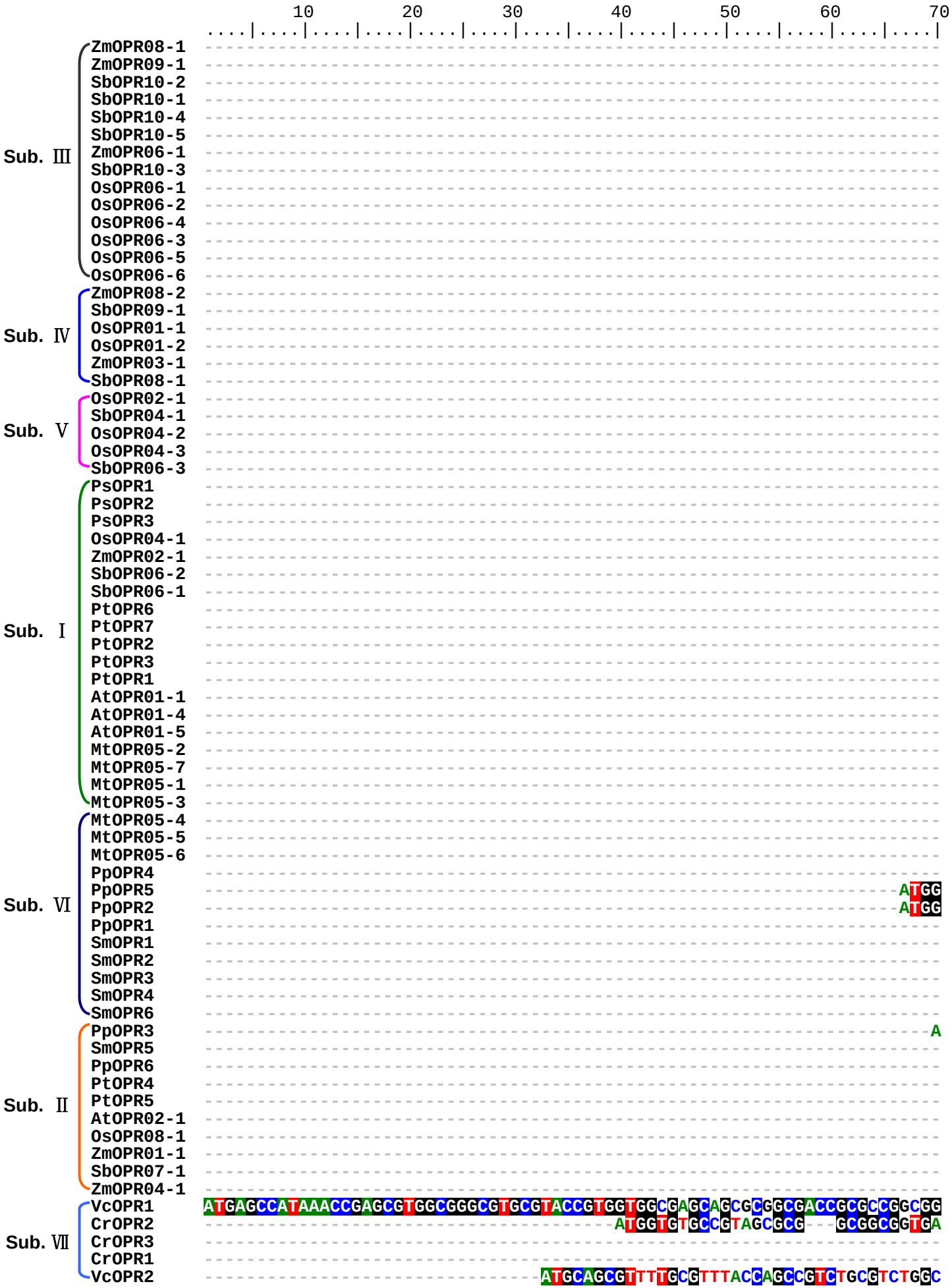
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OsOPR06-3
OsOPR06-5
OsOPR06-6
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SbOPR09-1
OsOPR01-1
OsOPR01-2
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SbOPR08-1
Sub. Ⅴ
OsOPR02-1
SbOPR04-1
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OsOPR04-3
SbOPR06-3
Sub. Ⅰ
PsOPR1
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PsOPR3
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SbOPR06-2
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PtOPR7
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Sub. Ⅵ
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MtOPR05-5
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PpOPR4
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SmOPR1
SmOPR2
SmOPR3
SmOPR4
SmOPR6
Sub. Ⅱ
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SmOPR5
PpOPR6
PtOPR4
PtOPR5
AtOPR02-1
OsOPR08-1
ZmOPR01-1
SbOPR07-1
ZmOPR04-1
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CrOPR2
CrOPR3
CrOPR1
VcOPR2
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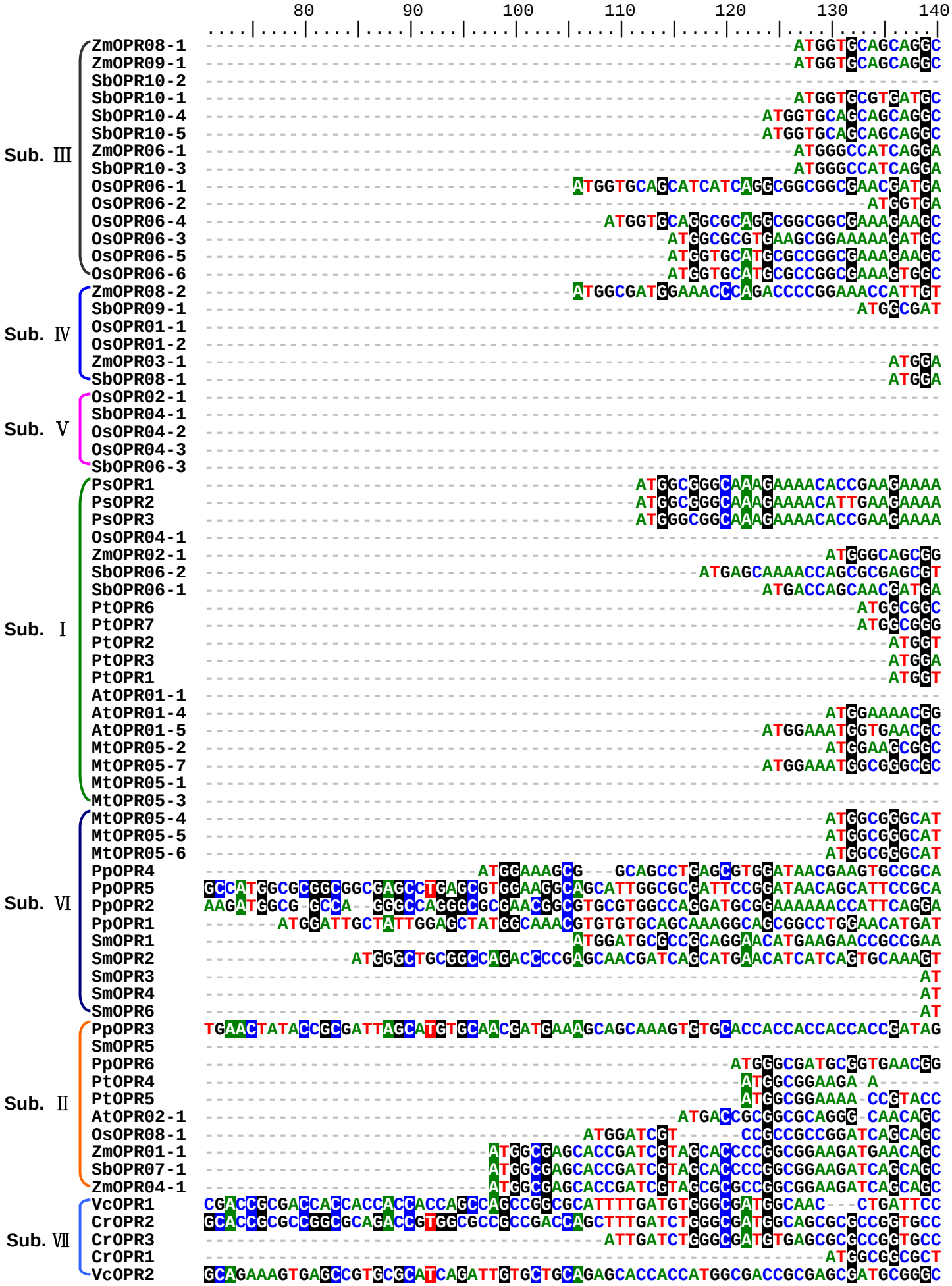
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SbOPR10-3
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Sub. Ⅴ
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SbOPR06-3
Sub. Ⅰ
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PsOPR2
PsOPR3
OsOPR04-1
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SbOPR06-1
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PtOPR7
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AtOPR01-1
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MtOPR05-5
MtOPR05-6
PpOPR4
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PpOPR1
SmOPR1
SmOPR2
SmOPR3
SmOPR4
SmOPR6
Sub. Ⅱ
PpOPR3
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PpOPR6
PtOPR4
PtOPR5
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OsOPR08-1
ZmOPR01-1
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CrOPR2
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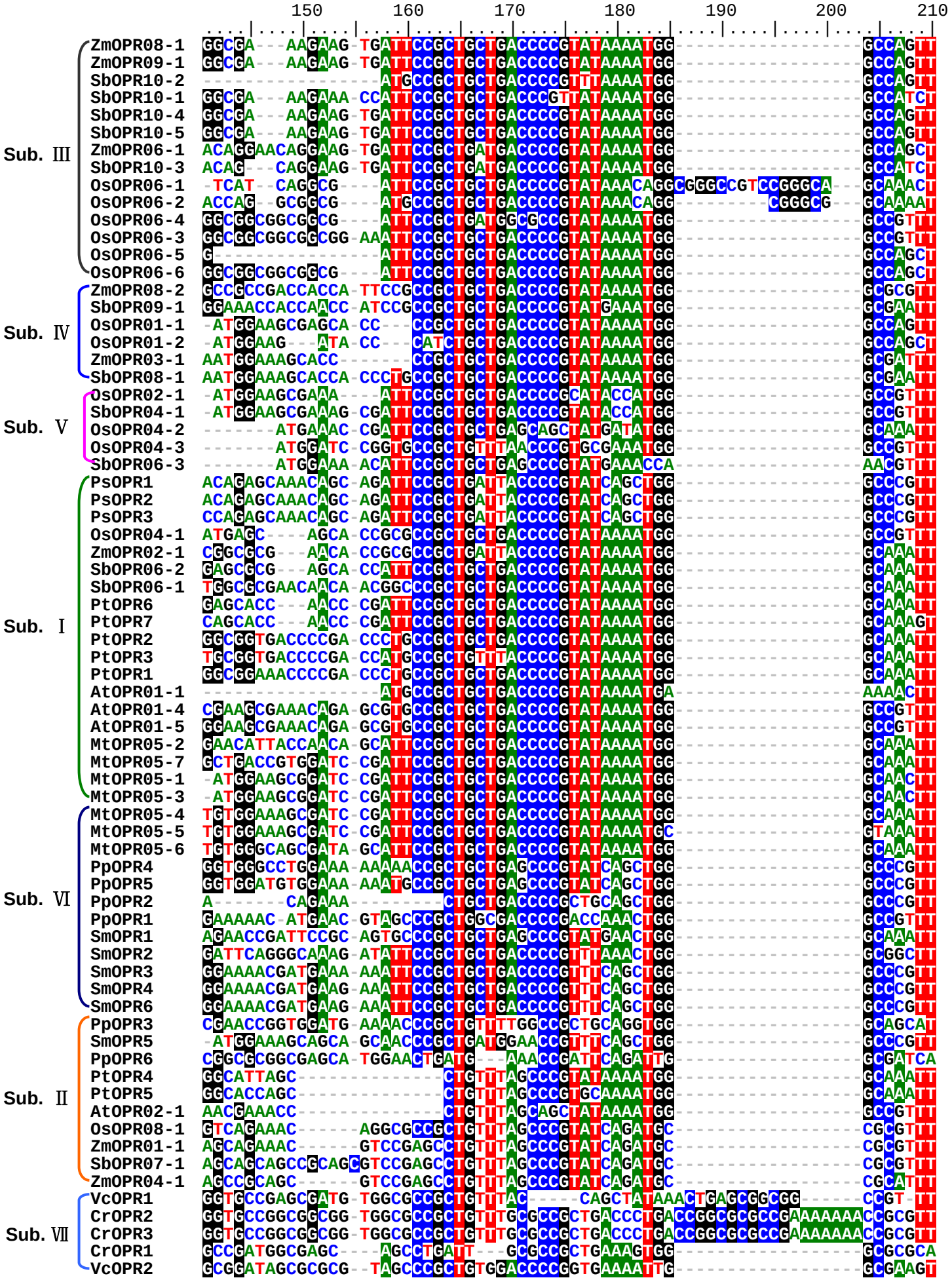
VcOPR2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SbOPR10-3
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OsOPR01-2
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SbOPR08-1
Sub. Ⅴ
OsOPR02-1
SbOPR04-1
OsOPR04-2
OsOPR04-3
SbOPR06-3
Sub. Ⅰ
PsOPR1
PsOPR2
PsOPR3
OsOPR04-1
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SbOPR06-2
SbOPR06-1
PtOPR6
PtOPR7
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MtOPR05-6
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SmOPR1
SmOPR2
SmOPR3
SmOPR4
SmOPR6
Sub. Ⅱ
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PpOPR6
PtOPR4
PtOPR5
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OsOPR08-1
ZmOPR01-1
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ZmOPR04-1
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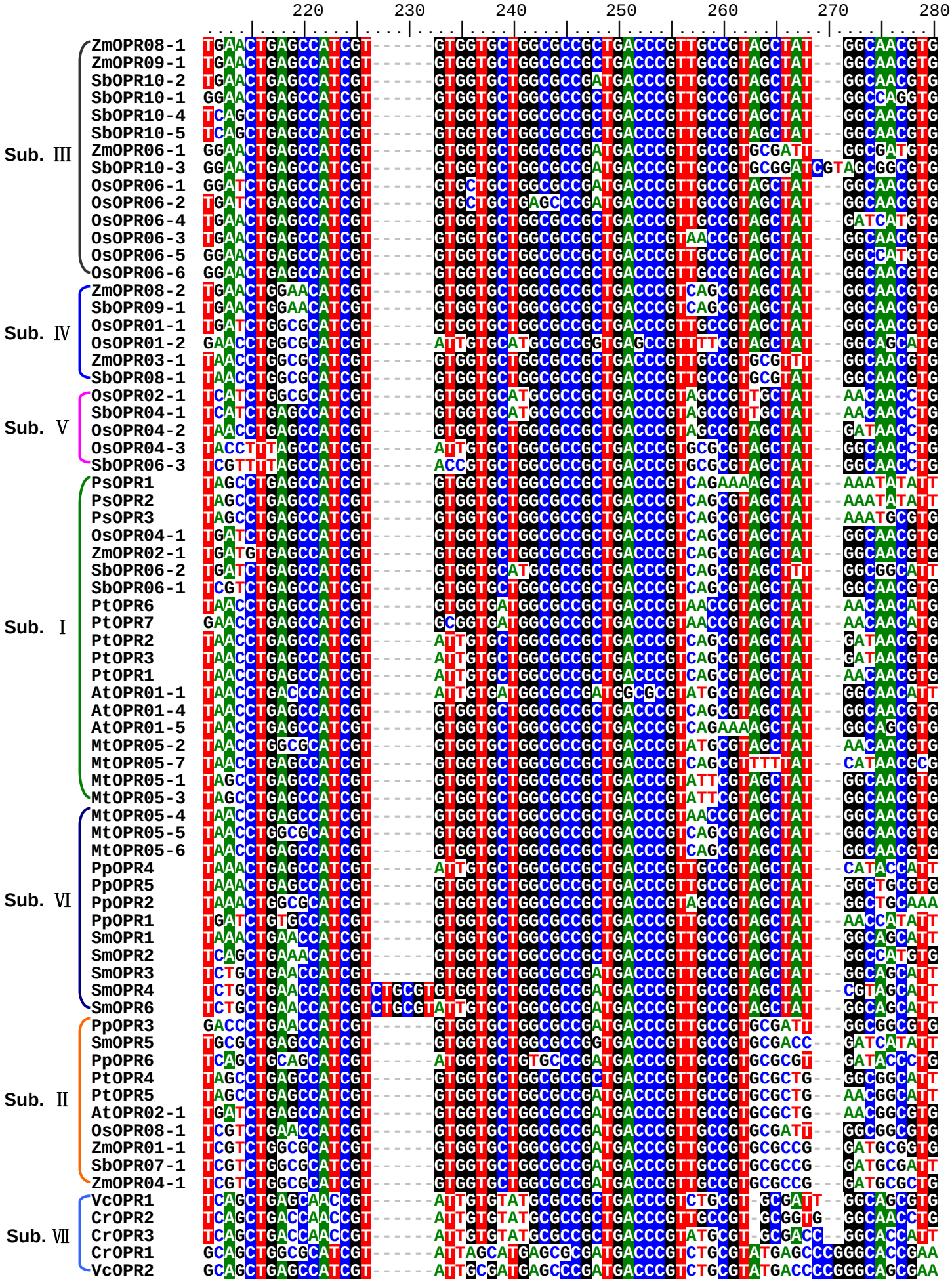
CrOPR2
CrOPR3
CrOPR1
VcOPR2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OsOPR06-2
OsOPR06-4
OsOPR06-3
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OsOPR06-6
Sub. Ⅳ
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SbOPR08-1
Sub. Ⅴ
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SbOPR04-1
OsOPR04-2
OsOPR04-3
SbOPR06-3
Sub. Ⅰ
PsOPR1
PsOPR2
PsOPR3
OsOPR04-1
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SbOPR06-1
PtOPR6
PtOPR7
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MtOPR05-7
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MtOPR05-3
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MtOPR05-5
MtOPR05-6
PpOPR4
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SmOPR1
SmOPR2
SmOPR3
SmOPR4
SmOPR6
Sub. Ⅱ
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PpOPR6
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PtOPR5
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OsOPR08-1
ZmOPR01-1
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CrOPR2
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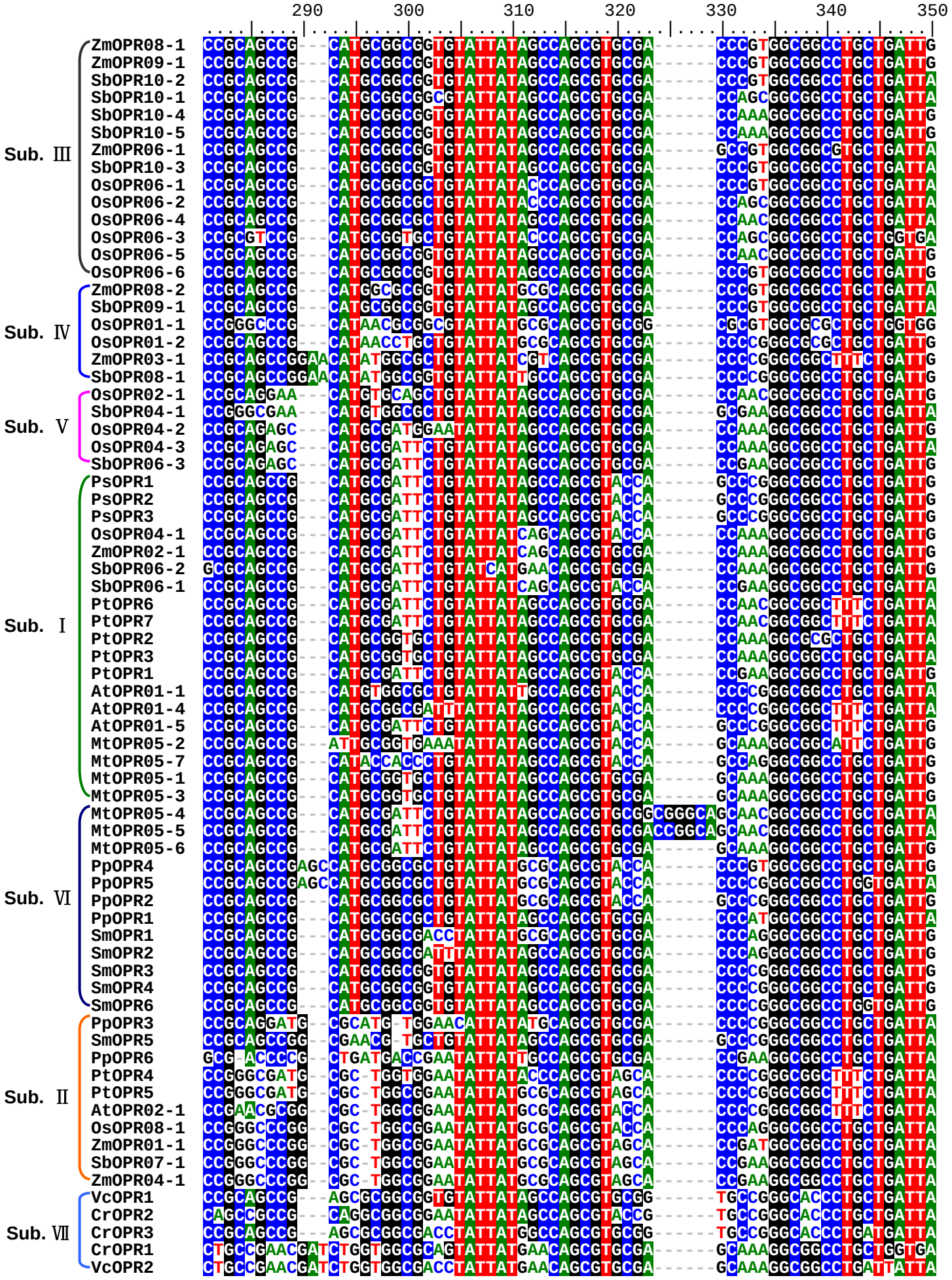
CrOPR1
VcOPR2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SbOPR10-3
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OsOPR06-2
OsOPR06-4
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OsOPR06-5
OsOPR06-6
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SbOPR08-1
Sub. Ⅴ
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SbOPR04-1
OsOPR04-2
OsOPR04-3
SbOPR06-3
Sub. Ⅰ
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PsOPR2
PsOPR3
OsOPR04-1
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SbOPR06-1
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PtOPR7
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MtOPR05-7
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MtOPR05-3
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MtOPR05-5
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SmOPR2
SmOPR3
SmOPR4
SmOPR6
Sub. Ⅱ
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SmOPR5
PpOPR6
PtOPR4
PtOPR5
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OsOPR08-1
ZmOPR01-1
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CrOPR2
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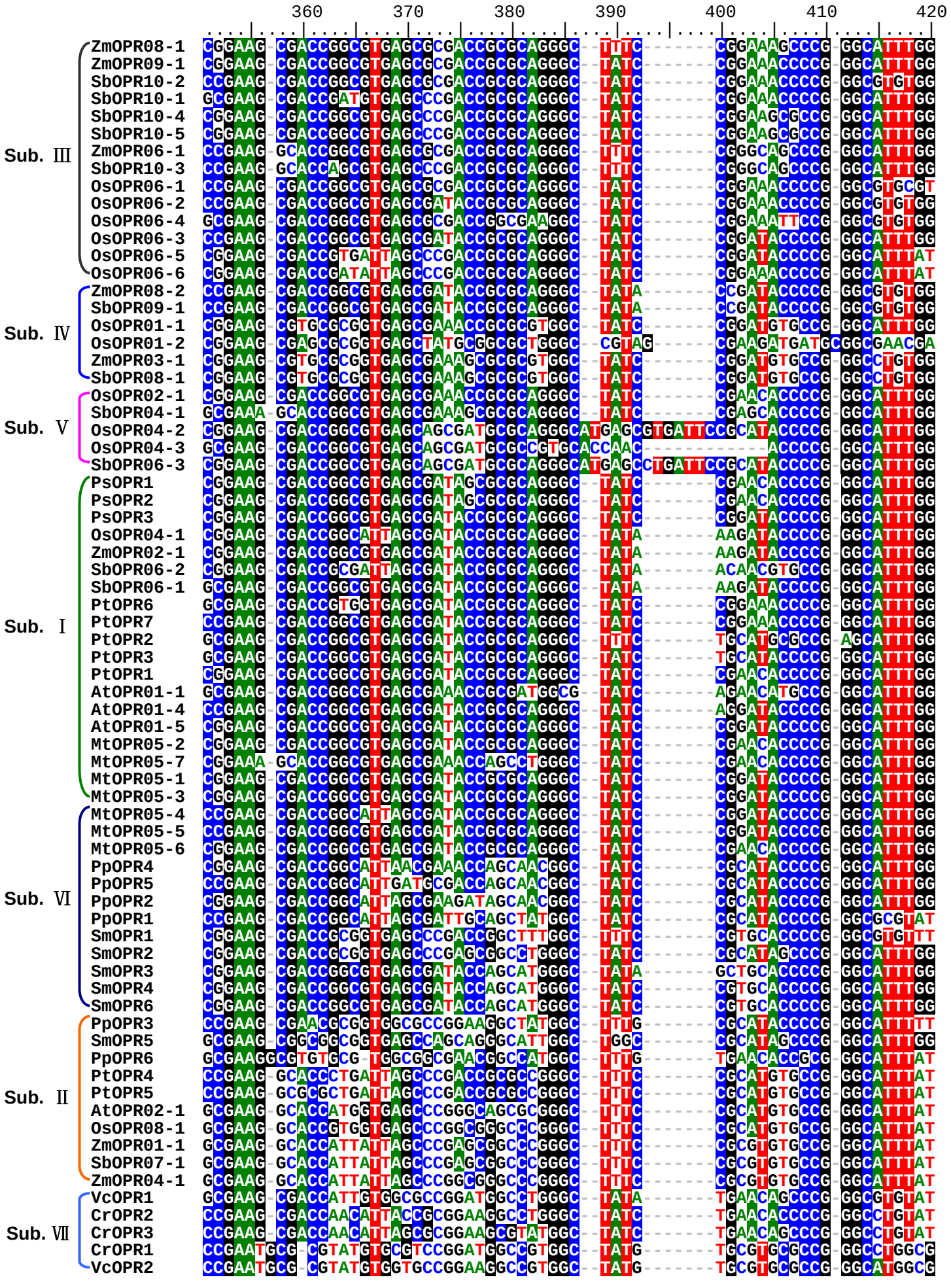
CrOPR1
VcOPR2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SbOPR10-3
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OsOPR06-4
OsOPR06-3
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OsOPR06-6
Sub. Ⅳ
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SbOPR09-1
OsOPR01-1
OsOPR01-2
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SbOPR08-1
Sub. Ⅴ
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SbOPR04-1
OsOPR04-2
OsOPR04-3
SbOPR06-3
Sub. Ⅰ
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PsOPR2
PsOPR3
OsOPR04-1
ZmOPR02-1
SbOPR06-2
SbOPR06-1
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PtOPR7
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MtOPR05-7
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MtOPR05-3
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MtOPR05-5
MtOPR05-6
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SmOPR1
SmOPR2
SmOPR3
SmOPR4
SmOPR6
Sub. Ⅱ
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SmOPR5
PpOPR6
PtOPR4
PtOPR5
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OsOPR08-1
ZmOPR01-1
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CrOPR2
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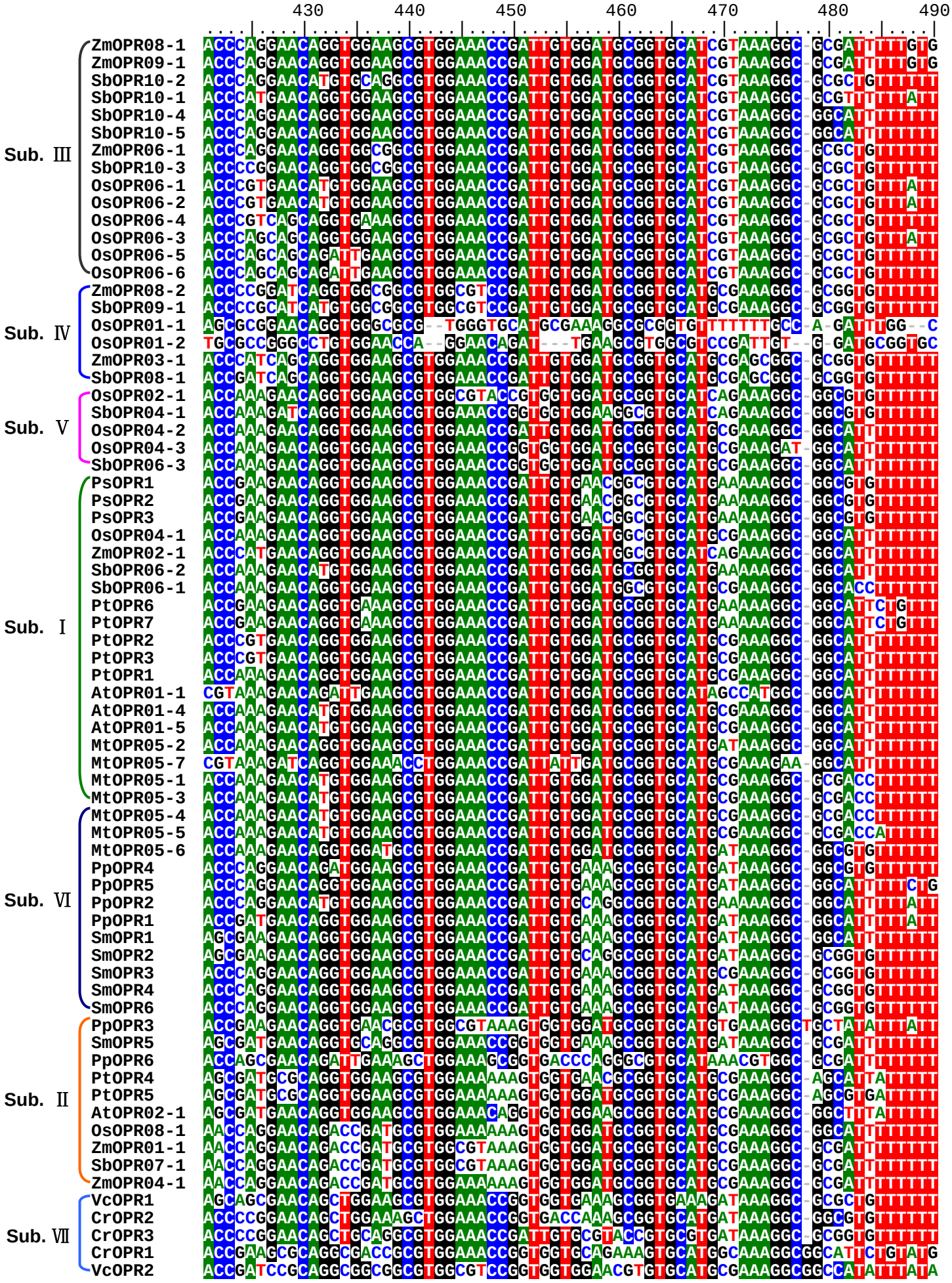
VcOPR2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SbOPR10-3
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OsOPR06-4
OsOPR06-3
OsOPR06-5
OsOPR06-6
Sub. Ⅳ
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SbOPR09-1
OsOPR01-1
OsOPR01-2
ZmOPR03-1
SbOPR08-1
Sub. Ⅴ
OsOPR02-1
SbOPR04-1
OsOPR04-2
OsOPR04-3
SbOPR06-3
Sub. Ⅰ
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PsOPR2
PsOPR3
OsOPR04-1
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SbOPR06-2
SbOPR06-1
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PtOPR7
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AtOPR01-1
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MtOPR05-7
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MtOPR05-3
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MtOPR05-5
MtOPR05-6
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PpOPR2
PpOPR1
SmOPR1
SmOPR2
SmOPR3
SmOPR4
SmOPR6
Sub. Ⅱ
PpOPR3
SmOPR5
PpOPR6
PtOPR4
PtOPR5
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OsOPR08-1
ZmOPR01-1
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CrOPR2
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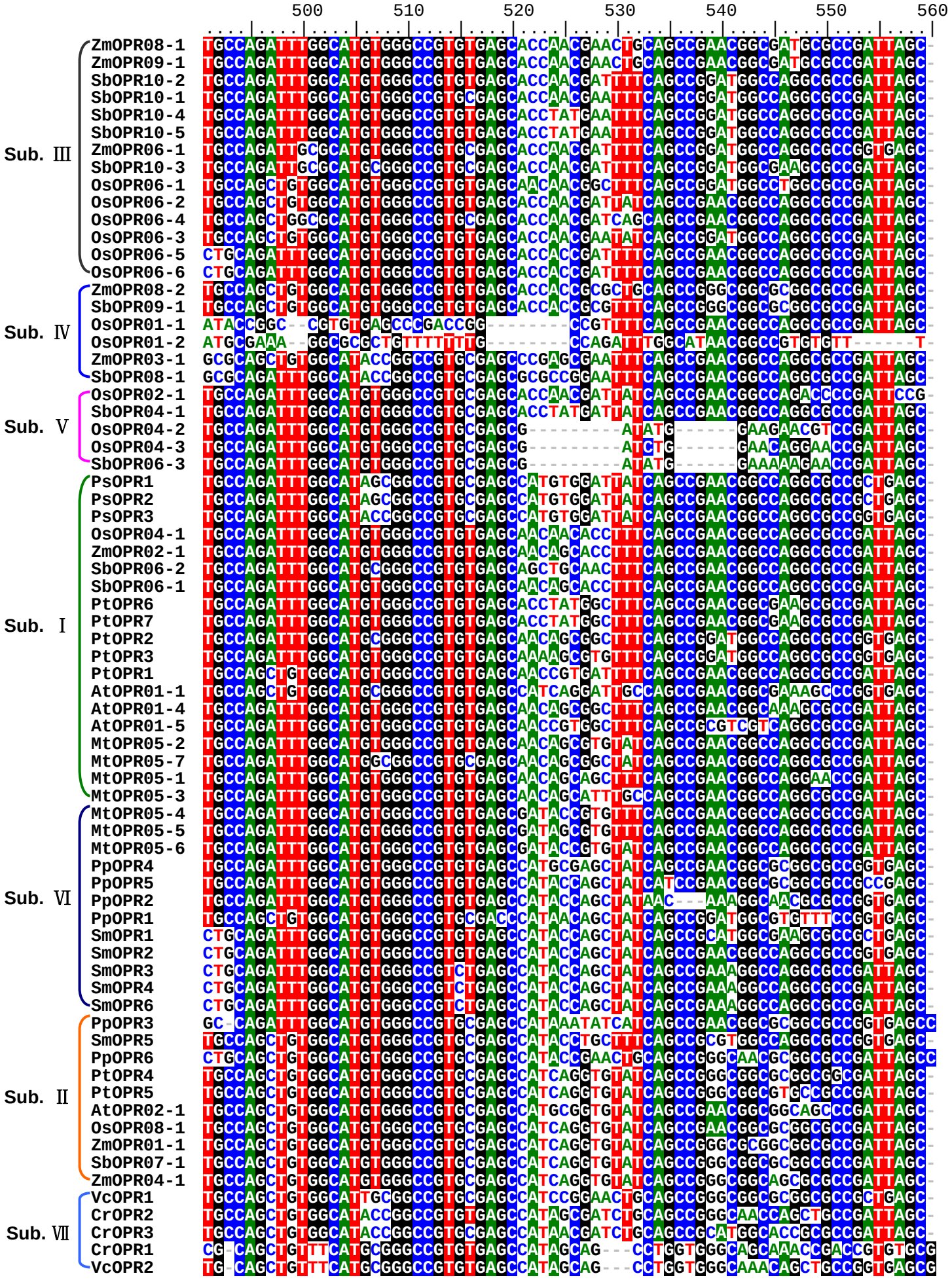
VcOPR2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SbOPR10-3
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OsOPR06-6
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OsOPR01-2
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SbOPR08-1
Sub. Ⅴ
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SbOPR04-1
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OsOPR04-3
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Sub. Ⅰ
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PsOPR2
PsOPR3
OsOPR04-1
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SbOPR06-1
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PtOPR7
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MtOPR05-3
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MtOPR05-5
MtOPR05-6
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PpOPR2
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SmOPR2
SmOPR3
SmOPR4
SmOPR6
Sub. Ⅱ
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SmOPR5
PpOPR6
PtOPR4
PtOPR5
AtOPR02-1
OsOPR08-1
ZmOPR01-1
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CrOPR2
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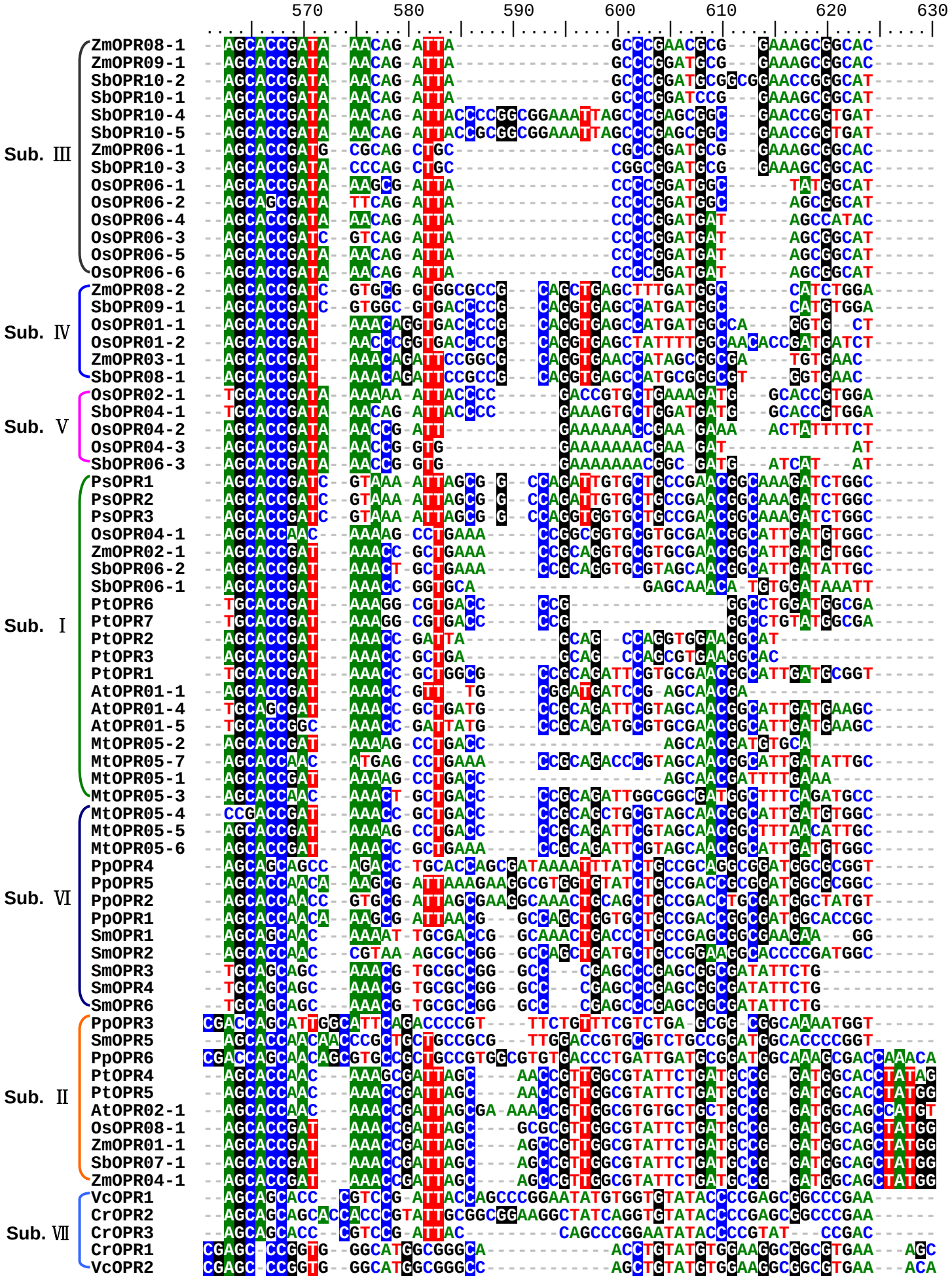
VcOPR2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SbOPR10-3
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Sub. Ⅴ
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PsOPR2
PsOPR3
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PtOPR7
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MtOPR05-6
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SmOPR2
SmOPR3
SmOPR4
SmOPR6
Sub. Ⅱ
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SmOPR5
PpOPR6
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PtOPR5
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ZmOPR01-1
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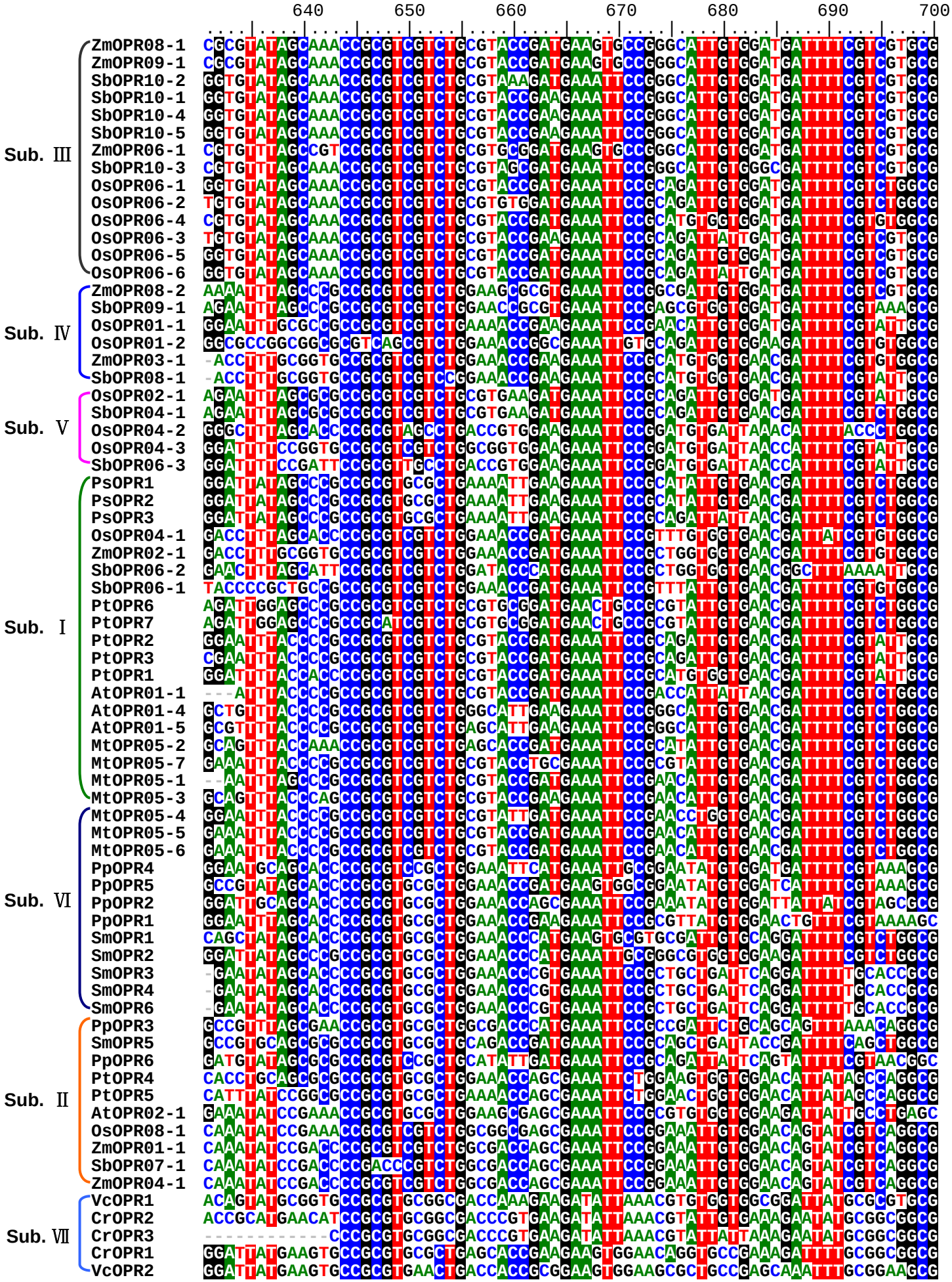
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SbOPR10-3
OsOPR06-1
OsOPR06-2
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OsOPR06-6
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SbOPR09-1
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SbOPR08-1
Sub. Ⅴ
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OsOPR04-3
SbOPR06-3
Sub. Ⅰ
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PsOPR3
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SmOPR2
SmOPR3
SmOPR4
SmOPR6
Sub. Ⅱ
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SmOPR5
PpOPR6
PtOPR4
PtOPR5
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ZmOPR01-1
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CrOPR2
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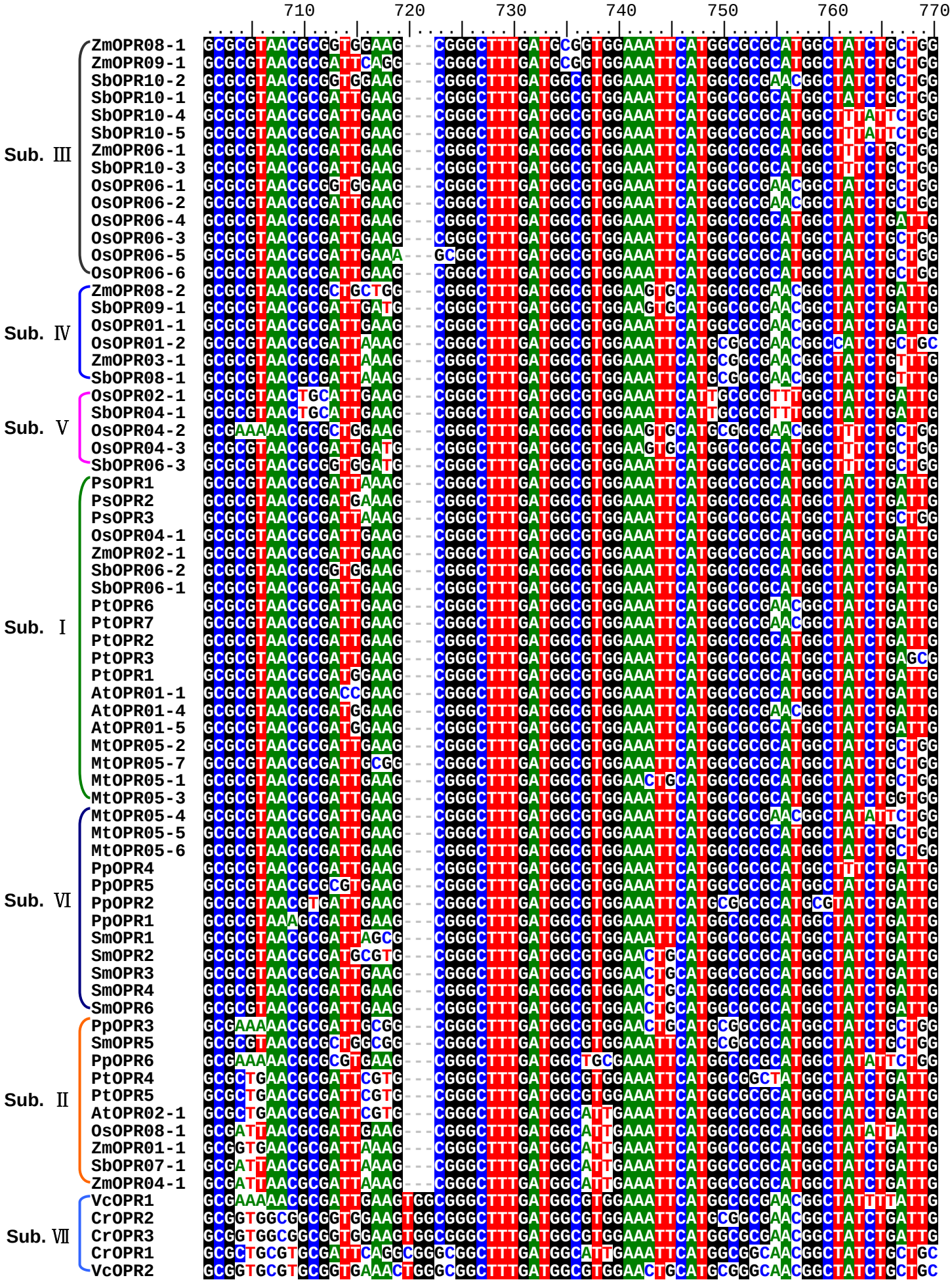
VcOPR2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ZmOPR06-1
SbOPR10-3
OsOPR06-1
OsOPR06-2
OsOPR06-4
OsOPR06-3
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OsOPR06-6
Sub. Ⅳ
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SbOPR09-1
OsOPR01-1
OsOPR01-2
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SbOPR08-1
Sub. Ⅴ
OsOPR02-1
SbOPR04-1
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OsOPR04-3
SbOPR06-3
Sub. Ⅰ
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PsOPR2
PsOPR3
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SbOPR06-1
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SmOPR2
SmOPR3
SmOPR4
SmOPR6
Sub. Ⅱ
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SmOPR5
PpOPR6
PtOPR4
PtOPR5
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OsOPR08-1
ZmOPR01-1
SbOPR07-1
ZmOPR04-1
Sub. Ⅶ
VcOPR1
CrOPR2
CrOPR3
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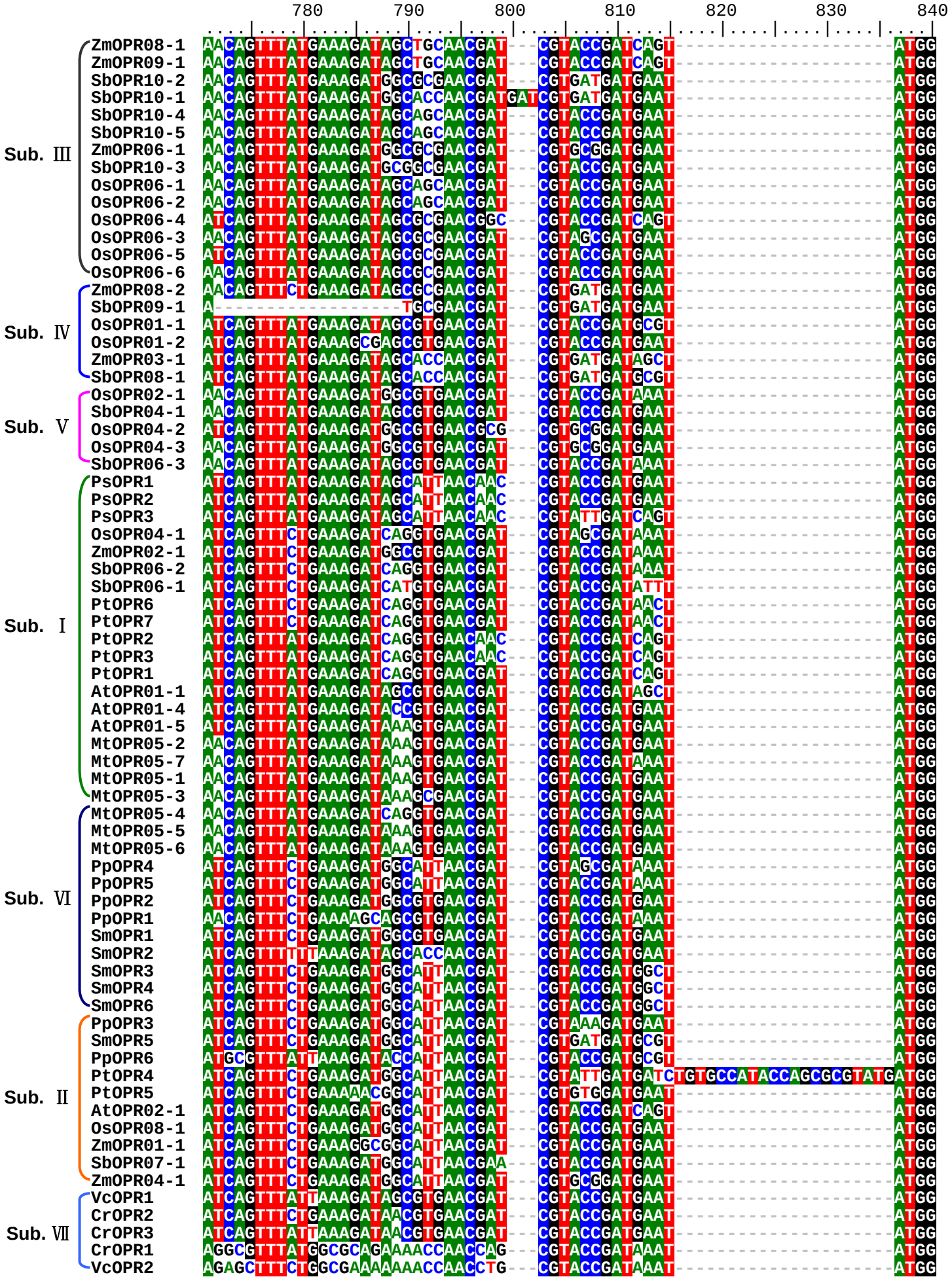
VcOPR2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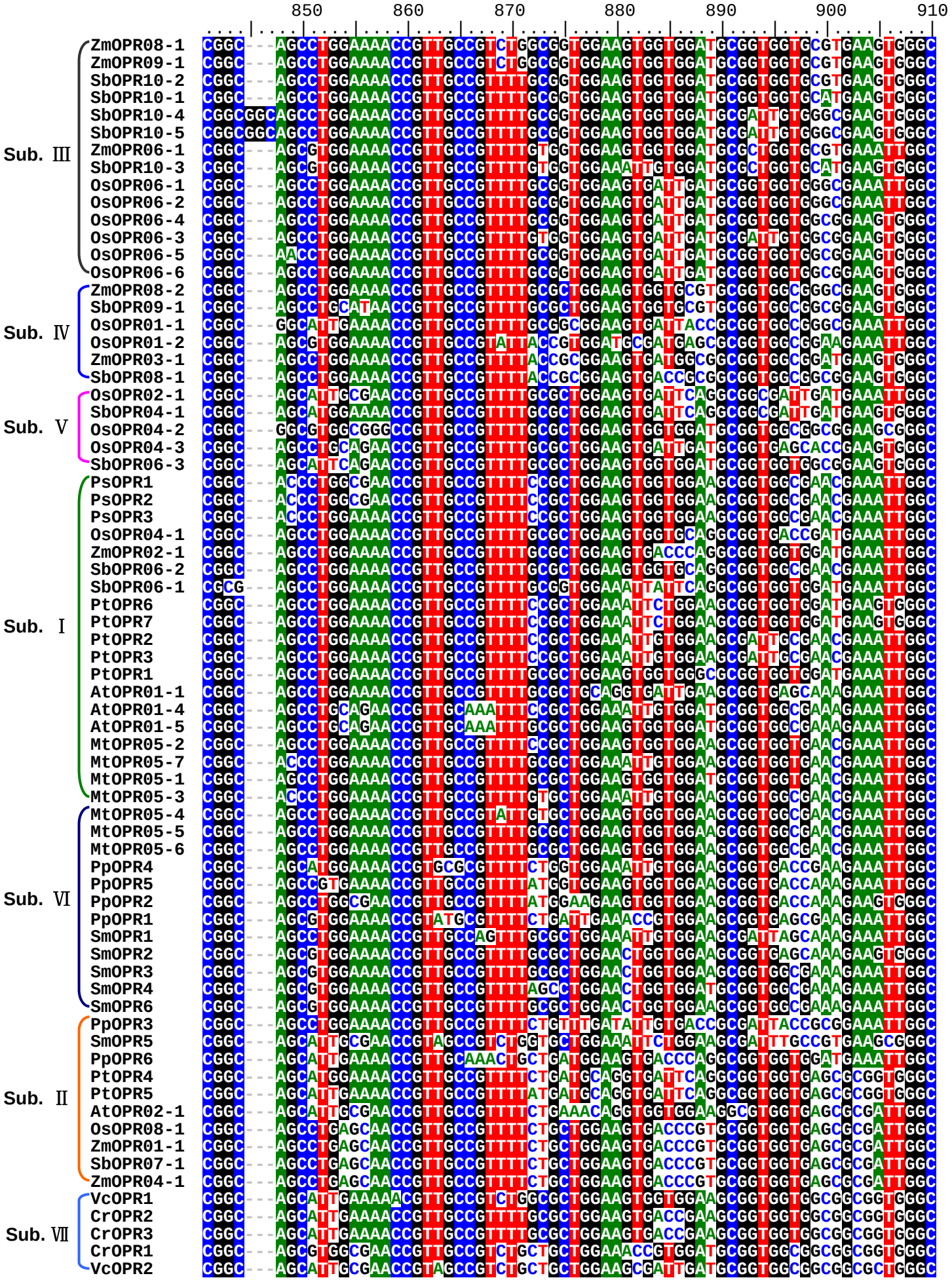
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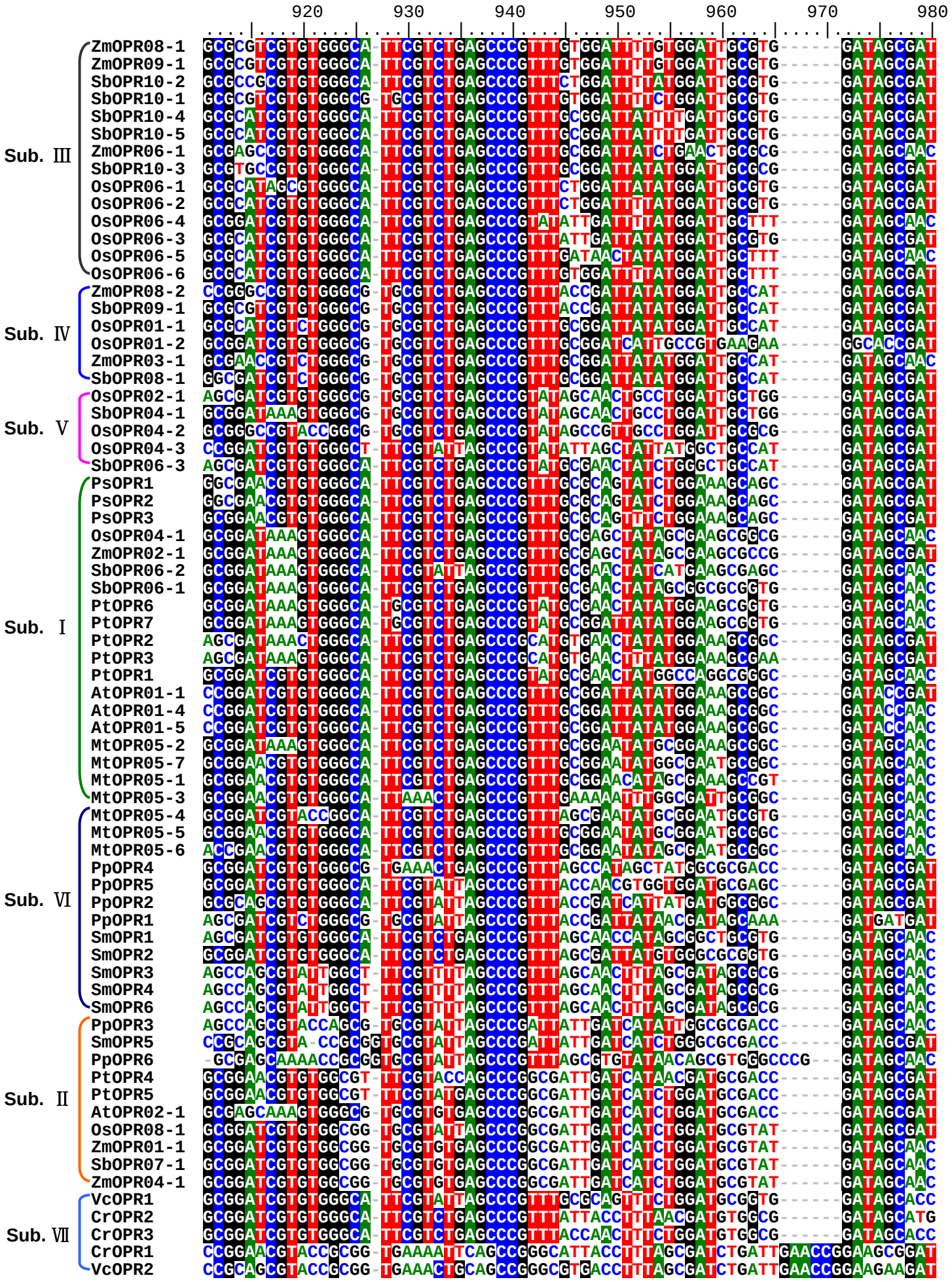
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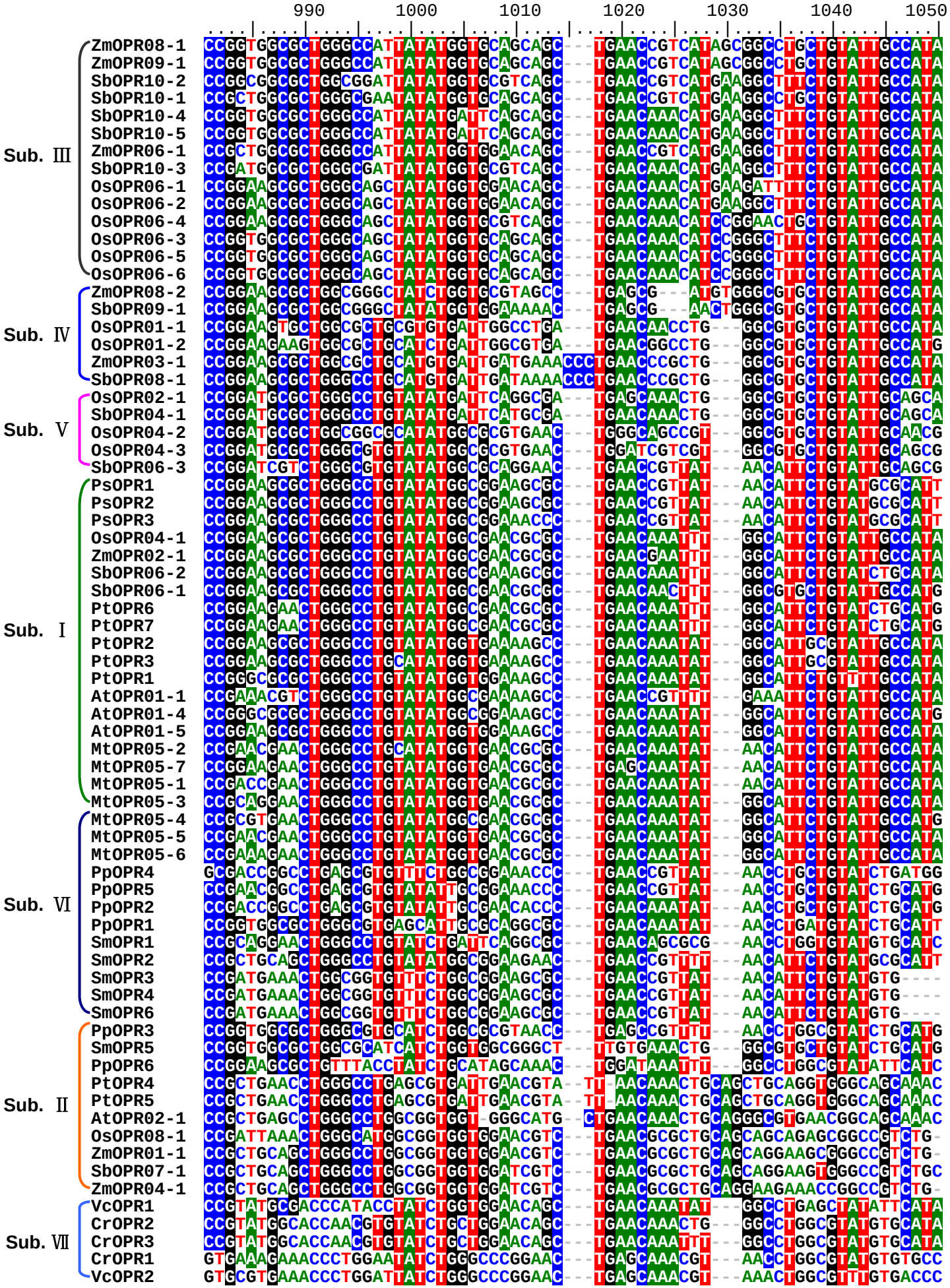
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PsOPR2
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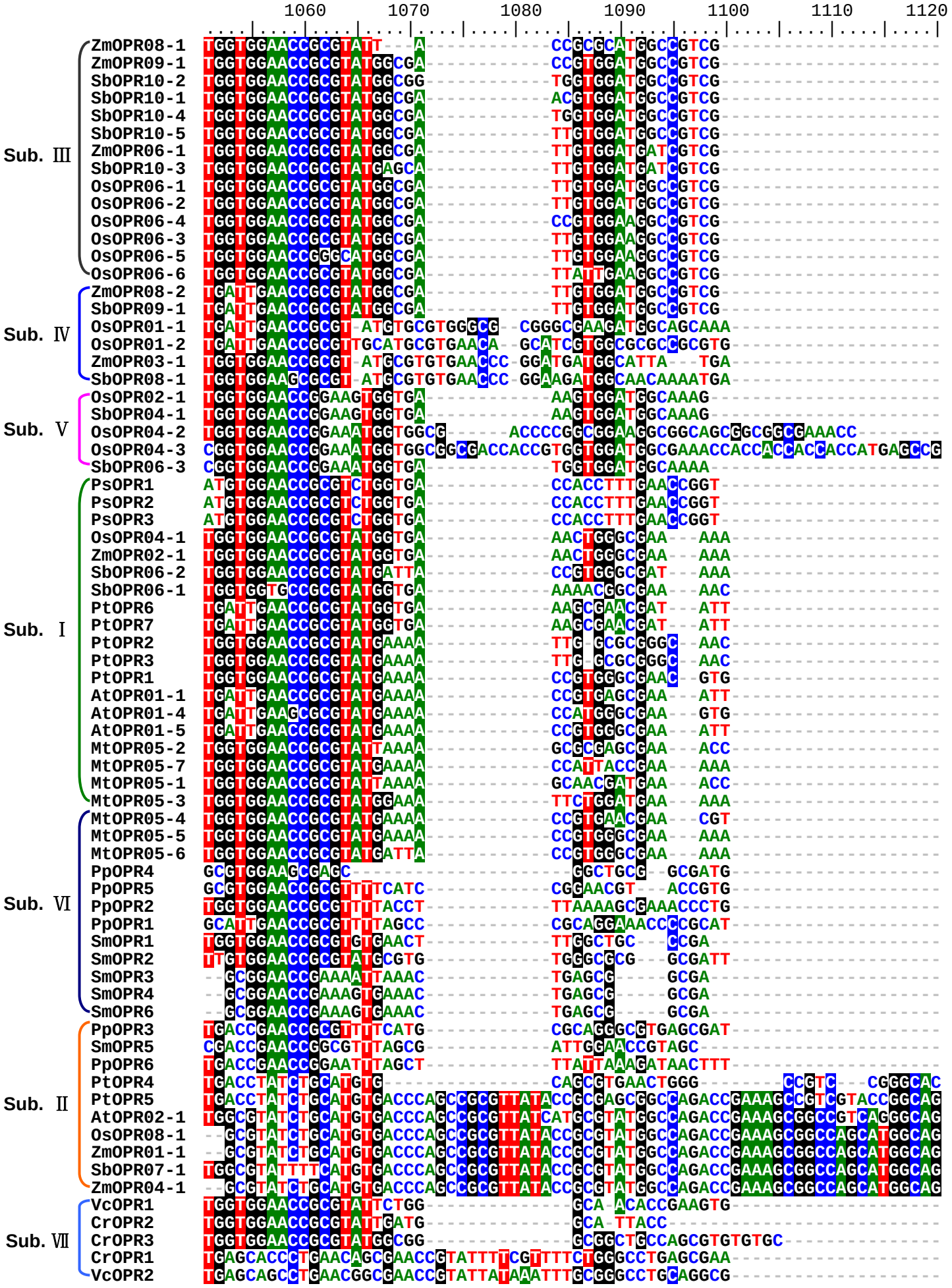
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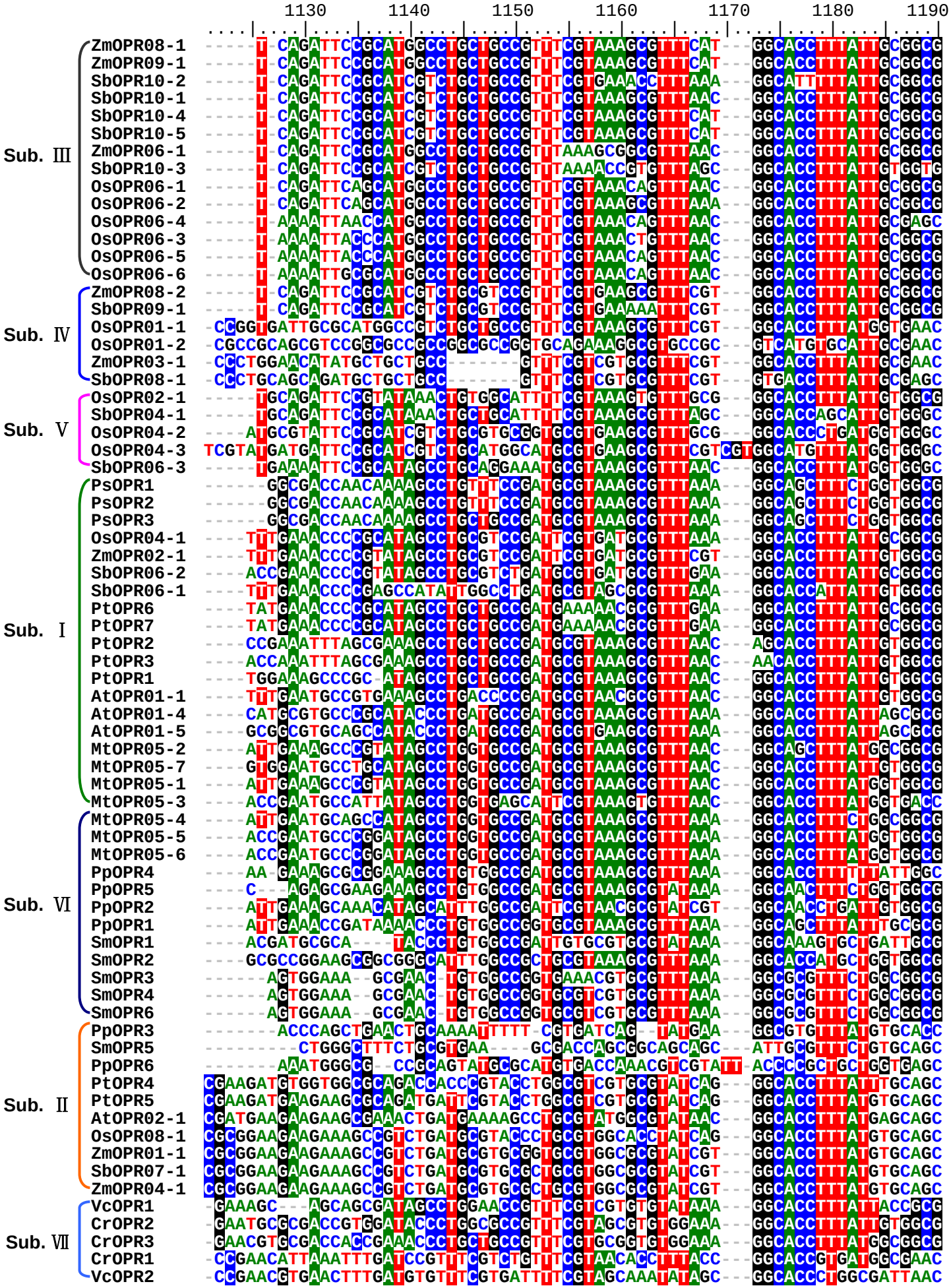
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PsOPR2
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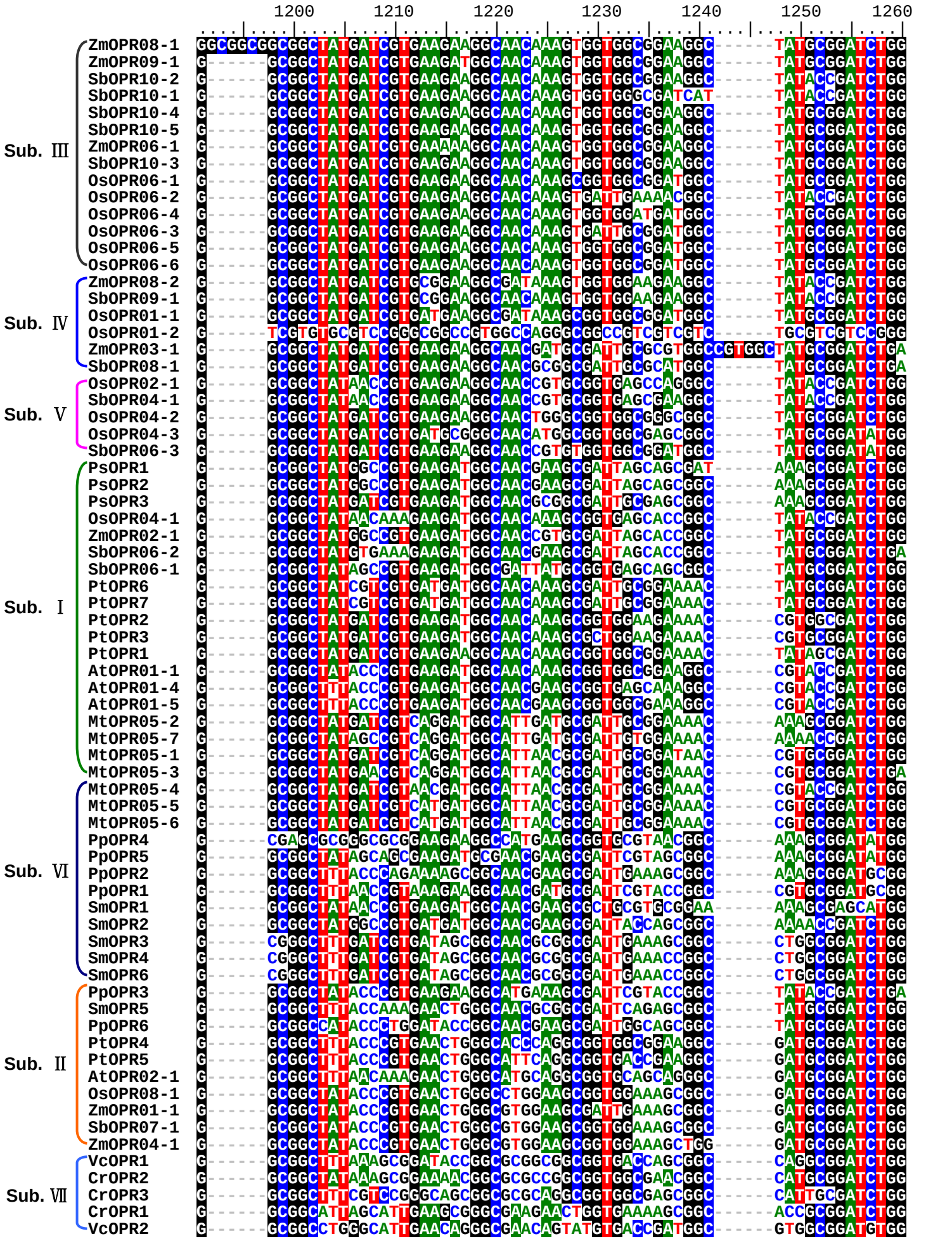
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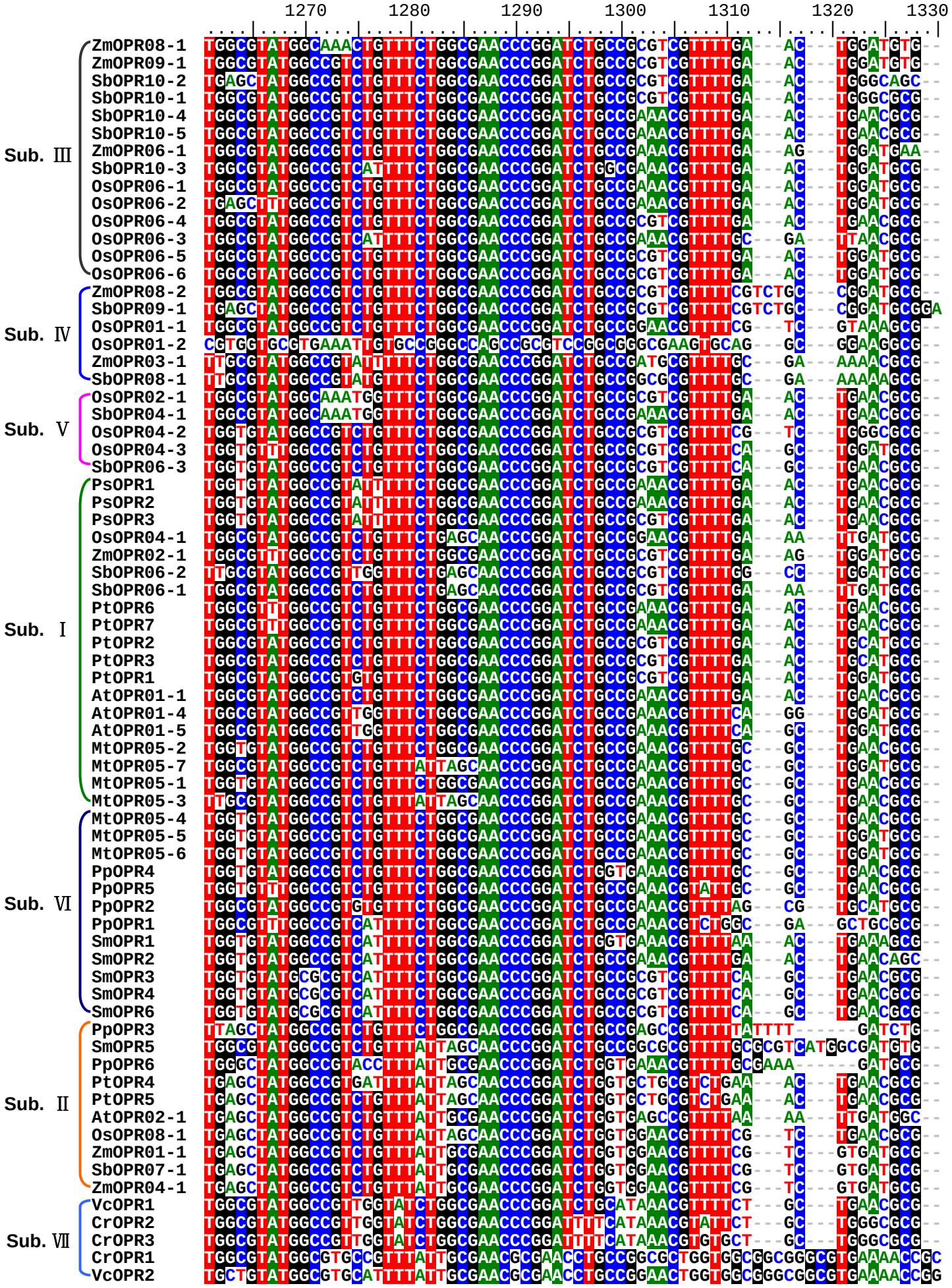
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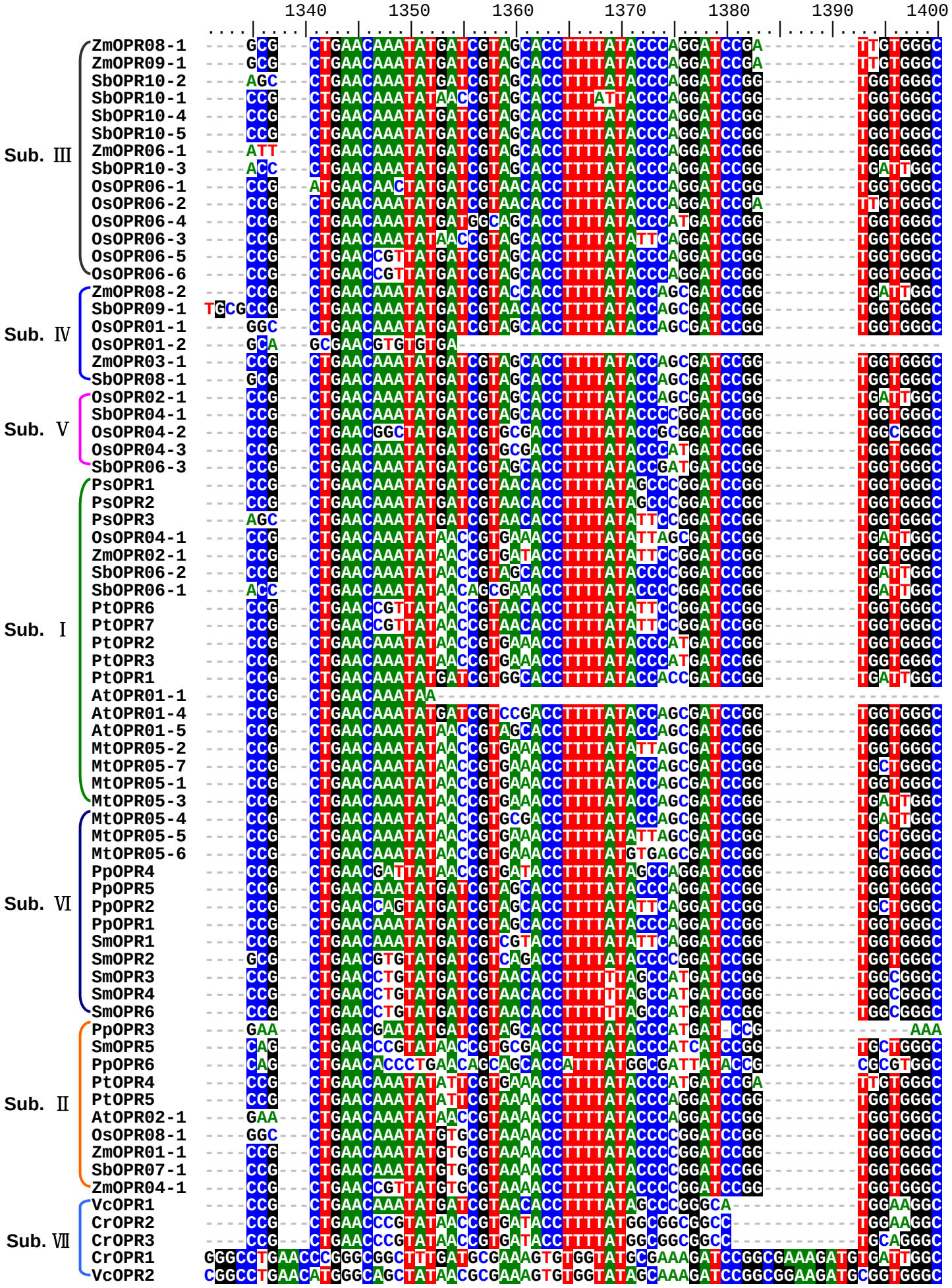
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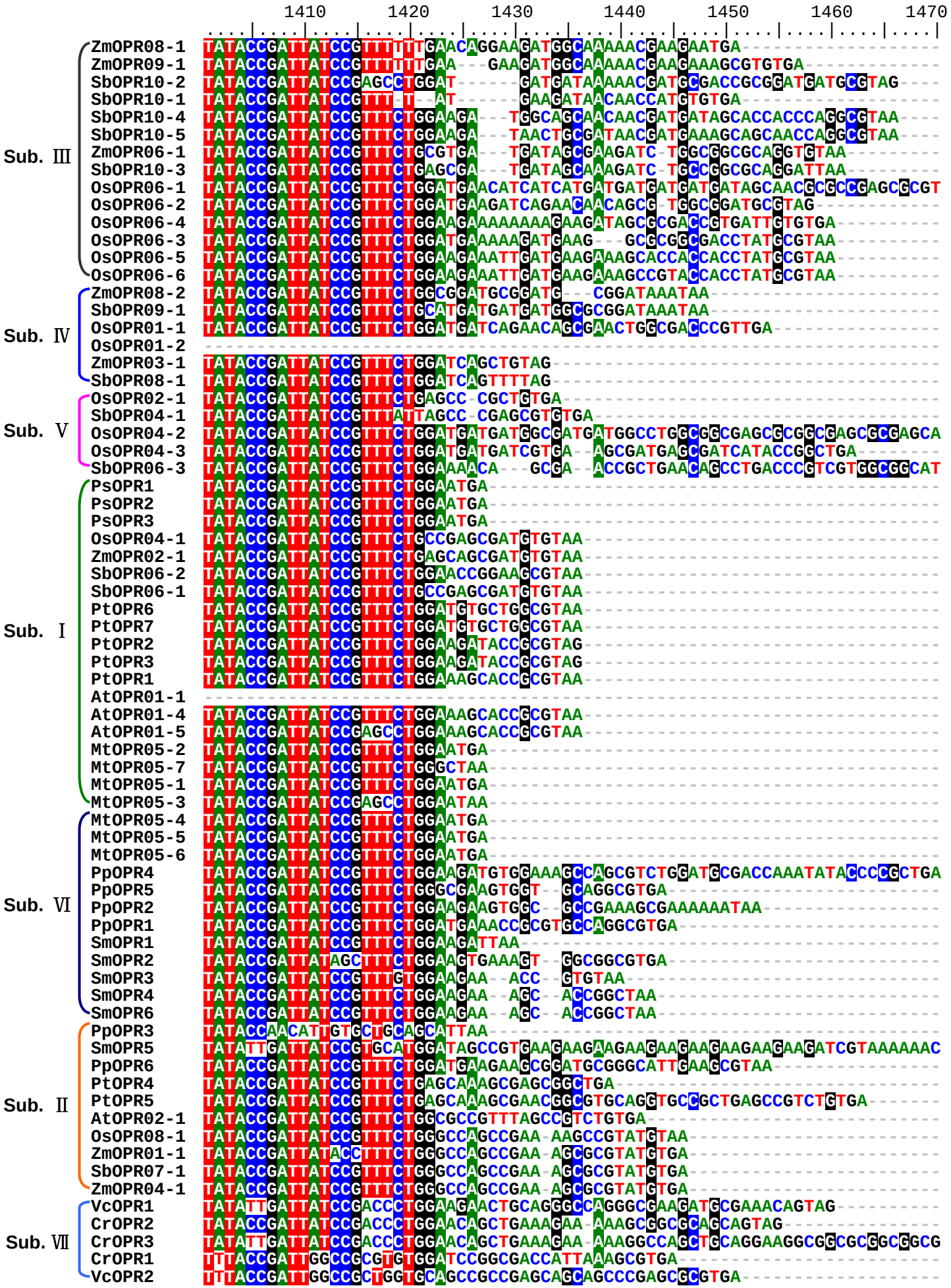
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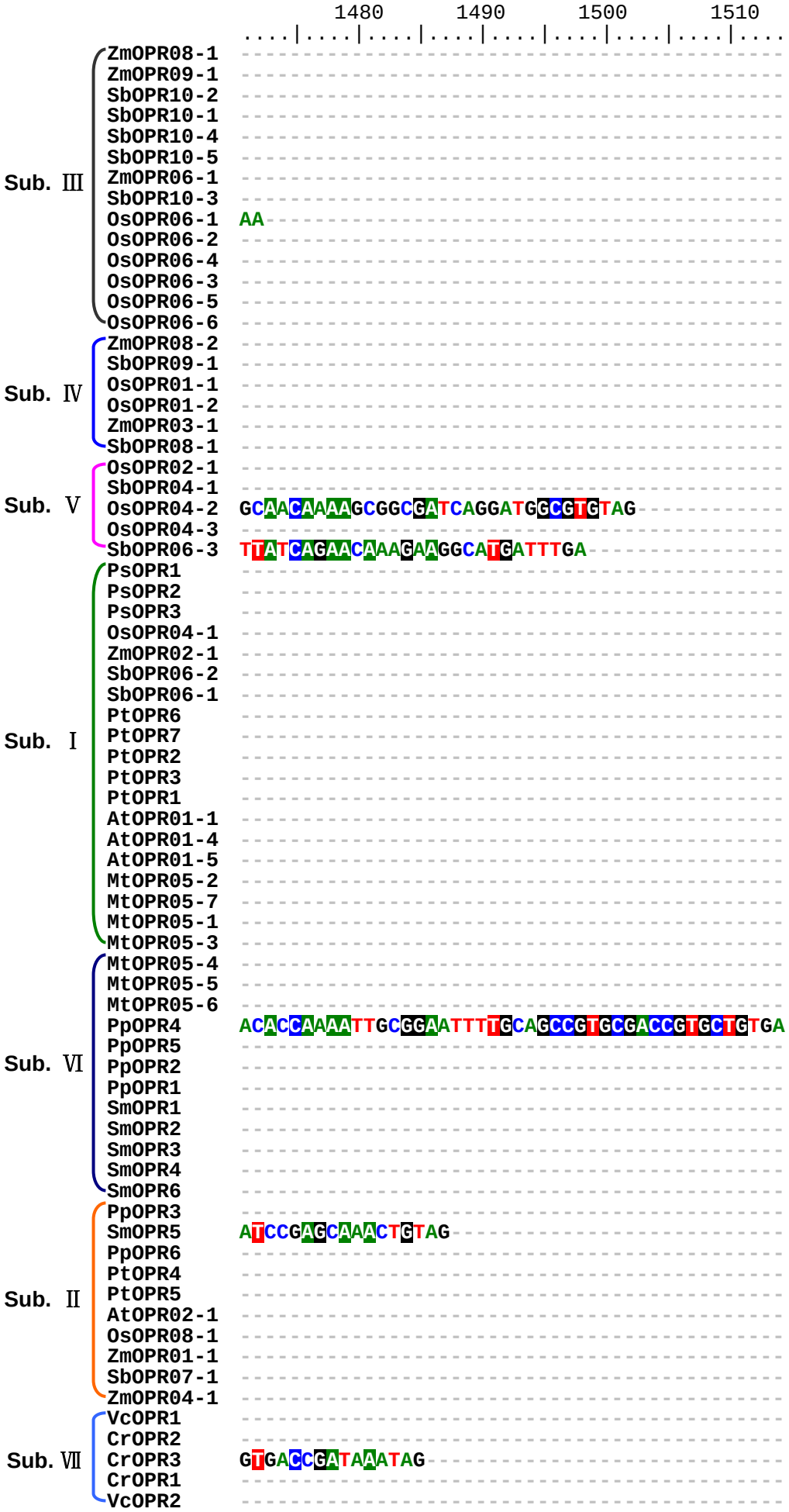
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CrOPR2
CrOPR3
CrOPR1
VcOPR2

Additional file 4

Nucleotide sequences alignment of OPR genes from eleven species representing the six major lineages within the green plants: the green algae (*Chlamydomonas reinhardtii* and *Volvox carteri*), the mosses (*Physcomitrella patens*), the lycophytes (*Selaginella moellendorffii*), the gymnosperms (*Picea sitchensis*), the monocotyledoneous angiosperms (*Oryza sativa*, *Sorghum bicolor* and *Zea mays*) and the dicotyledoneous angiosperms (*Arabidopsis thaliana*, *Populus trichocarpa* and *Medicago truncatula*). Identical residues in the alignments are shaded and seven well-conserved OPR subfamilies are represented as Sub. Ⅰ, Ⅱ, Ⅲ, Ⅳ, Ⅴ, Ⅵ and Ⅶ at the left side of the alignment.