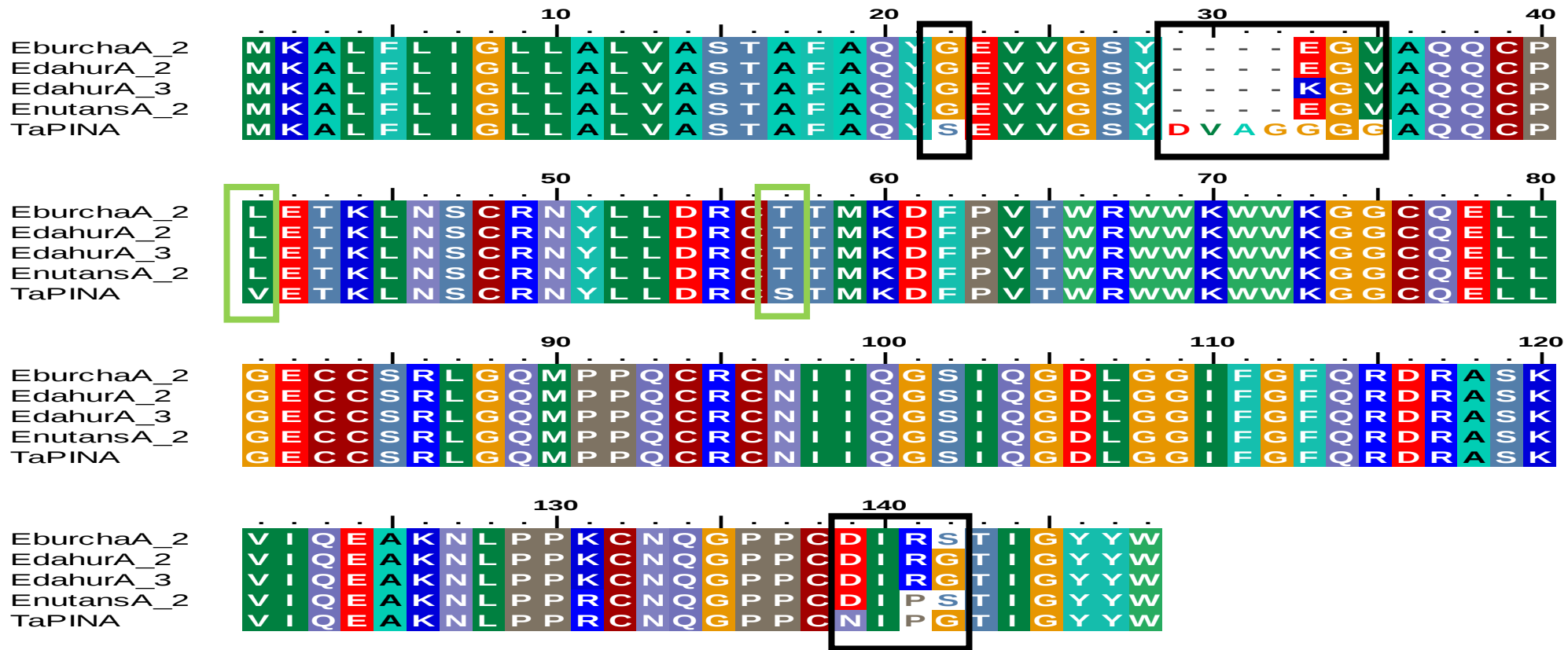
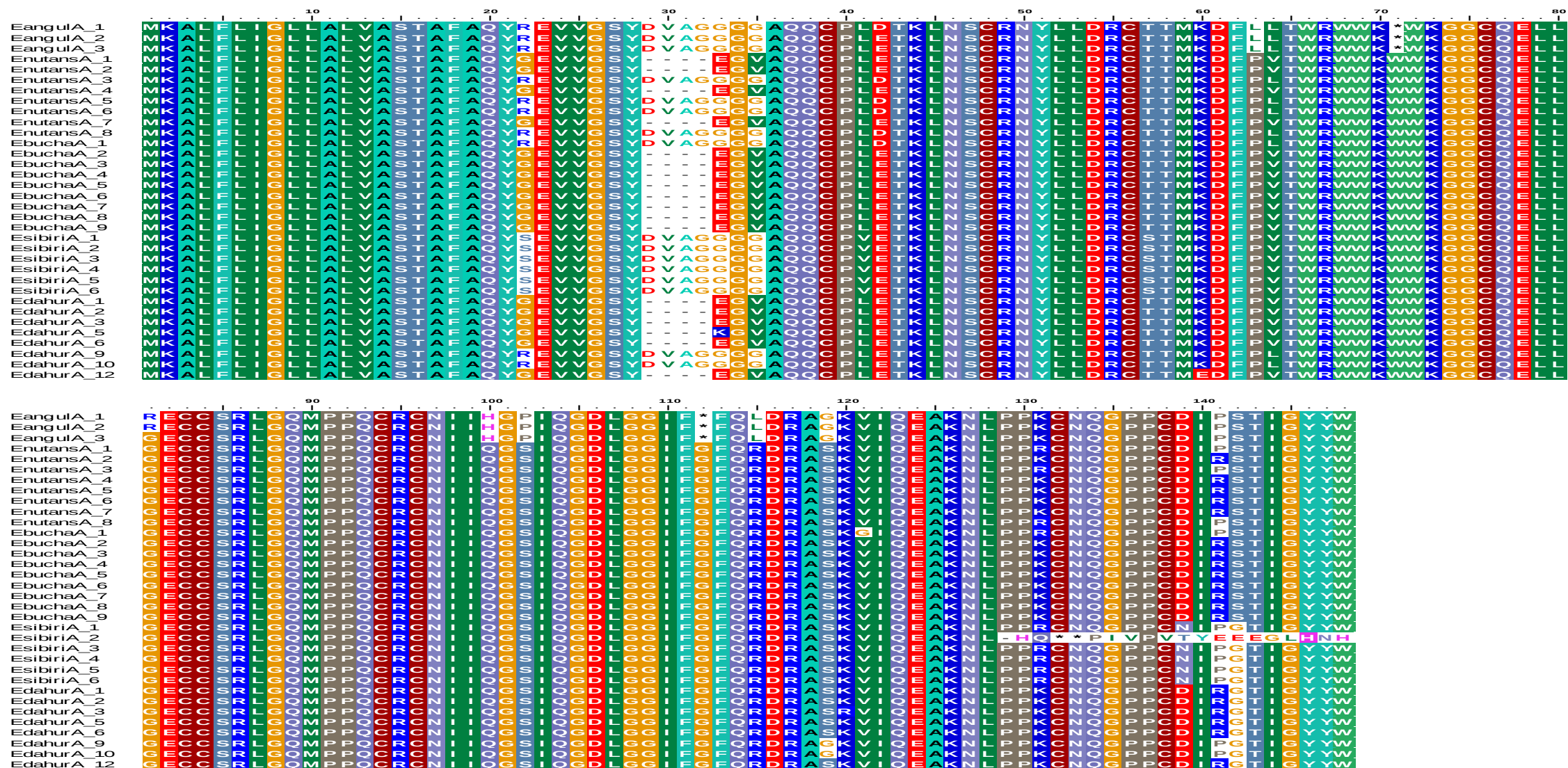
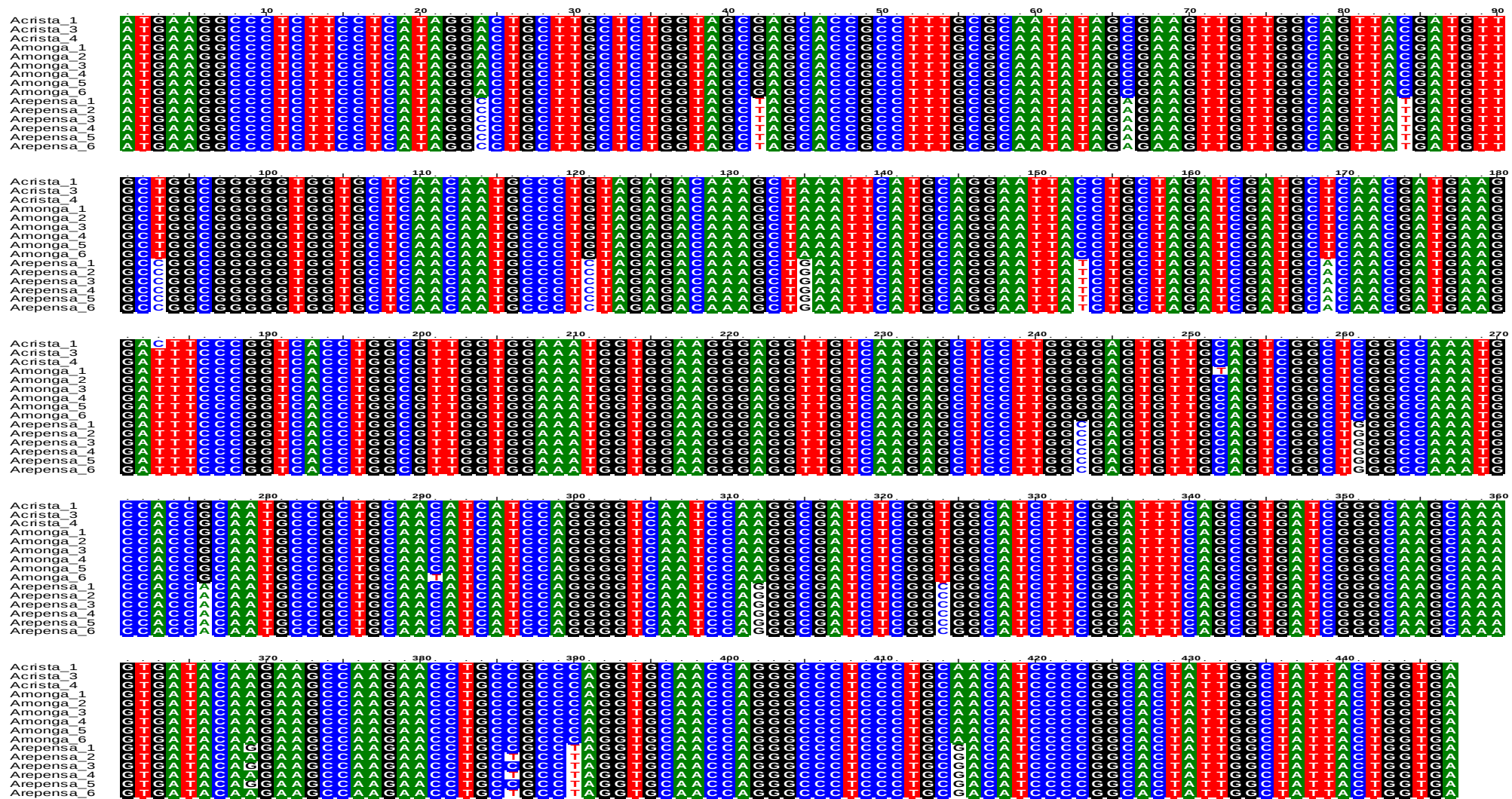




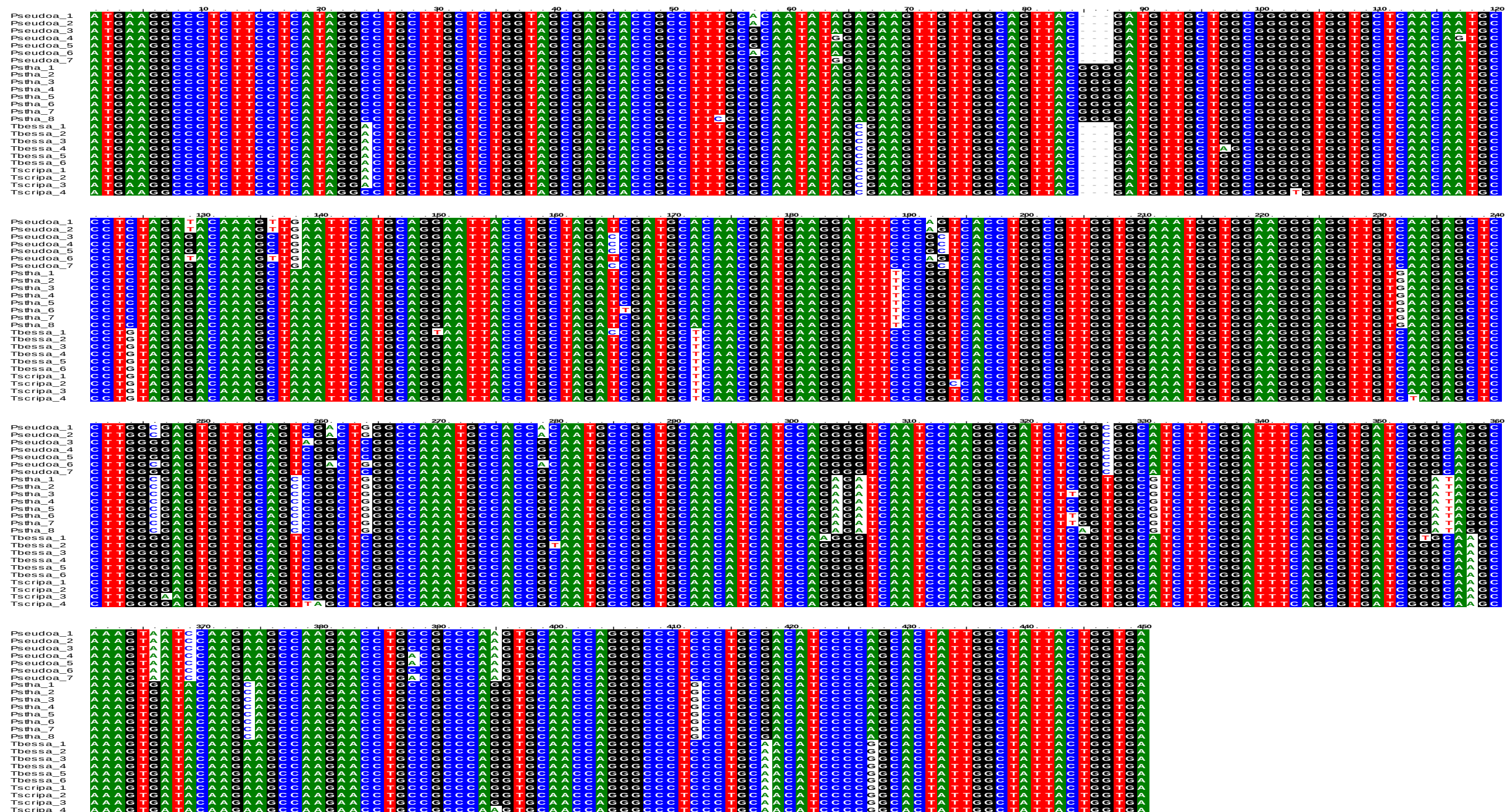
Supplementary Figure S1: Protein alignment of novel PINA sequences from *Elymus* species with wild type from *T. aestivum* (bread wheat). Black boxes indicate main amino acid motif differences between the sequences. Those in the green boxes indicate same amino acid type (i.e. hydrophobic or hydrophilic) change.



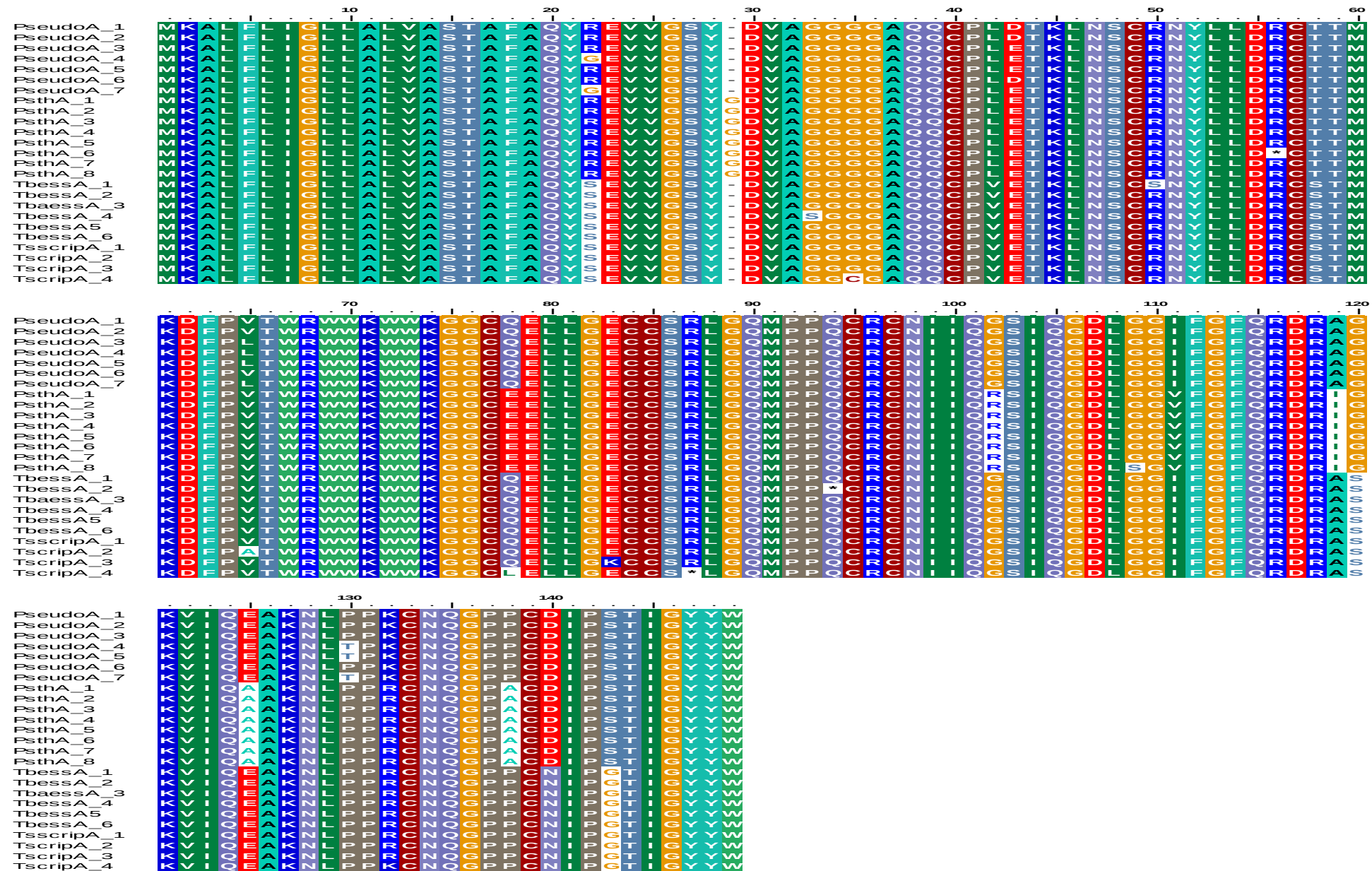
Supplementary Figure S3: Protein alignment of PINA sequences for *Elymus angulutus*, *Elymus nutans*, *Elymus burchan-buddae*, *Elymus sibiricus* and *Elymus dahuricus*. Number refers to clone number.



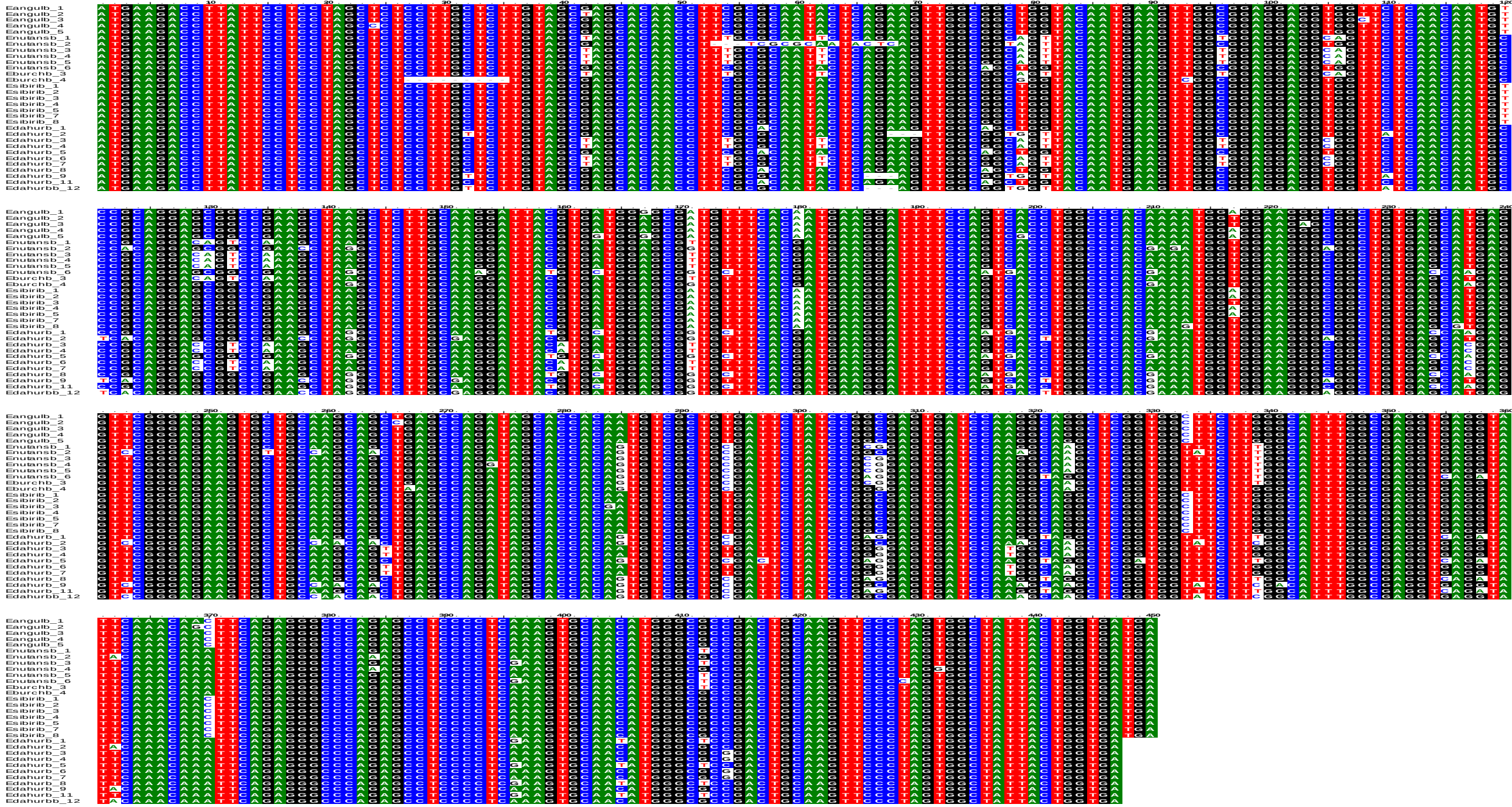
Supplementary Figure S4: Nucleotide alignment of Pin a sequences for *Agropyron cristatum*, *Agropyron mongolicum*, and *Agropyron repens*. Number refers to clone number.



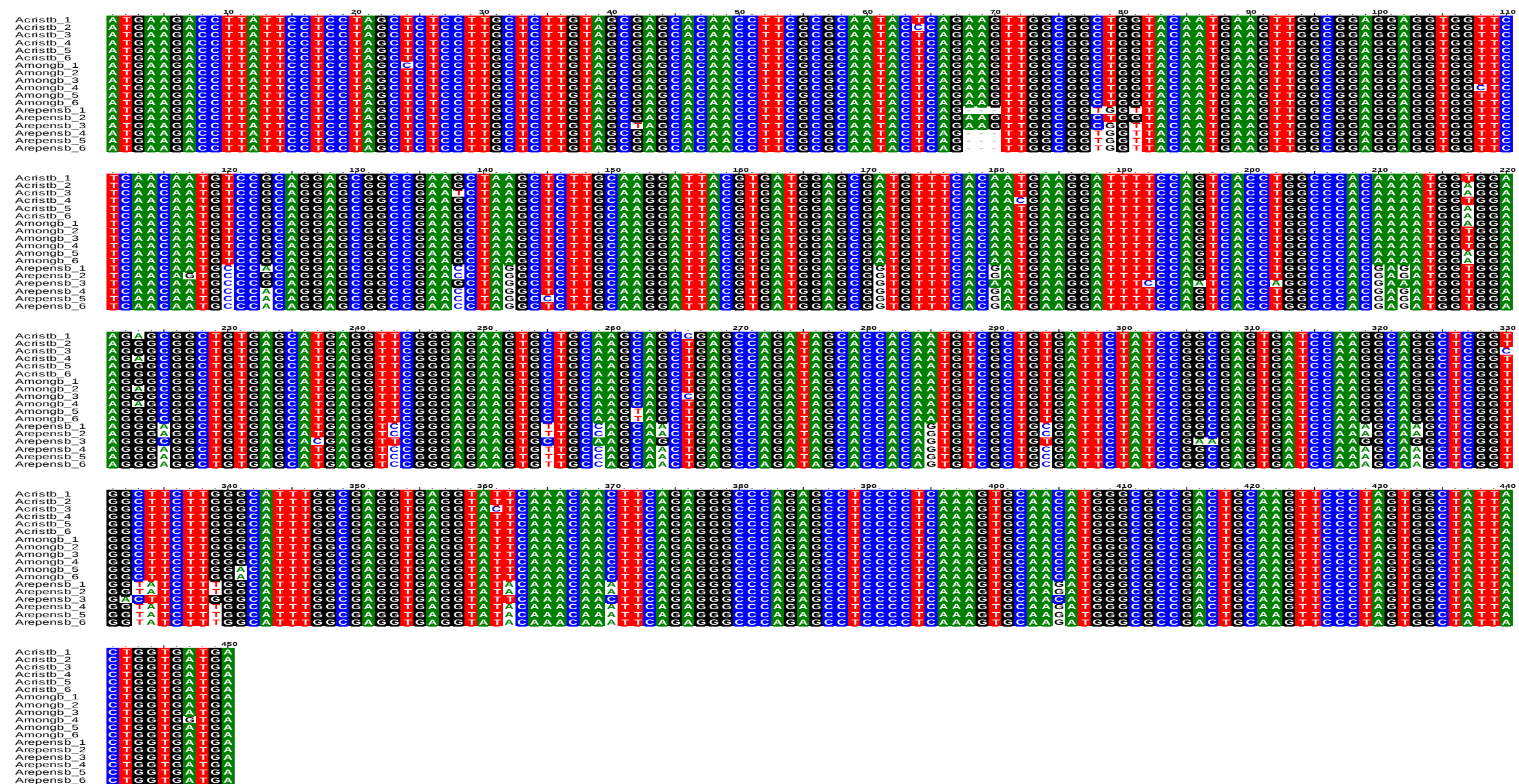
Supplementary Figure S6: Nucleotide alignment of Pin a sequences for *Pseudoroegneria spicata*, *Psathyrostachys juncea*, *Thinopyrum bessarabicum* and *Thinopyrum scripeum*. Number refers to clone number.



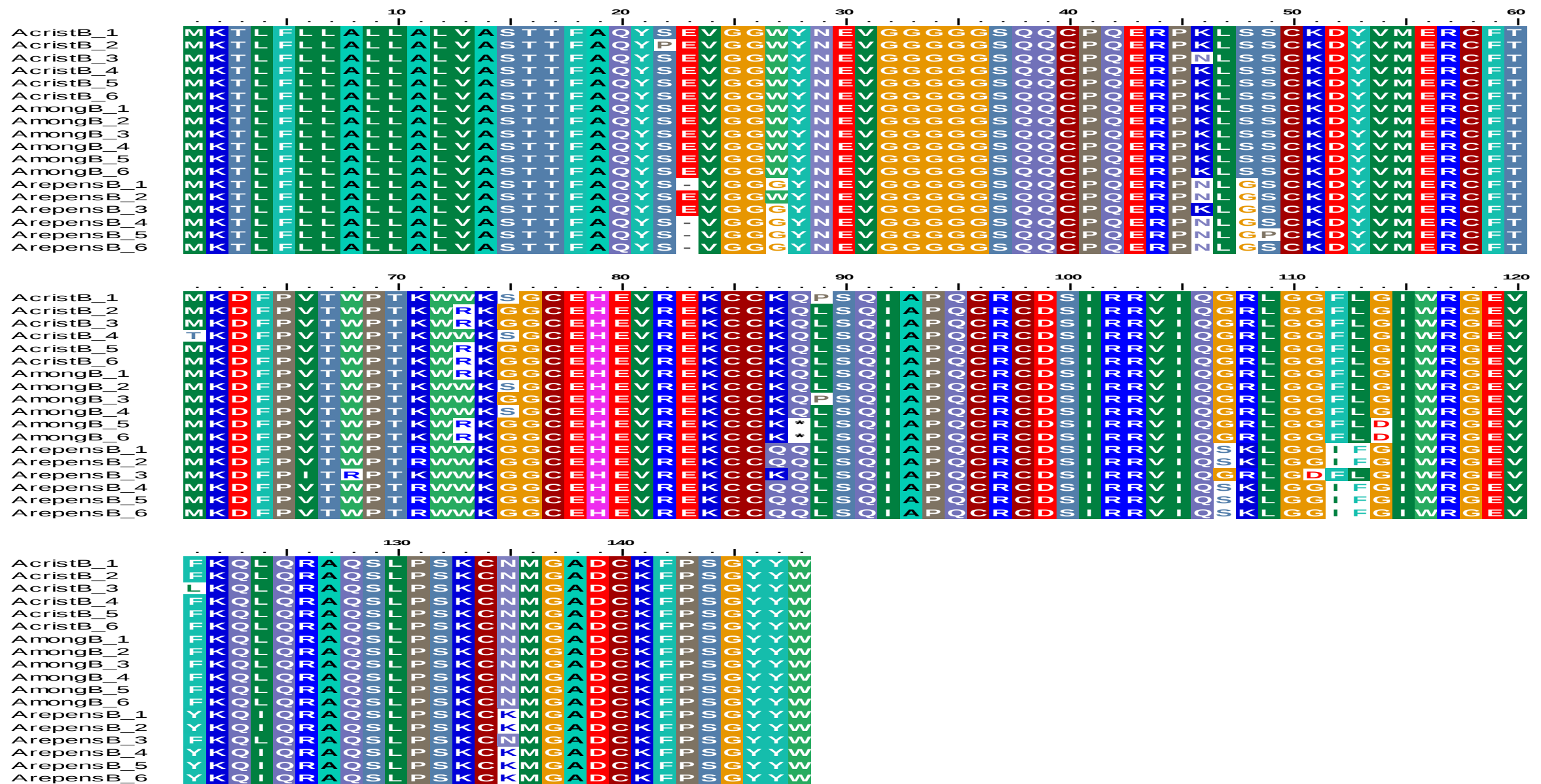
Supplementary Figure S7: Protein alignment of PINA sequences for *Pseudoroegneria spicata*, *Psathyrostachys juncea*, *Thinopyrum bessarabicum* and *Thinopyrum scribeum*. Number refers to clone number.



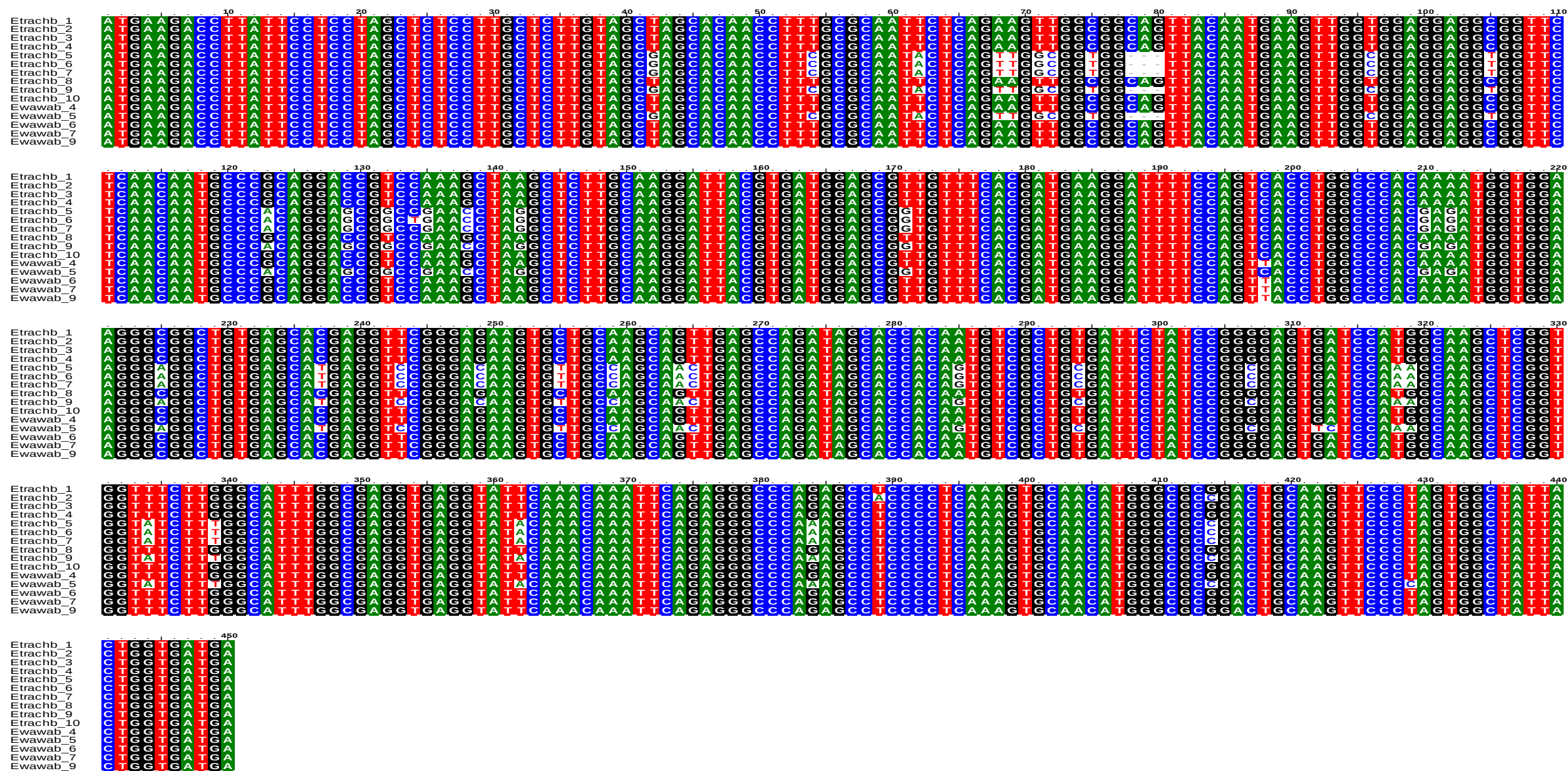
Supplementary Figure S8: Nucleotide alignment of Pin b sequences for *Elymus angulutus*, *Elymus nutans*, *Elymus burchan-buddae*, *Elymus sibiricus* and *Elymus dahuricus*. Number refers to clone number.



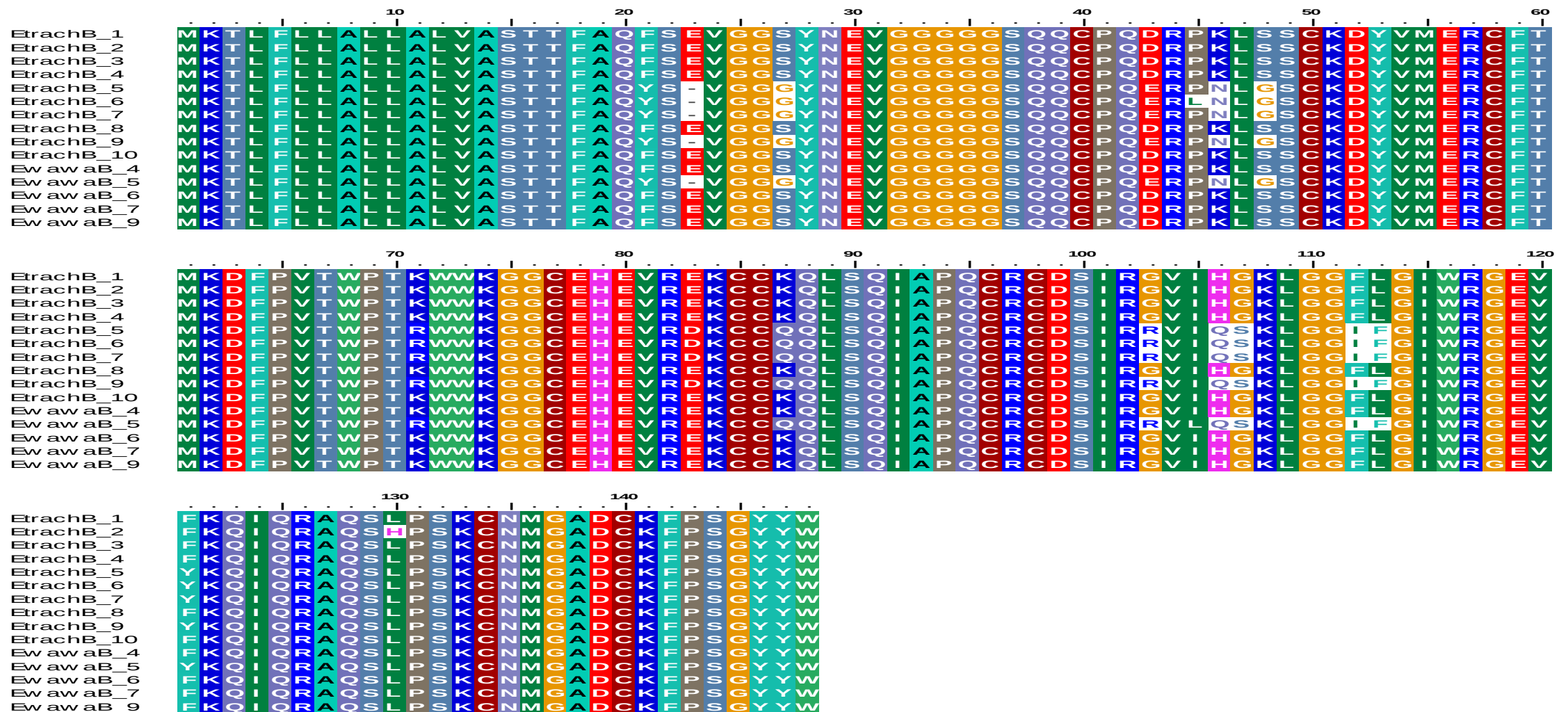
Supplementary Figure S10: Nucleotide alignment of Pin b sequences for *Agropyron cristatum*, *Agropyron mongolicum*, and *Agropyron repens*. Number refers to clone number.



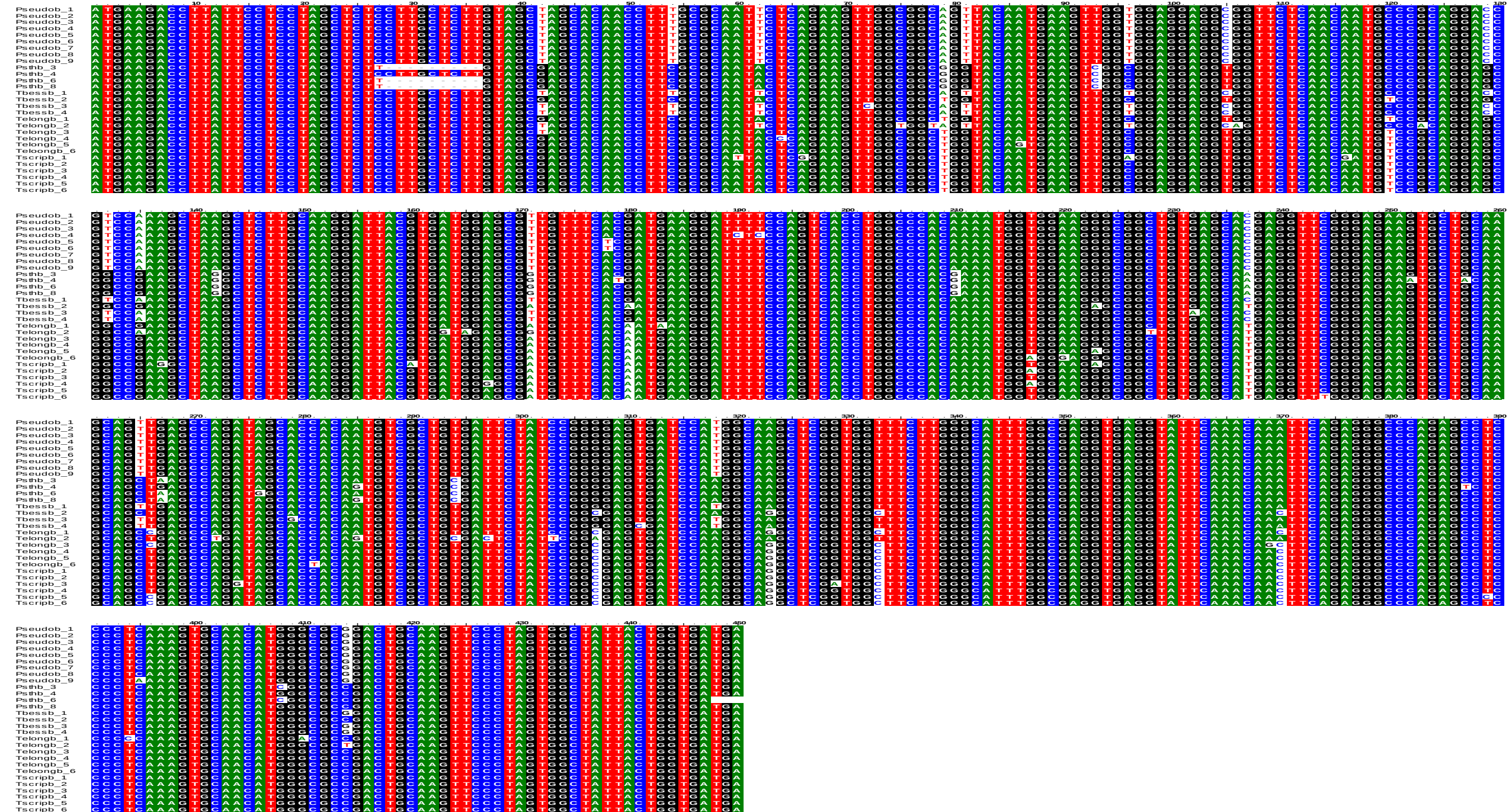
Supplementary Figure S11: Protein alignment of PINB sequences for *Agropyron cristatum*, *Agropyron mongolicum*, and *Agropyron repens*. Number refers to clone number.

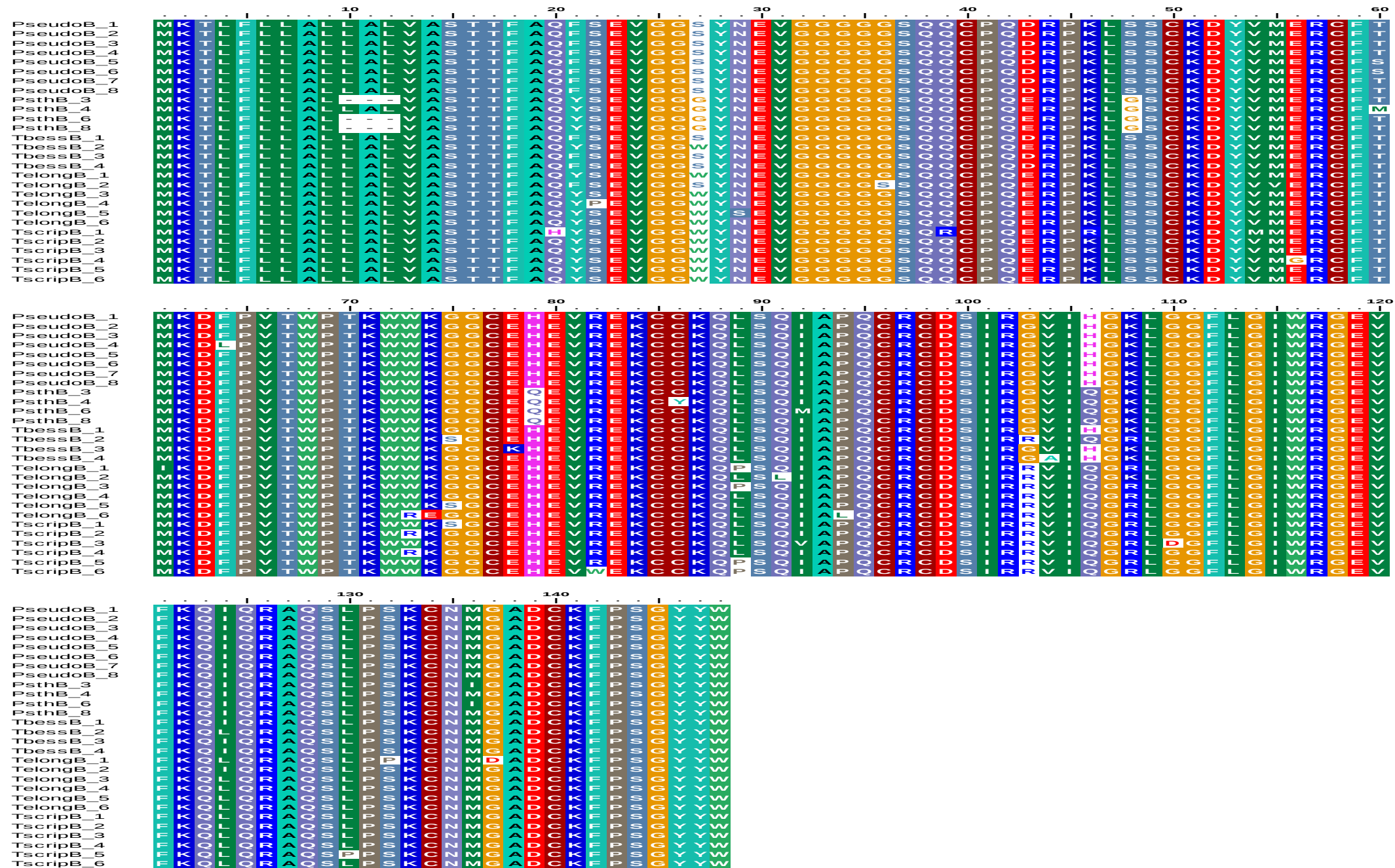


Supplementary Figure S12: Nucleotide alignment of Pin b sequences for *Elymus trachycaulus* subsp. *subsecundus* and *Elymus wawawaiensis*. Number refers to clone number.

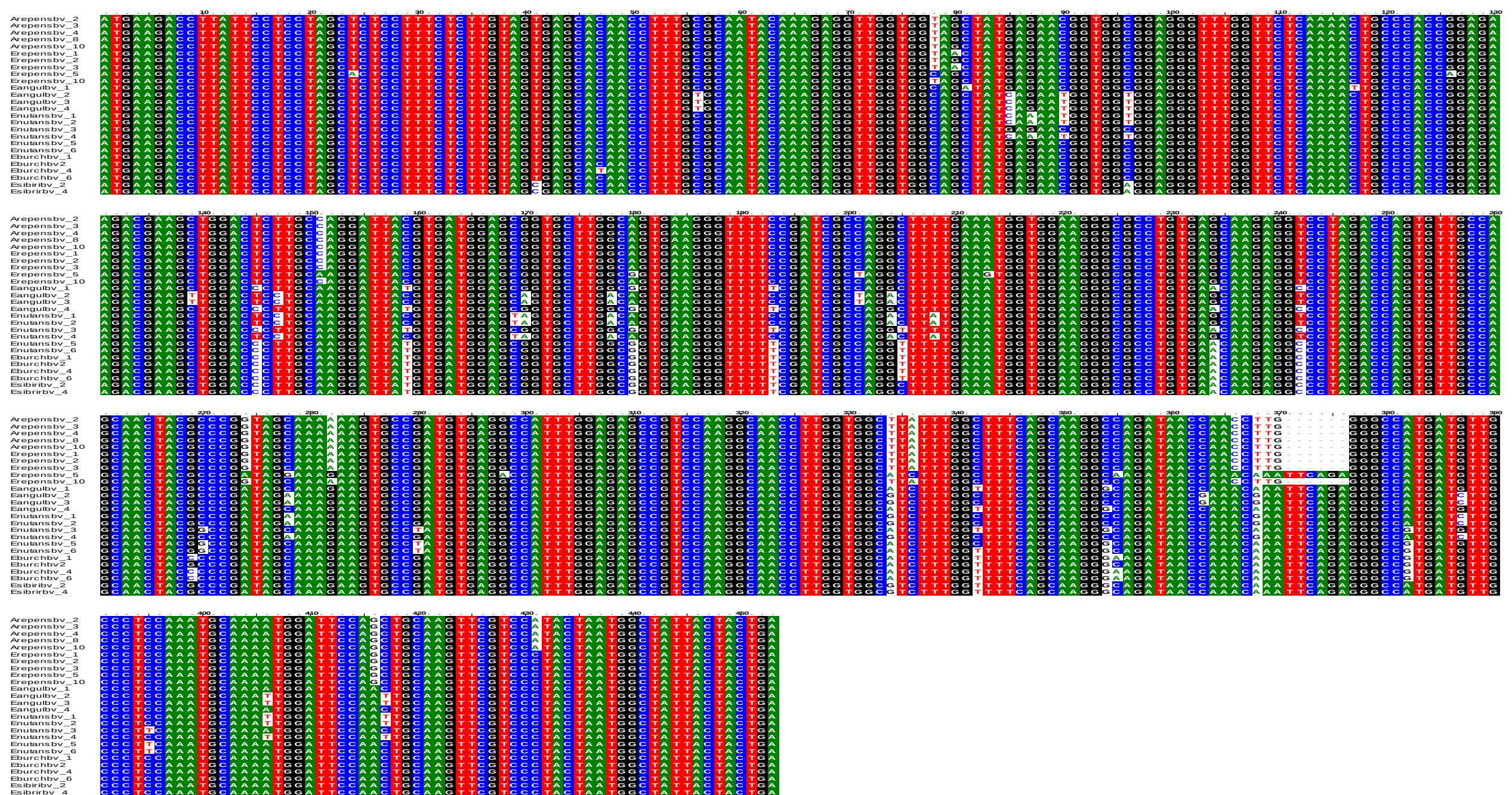


Supplementary Figure S13: Protein alignment of PINB sequences for *Elymus trachycaulus* subsp. *subsecundus* and *Elymus wawawaiensis*. Number refers to clone number.

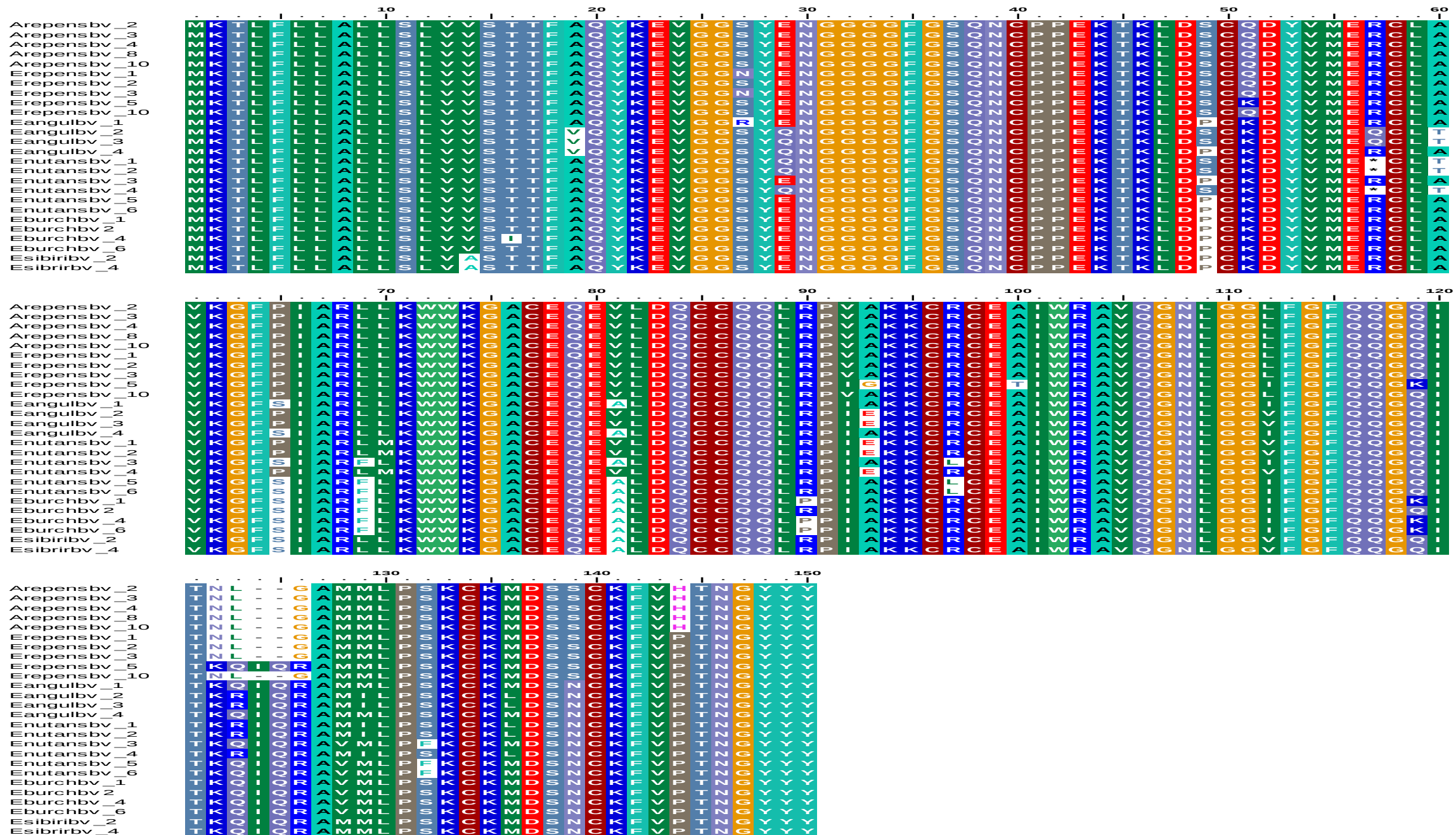




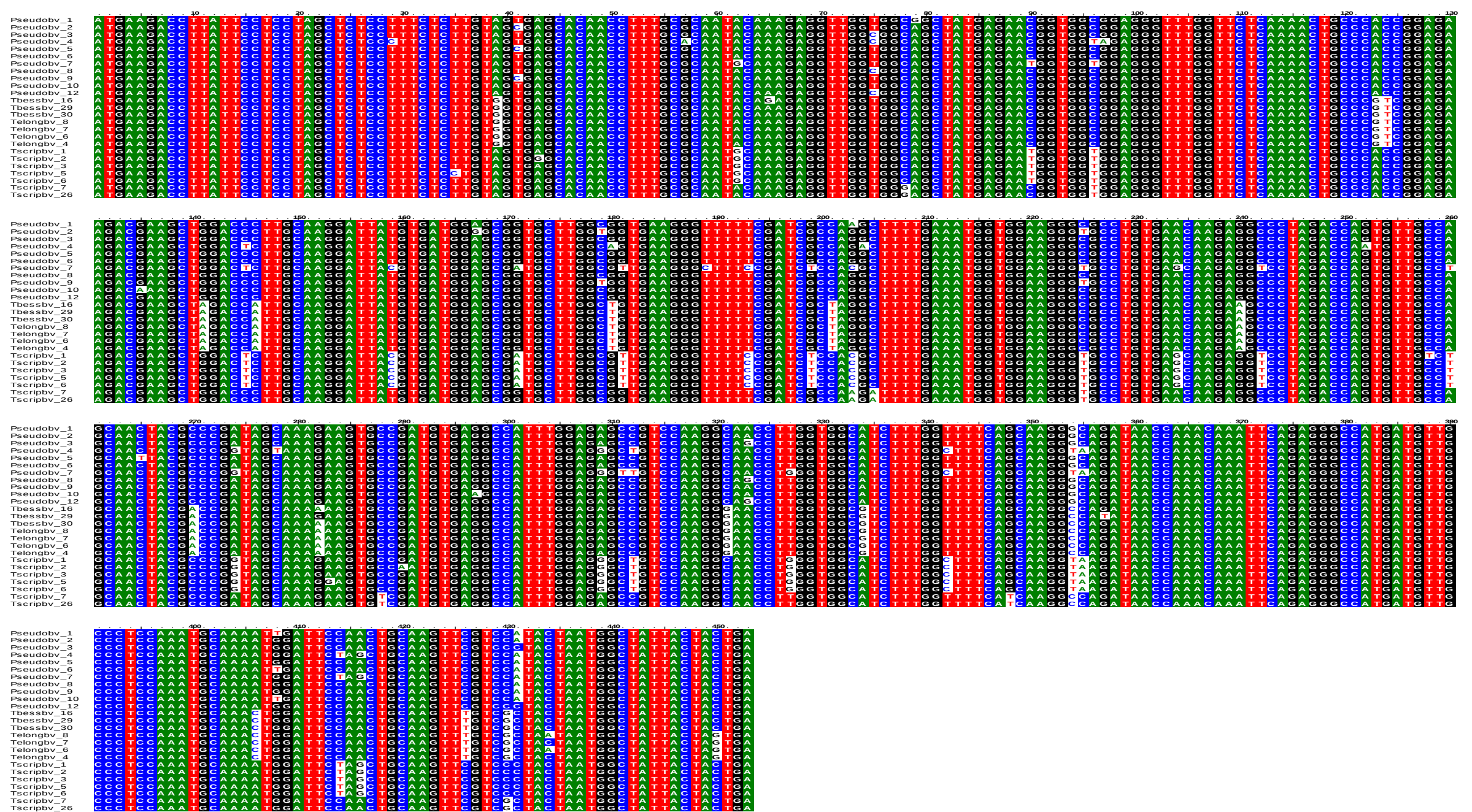
Supplementary Figure S15: Protein alignment of PINB sequences for *Pseudoroegneria spicata*, *Psathyrostachys juncea*, *Thinopyrum bessarabicum*, *Thinopyrum elongatum* and *Thinopyrum scribeum*. Number refers to clone number.



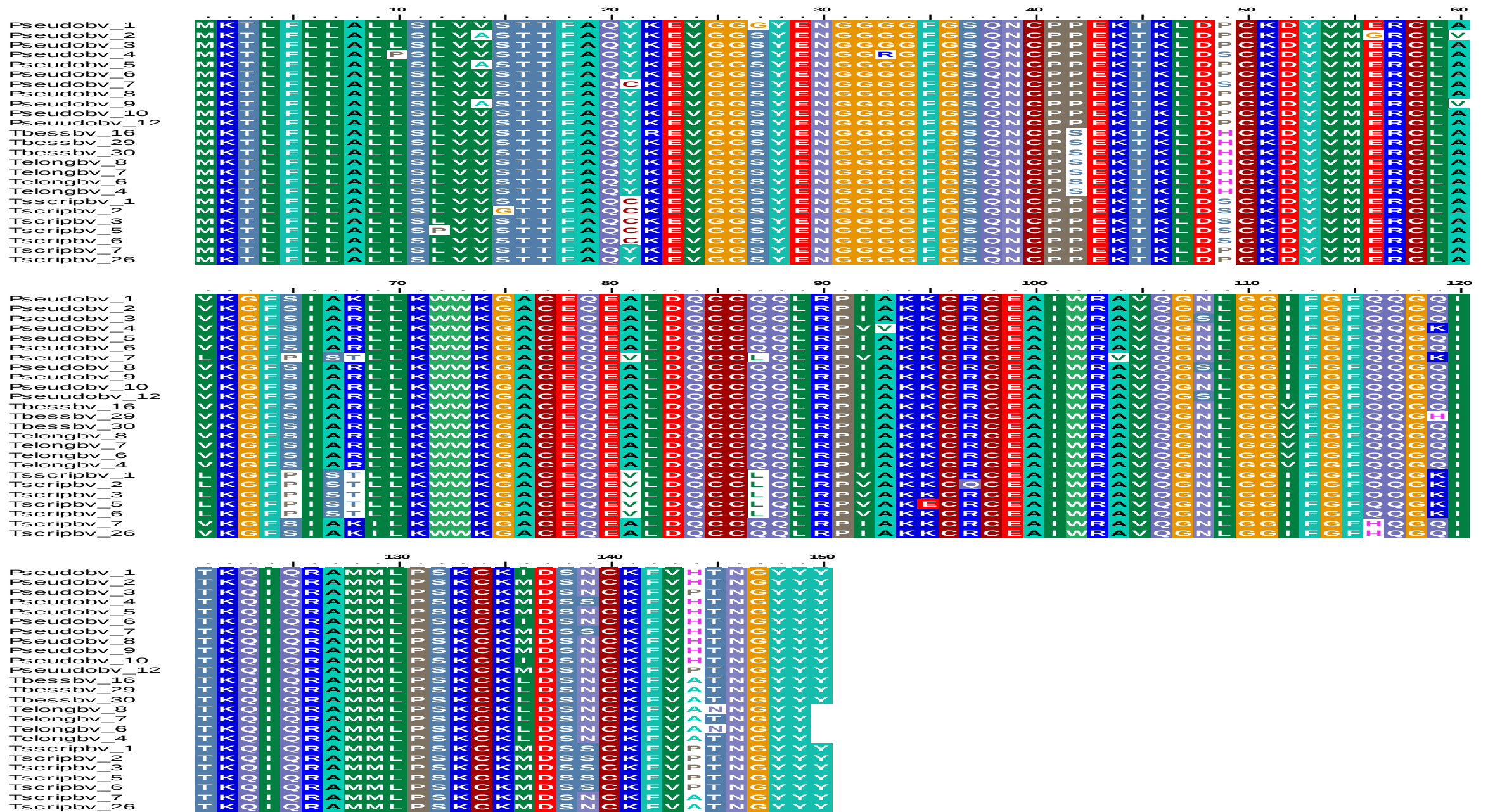
Supplementary Figure S16: Nucleotide alignment of Pinb-2 (variant) sequences for *Agropyron repens*, *Elymus repens*, *Elymus angulutus*, *Elymus nutans*, *Elymus burchan-buddae* and *Elymus sibiricus*. Number refers to clone number.



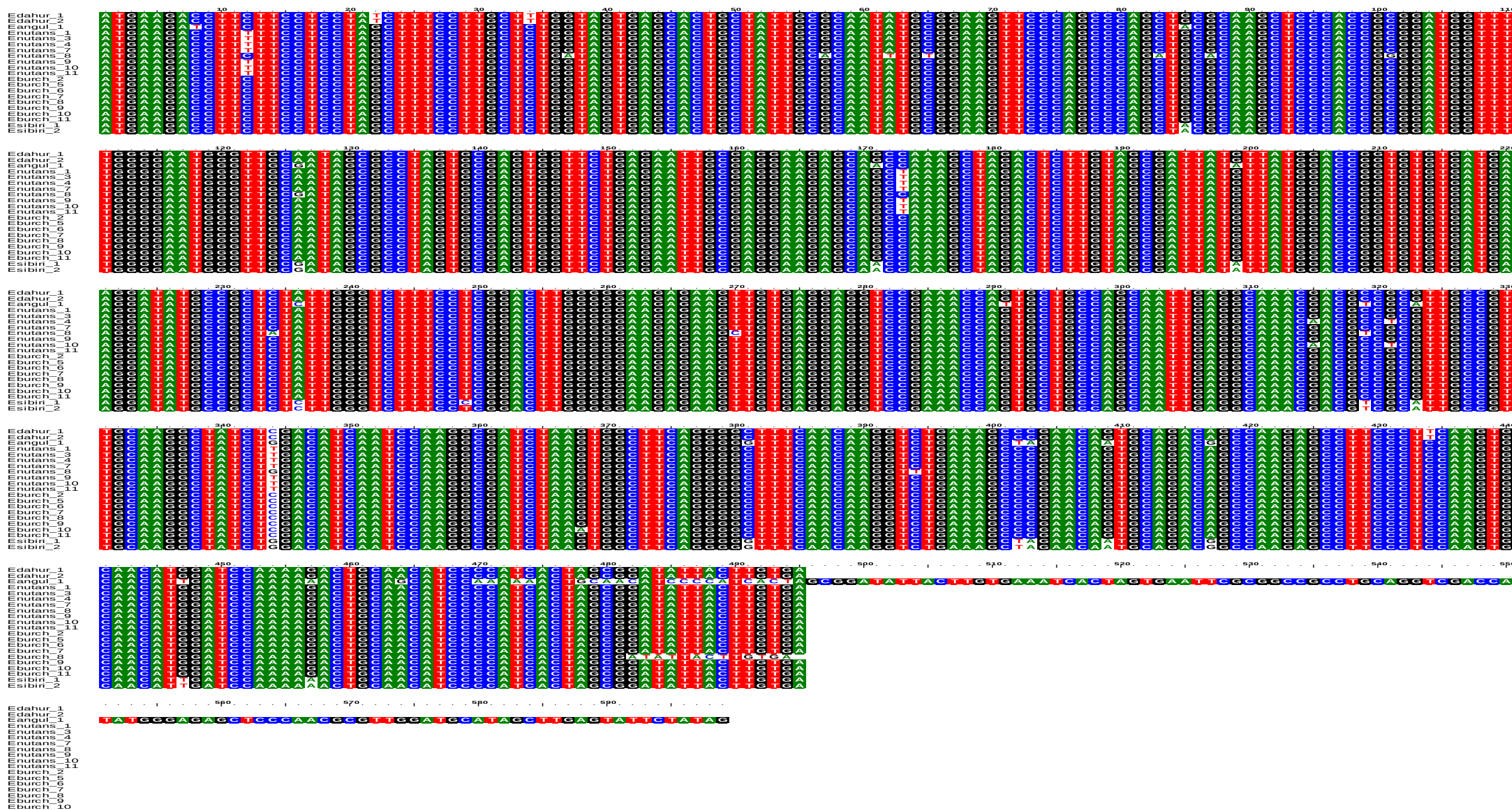
Supplementary Figure S17: Protein alignment of PINB-2 (variant) sequences for *Agropyron repens*, *Elymus repens*, *Elymus angulutus*, *Elymus nutans*, *Elymus burchan-buddae* and *Elymus sibiricus*. Number refers to clone number.



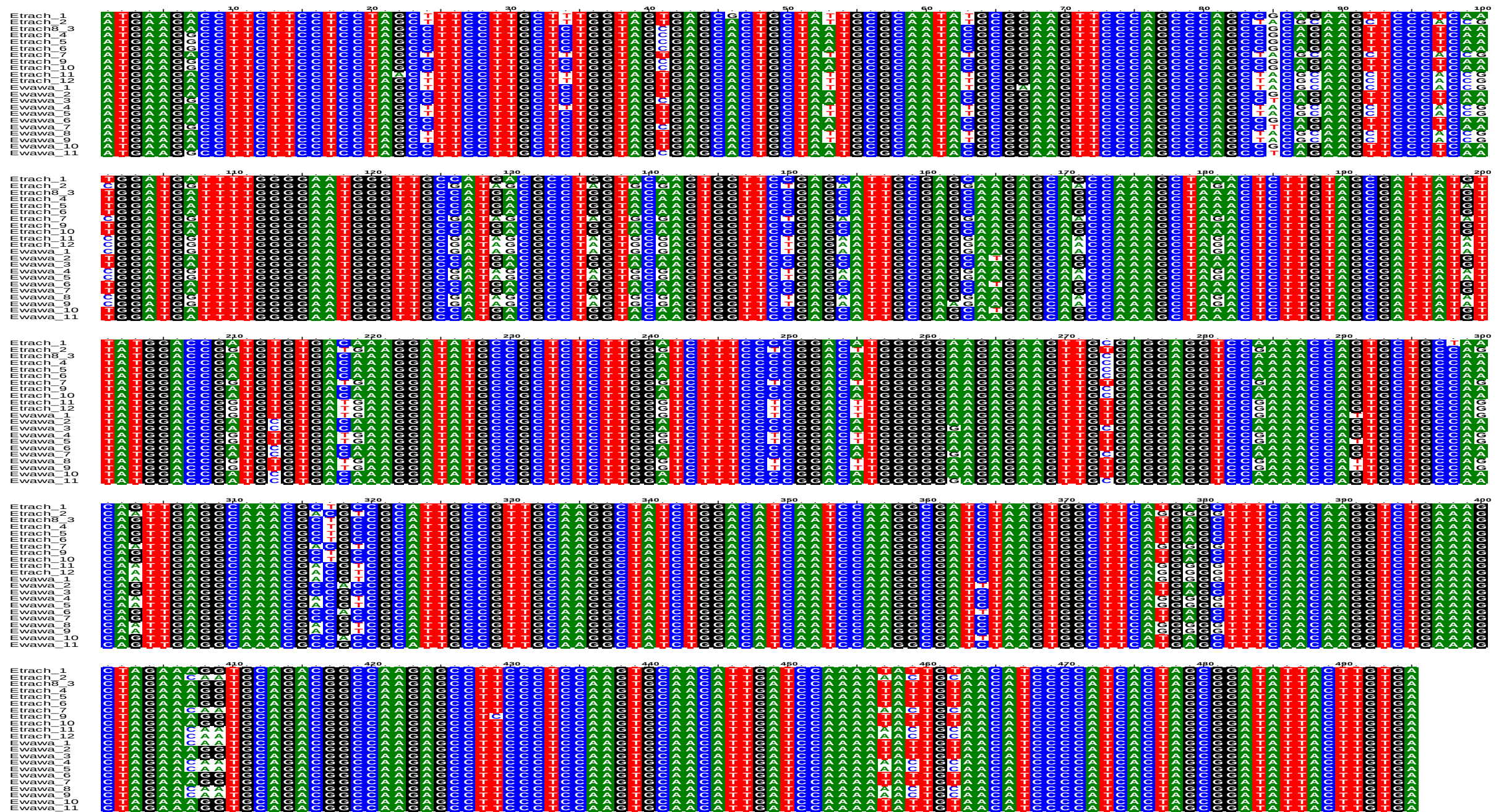
Supplementary Figure S18: Nucleotide alignment of Pinb-2 variant sequences for *Pseudoroegneria spicata*, *Thinopyrum bessarabicum*, *Thinopyrum elongatum*, and *Thinopyrum scribeum*. Number refers to clone number.



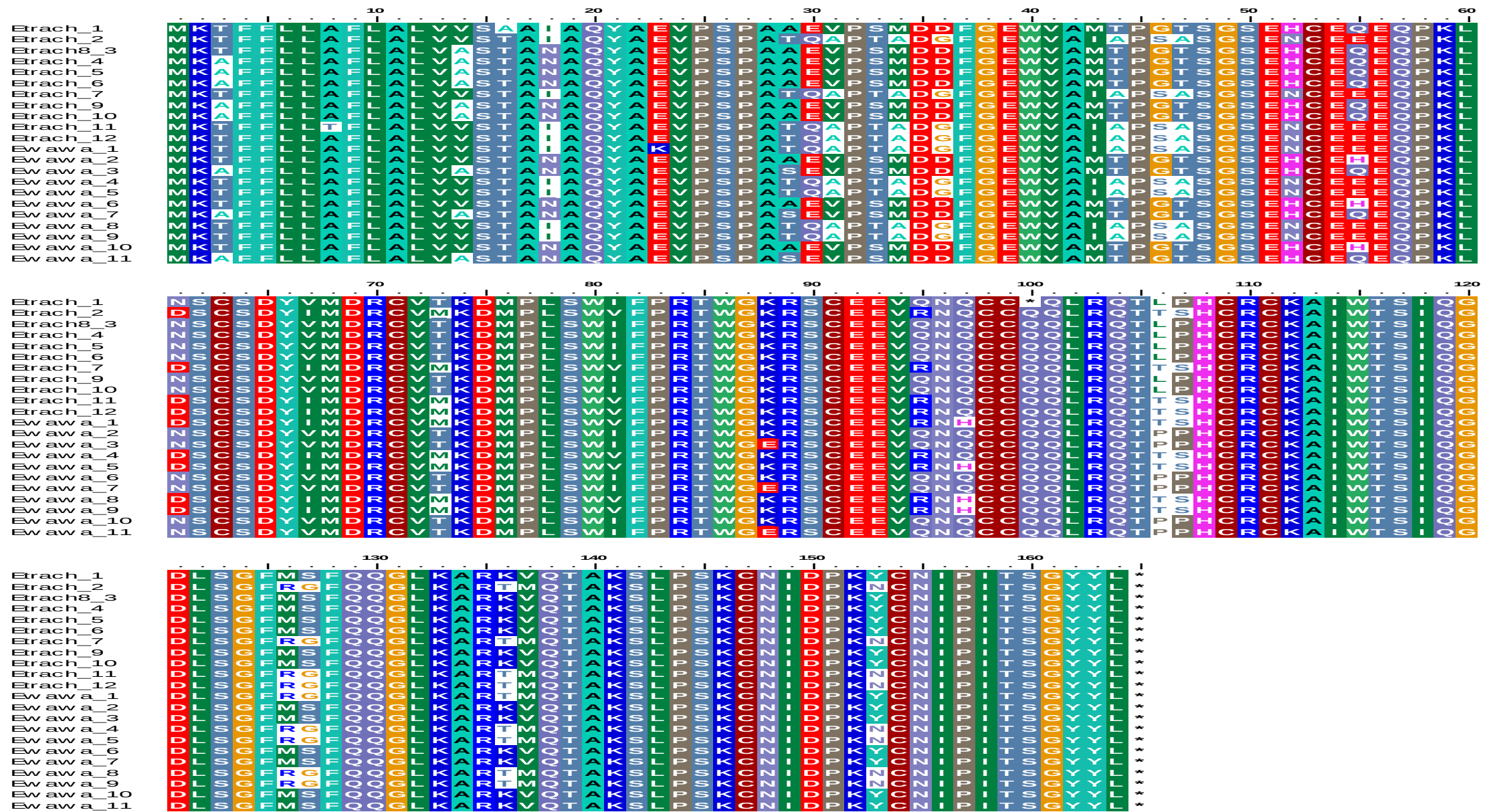
Supplementary Figure S19: Protein alignment of PINB-2 variant sequences for *Pseudoroegneria spicata*, *Thinopyrum bessarabicum*, *Thinopyrum elongatum*, and *Thinopyrum scribeum*. Number refers to clone number.



Supplementary Figure S20: Nucleotide alignment of *Gsp-1* sequences for *Elymus dahuricus*, *Elymus angulutus*, *Elymus nutans*, *Elymus burchan-buddae*, and *Elymus sibiricus*. Number refers to clone number.



Supplementary Figure S22: Nucleotide alignment of *Gsp-1* sequences for *Elymus trachycaulus* subsp. *subsecundus* and *Elymus wawawaiensis*. Number refers to clone number.



Supplementary Figure S23: Protein alignment of GSP1 sequences for *Elymus trachycaulus* subsp. *subsecundus* and *Elymus wawawaiensis*. Number refers to clone number.