

## Supplementary Material 2

Multiple sequence alignment of primary and secondary structure of the expansion segments D2 and D3 of the LSU 28S nuclear rRNA gene from seven chalcidoid species (*Encarsia hispida*, *Copidosoma truncatellum*, *Cheiloneurus fulvescens*, *Megaphragma* sp. 1, *Epoligosita* sp., *Signiphora* sp. 8, and *Anorasema pallidipes*). Regions of core rRNA between the two expansion segments and flanking the 3' end of the D3 are numbered following Cannone et al. (2002). The notation for the 30 conserved helices within the expansion segment D2 is modified from Gillespie et al. (2003, 2004a, b). The notation for the 5 conserved helices within the expansion segment D3 is modified from Kjer, Blahník, and Holzenthal (2001), Gillespie et al. (2004b) and Gillespie, Yoder, and Wharton (2005). A pairing-mask (see text) above each column denotes the secondary structure predicted across the alignment. Helices with long-range interactions are placed within bars (I) and immediate hairpin-stem loops are placed within double bars (II). All complementary strands are depicted with a prime ('; e.g., strand **1** hydrogen bonds with strand **1'** to form helix **1**). Regions of alignment ambiguity (**RAA**), slipped-strand compensation (**RSC**), and expansion and contraction (**REC**) are placed within brackets ([ ]) following Gillespie (2004). Nucleotides within conserved helices involved in hydrogen-bonding are underlined. Underlined positions within **RSCs** and **RECs** depict structures that are not consistent across the alignment. Single insertions (\*) and deletions (-) are noted as in Kjer, Blahník, and Holzenthal (2001). Bulges within conserved helices are shaded. Positions which can form an expansion of a helix across some but not all taxa are labeled with a caret (^). Every tenth nucleotide assigned positional homology is noted under the alignment with a tick (|), with every 50<sup>th</sup> position numbered. The sequences are 5' to 3' in direction. Missing nucleotides are represented with question marks (?). Note: this alignment has not been amended for these seven taxa from the original alignment of 527 chalcidoid sequences. The complete alignment is available at <http://hymenoptera.tamu.edu/rna>.

	H375	H375'	H406	H413	H406'	H265'	H234'	H35'
	.	((((((( ..... ))))))	.....	((( ( .. ..... ))))	..	....	..	. ...
Species 1	C   <u>GUGUUGC</u>	UUGAUAGU   <u>GCAGCUC</u>	UAAGU   <u>UGGUG</u>	GU   AAACUC   <u>CAUCU</u>	AA	GGCU	AA	A   UAU   <u>UGCCACGAGACC</u>
Species 2	C   <u>GUGUUGC</u>	UUGAUAGU   <u>GCAGCUC</u>	UAAGU   <u>GGGUG</u>	GU   AAGCUC   <u>CAUCU</u>	AA	GGCU	AA	A   UAU   <u>GACCACGAGACC</u>
Species 3	C   <u>GUGUUGC</u>	UUGAUAGU   <u>GCAGCUC</u>	UAAGU   <u>UGGUG</u>	GU   AAACUC   <u>CAUCU</u>	AA	GGCU	AA	A   UAU   <u>GACCACGAGACC</u>
Species 4	C   <u>GUGUUGC</u>	UUGAUAGU   <u>GCAGCUC</u>	UAAGU   <u>UGGUG</u>	GU   AAACUC   <u>CAUCU</u>	AA	GGCU	AA	A   UAU   <u>GACCACGAGACC</u>
Species 5	C   <u>GUGUUGC</u>	UUGAUAGU   <u>GCAGCUC</u>	UAAGU   <u>UGGUG</u>	GU   AAACUC   <u>CAUCU</u>	AA	GGCU	AA	A   UAU   <u>GACCACGAGACC</u>
Species 6	C   <u>GUGUUGC</u>	UUGAUAGU   <u>GCAGCUC</u>	UAAGU   <u>UGGUG</u>	GU   AAACUC   <u>CAUCU</u>	AA	GGCU	AA	A   UAU   <u>GACCACGAGACC</u>
Species 7	C   <u>GUGUUGC</u>	UUGAUAGU   <u>GCAGCUC</u>	UAAGU   <u>UGGUG</u>	GU   AAACUC   <u>CAUCU</u>	AA	GGCU	AA	A   UAC   <u>GACCACGAGACC</u>
						50		
	H461	H461'	H31'	H484	H484'	H15'	t	D2-1a
	.....	(( ..... ))	.....	((( ..... )))	.....	.....	.....	-----
GAUAGCGAACAAGUA	<u>CC</u>   GUGA   <u>GG</u>   GAAA   GU	UGAAAAGAA	<u>CUUU</u>   GAAG   <u>AGAG</u>   AGUUCAAUAGUAC	<u>GUGAAA</u> CCGUUCAGGG	GUAAA	<u>CCUGAGA</u>		
GAUAGCGAACAAGUA	<u>CC</u>   GUGA   <u>GG</u>   GAAA   GU	UGAAAAGAA	<u>CUUU</u>   GAAG   <u>AGAG</u>   AGUUCAGAGUAC	<u>GUGAAA</u> CCGUUCAGGG	GUAAA	<u>CCUGAGA</u>		
GAUAGCGAACAAGUA	<u>CC</u>   GUGA   <u>GG</u>   GAAA   GU	UGAAAAGAA	<u>CUUU</u>   GAAG   <u>AGAG</u>   AGUUCAAGAGUAC	<u>GUGAAA</u> CCGUUCAGGG	GUAAA	<u>CCUGAGA</u>		
GAUAGCGAACAAGUA	<u>CC</u>   GUGA   <u>GG</u>   GAAA   GU	UGAAAAGAA	<u>CUUU</u>   GAAG   <u>AGAG</u>   AGUUCAAGAGUAC	<u>GUGAAA</u> CCGUUCAGGG	GUAAA	<u>CCUGAGA</u>		
GAUAGCGAACAAGUA	<u>CC</u>   GUGA   <u>GG</u>   GAAA   GU	UGAAAAGAA	<u>CUUU</u>   GAAG   <u>AGAG</u>   AGUUCAGAGUAC	<u>GUGAAA</u> CCGUUCAGGG	GUAAA	<u>CCUGAGA</u>		
GAUAGCGAACAAGUA	<u>CC</u>   GUGA   <u>GG</u>   GAAA   GU	UGAAAAGAA	<u>CUUU</u>   GAAG   <u>AGAG</u>   AGUUCAAGAGUAC	<u>GUGAAA</u> CCGUUCAGGG	GUAAA	<u>CCUGAGA</u>		
			100				150	

D2-1b	2	2a	RAA	2b	2c	2d	2e	RAA	2f			
	*	*	(1)	* *		-	* * * *	(2)	*			
.. ((((((	.....	(.(((	.....	(((((	(	(((((	.(((	(((((	(((((			
AA <u>CCCAAA</u>	AGAUCGAAUG	G- <u>GGAGA</u>	UUCAU	<u>CGU-CAACC-U</u>	[-----]	C-U- <u>UUGG</u>	CUU	<u>ACGUG</u>	-	UG-G-A-C	[--]	<u>GCGAUG-U</u>
AA <u>UCCAAA</u>	AGUUCGAAUG	G- <u>AGAGA</u>	UUCAG	<u>CGU-CAGUG-G</u>	[C-----]	U-G- <u>UUGG</u>	CUU	<u>GCGUG</u>	-	UG-A-U-C	[--]	<u>GCGAUG-C</u>
AA <u>CCCAAA</u>	AGAUCGAAUG	G- <u>GAAGA</u>	UUCAG	<u>CGUUC AACC-A</u>	[UC-----]	A- <u>GUUUGG</u>	CUU	<u>CCGUG</u>	-	UG-G-CUC	[--]	<u>GCGAUG-C</u>
AA <u>CCCAAA</u>	AGAUCGAAUG	G- <u>GGAGA</u>	UUCAU	<u>CGU-CAGCU-U</u>	[-----]	U-U- <u>UCGG</u>	CUU	<u>GCGUG</u>	-	CU-G-C-U	[C-]	<u>GCGAUG-C</u>
AA <u>CCCAAA</u>	AGAUCGAAUG	G- <u>GGAGA</u>	UUCAU	<u>CGU-CAGCC-G</u>	[-----]	C-G- <u>UUGG</u>	CUU	<u>GCGUG</u>	-	UG-A-C-U	[C-]	<u>GCGAUG-C</u>
AA <u>CCCAAA</u>	AGAUCGAAUG	G- <u>GGAGA</u>	UUCAU	<u>CGU-CAGCC-G</u>	[-----]	C-A- <u>UCGG</u>	CUU	<u>CCGUG</u>	-	CG-G-C-G	[C-]	<u>GCGAUG-U</u>
AA <u>CCCGAA</u>	AGAUCGAAUG	A- <u>GGAGA</u>	UUCAG	<u>CGU-UGGCU-G</u>	[-----]	A-G- <u>CGCA</u>	CAA	<u>CCGUG</u>	-	CG-A-A-U	[C-]	<u>GCGAUG-C</u>

200

RSC	2g	REC	RAA	REC	2g'	RSC	2f'	2e'	2d'		
(1)	* - ^	(1)	(3)	(1')	^ * - *	(1')	* *	* - * -	- * -		
[CGC-----]	U- <u>CGGC</u>	[-----]	[UUCG--]	[-----]	GC-UG-G	[-----GCG]	G-CAC-GC	-	G-UUCG	C--	UGCGG
[UCG-----]	G-UUGU	[CGGUACU-]	[UUCG--]	[GGUAUUUAGC]	GC-GC-U	[-----CGUG]	G-CAC-GU	-	G-GUUG	C--	CGCGU
[CCU-----]	G-UUGG	[CCGUUGUCGCGU]	[UUCG--]	[CGUGGCAGCG]	GUGCU-C	[-----UUG]	G-CAC-GC	-	C-GUCA	C--	UGCGG
[UCGUCUUGG-]	A-GUGU	[U-----]	[AAU--]	[-----A]	GC-GC-U	[--UUUUUGACGA]	G-CAC-GC	-	G-GCGG	C--	UGCGU
[UC-----]	G-UUCG	[-----]	[CUCG--]	[-----]	GC-GUUC	[-----GG]	G-CAC-GC	-	G-GUCG	C--	UGCGC
[CGCUCGCGGG]	C-GGGC	[U-----]	[CUCG--]	[-----G]	GC-UC-G	[UCCGUCUGCCG]	G-CAC-GC	-	C-GCCG	C--	UGCGC
[UC-----]	G-UUGG	[-----]	[UUCG--]	[-----]	CU-CG-C	[-----GUG]	G-CAC-GC	-	G-UUCG	C--	UGCGG

250

RAA	2c'	RAA	2b'	RAA	2a'	2'	3	3a	3b	3c				
(4)	-	(5)	-	(6)	*				**	****				
[----C]	<u>AUG</u>	[---U]	<u>CCGGAG</u>	[---]	<u>A-GGUCGGCG</u>	UGCACU	<u>UCUCCC</u>	CUAGUAGGA	<u>CGUCGC</u>	GAC	<u>CCGUUG</u>	[G--GUG]	----	<u>CUUGUC</u>
[----C]	<u>AUG</u>	[---U]	<u>CCGACG</u>	[---]	<u>A-CGCCGGCG</u>	UGCACU	<u>UCUCUC</u>	CUAGUAGGA	<u>CGUCGC</u>	GAC	<u>CCGUUG</u>	[G--GUG]	----	<u>UCGGU-</u>
[----U]	<u>AUG</u>	[---A]	<u>CCGGCG</u>	[---]	<u>U-CGUCCGGCG</u>	UGCACU	<u>UCUCCC</u>	CUAGUAGGA	<u>CGUCGC</u>	GAC	<u>CCGCUG</u>	[G--GUG]	----	<u>UCGGCC</u>
[AAUUU]	<u>UUG</u>	[---C]	<u>CCGUUG</u>	[---]	<u>A-AGUCGGCG</u>	UGCACU	<u>UCUCCC</u>	CUAGUAGGA	<u>CGUCGC</u>	GAC	<u>CCGUUG</u>	[A--GUG]	----	<u>UCGGUC</u>
[----C]	<u>AUG</u>	[---U]	<u>CCGGCG</u>	[---]	<u>C-GGUCGGCG</u>	UGCACU	<u>UCUCCC</u>	CUAGUAGGA	<u>CGUCGC</u>	GAC	<u>CCGUUG</u>	[G--GUG]	----	<u>UCGGUC</u>
[----G]	<u>AUG</u>	[-CGC]	<u>CCGGUG</u>	[---]	<u>C-CGUCCGGCG</u>	UGCACU	<u>UCUCCC</u>	CUUGUAGAA	<u>CGUCGC</u>	GAC	<u>CCGUUG</u>	[G--GUG]	----	<u>UCGGUC</u>
[----C]	<u>UAG</u>	[---C]	<u>UGCGCU</u>	[---]	<u>U-GGCCGGUG</u>	UGCACU	<u>UCUUCU</u>	CUAGUAGGA	<u>CGUCGC</u>	GAC	<u>CCGUUG</u>	[G--GUA]	----	<u>UCGGUC</u>

300

RAA	3d	3e	RSC	3f-1	3f-2	RSC	3f-3	REC	RAA	REC	3f-3'		
(7)	- *	** *	(2)	* -	-- * ** ^^	(3)	^^^	(2)	(8)	(2')	^^^		
[UAC-----]	GGU	-	C- <u>CGGUA</u>	[---]	GG-UC	--GAC	UGGC-G--AG-U	[-----]	CU- <u>CGC</u>	[---]	[GCAA----	[---]	<u>GCU-UG</u>
[GAC-----]	GGC	-	C- <u>CGU-A</u>	[C--]	GG-UA	--GAC	UGUU-G--CG-C	[-----]	U-----	[---]	[CCC----	[---]	-----G
[CAA-----]	GGC	A	G-- <u>CGA-A</u>	[---]	CGAUU	--GAC	UGUC-G--CG-C	[-----]	U-----	[---]	[CCU----	[---]	-----G
[UAA-----]	GGC	-	C- <u>CGU-U</u>	[GC-]	GG-UC	--GAC	UGCC-G--GU-A	[CGUU-]	UG- <u>CGC</u>	[CGU]	[CAA----	[AAA]	<u>GCG-U-</u>
[AAC-----]	GGC	-	C- <u>CGC-A</u>	[AU-]	GG-UC	--GCC	UGUC-G--AG-C	[-----]	CG- <u>CGU</u>	[---]	[UCGC----	[---]	<u>GCG-CG</u>
[CAC-----]	GGC	-	C- <u>CGUG</u>	[---]	UG-UC	--GAC	UGUC-U--CG-A	[GG----	CG- <u>CGU</u>	[U--]	[AAU----	[--A]	<u>GCG-CG</u>
[AAC-----]	GGC	-	AUUCGA-U	[U--]	GG-UC	--GAC	UGUA-G--CG-U	[-----]	CU- <u>GCC</u>	[---]	[GCAA----	[---]	<u>GUU-AG</u>

350

RSC (3')	3f-2' ^ *- ** *-*	3f-1' -)	RSC (2')	3e' *-	RAA (9)	3d' --	RAA (10)	3c' * )))))	3b' - )))))	3a' )))))	..	
[-----A]	<u>UCU</u> -CG--U--C-A	<u>GACC</u>	[--]	<u>U</u> -CUGG	[-----UU]	<u>UCC</u>	[----C]	<u>GAU</u> -UGG	C	<u>UGCC</u>	<u>CGACGG</u>	UU
[-----]	<u>GCG</u> -CG--A--C-A	<u>GACC</u>	[-A]	<u>U</u> -CGG	[UGUCCA <u>UUGAA</u>	<u>ACC</u>	[---CC]	<u>GAC</u> -CGA	C	<u>UGCC</u>	<u>CGGCGG</u>	UA
[-----]	<u>GCG</u> -CG--A--C-A	<u>GACC</u>	[--]	<u>U</u> -UCGA	[----UUU <u>AAU</u>	<u>GCC</u>	[----C]	<u>GGC</u> -CGA	C	<u>UGCU</u>	<u>CGGCGG</u>	UA
[UGAU <u>CGU</u> ]	<u>UGC</u> -CG--G--U-A	<u>GACC</u>	[CU]	<u>U</u> -UUGG	[----- <u>UC</u> ]	<u>GCC</u>	[----C]	<u>GAC</u> -CGA	C	<u>UGCU</u>	<u>CGGCGG</u>	UA
[-----C]	<u>GCA</u> -CG--A--C-A	<u>GACC</u>	[--]	<u>U</u> -GCGG	[----- <u>UC</u> ]	<u>GCC</u>	[----C]	<u>GGC</u> -CGA	C	<u>UGCC</u>	<u>CGGCGG</u>	UA
[----- <u>UCG</u> ]	<u>CCG</u> -GA--A--C-A	<u>GACA</u>	[--]	C-GCGG	[----- <u>UC</u> ]	<u>GCC</u>	[----C]	<u>GGC</u> -CGG	C	<u>UGCC</u>	<u>CGGCGG</u>	UA
[-----C]	<u>ACG</u> -CU--G--C-A	<u>GACC</u>	[--]	A-UCGU	[-----A <u>UCA</u> ]	<u>GUC</u>	[----C]	<u>GAC</u> -CGA	G	<u>AGCU</u>	<u>CGGCGG</u>	UA

400

RAA (11)	3g *	RAA (12)	3h	3i ^	REC (3)	RAA (13)	REC (3')	3i' ^	3j --	RAA (14)	3k-1 --	3k-2 --
[UGAACGAUAAUUACA-----]	<u>G</u> -GU <u>AU</u>	[U---]	<u>GGGC</u>	<u>GCAC</u>	[-----]	<u>CAA</u> ----	[-----]	<u>GUGC</u>	<u>GUUC</u>	[A---]	<u>GGCCGU</u>	<u>CGUC</u>
[UUGAAAGCCUUGAAUCAAGAU-]	<u>G</u> -GU <u>AU</u>	[C---]	<u>GAGUC</u>	<u>GCAC</u>	[U-----]	[UUUG--]	[-----A]	<u>AUGC</u>	<u>GUUC</u>	[-----]	<u>GACUUGU</u>	<u>CGAU</u>
[UGUUUUUUCAUAAACACAA-----]	<u>G</u> -GU <u>AU</u>	[U---]	<u>GAGUC</u>	<u>GCAU</u>	[-----]	[GUCGA--]	[-----]	<u>AUGC</u>	<u>GUUC</u>	[-----]	<u>GACUCGU</u>	<u>CGAC</u>
[UAAAUGUUUGAAAGUUCAAU--]	<u>G</u> -GU <u>AU</u>	[C---]	<u>GAGCC</u>	<u>GCAU</u>	[GAU--]	[UUU----]	[AUGA]	<u>AUGC</u>	<u>GUUC</u>	[UUAU]	<u>GGCUCGU</u>	<u>CGGC</u>
[GAGAUCGCUAAU <u>CGAA</u> -----]	<u>G</u> -GU <u>AA</u>	[C---]	<u>GAGCC</u>	<u>GCAA</u>	[AAAA]	[UUUU--]	[UUUUU]	<u>GUGC</u>	<u>GUCU</u>	[UC--]	<u>GGCUCGU</u>	<u>CGGC</u>
[UCGAUUUAUCAAU <u>CUCGAA</u> ---]	C-G <u>CAA</u>	[U---]	<u>GAGCC</u>	<u>GCAC</u>	[-----]	[AAA----]	[-----]	<u>GUGC</u>	<u>GUAC</u>	[UUUU]	<u>GGCUCGG</u>	<u>CGGC</u>
[UUUAUACGAUUUUAA <u>UCGA</u> ---]	<u>G</u> -GU <u>AA</u>	[C---]	<u>GGGC</u>	<u>GCAC</u>	[-----]	[AAA----]	[-----]	<u>GUGC</u>	<u>GCCA</u>	[A---]	<u>GGCUCGU</u>	<u>CGGC</u>

450

31 *	3m	RAA (15)	3n * * -	RSC (4)	3o	3p	RAA (16)	3p' ))	RAA (17)	3o' )))))	RSC (4')	3n' * * * *	RAA (18)			
A	<u>GGC</u> - <u>UC</u>	-	<u>GCC</u>	U	[-----]	<u>CG</u> - <u>CU</u> - <u>CGG</u>	[AUUU----	<u>ACGA</u>	<u>AC</u>	[CUA--]	<u>GU</u>	[U--]	<u>UCGU</u>	[UG]	<u>UCG</u> -- <u>GG</u> - <u>CG</u>	[-----CUU]
C	<u>GAUCGA</u>	-	<u>GUC</u>	U	[-----]	<u>CG</u> - <u>CU</u> - <u>CGG</u>	[AUUUU----	<u>ACGG</u>	<u>AC</u>	[CUG--]	<u>GU</u>	[G--]	<u>CCGU</u>	[UG]	<u>UCG</u> -- <u>UG</u> - <u>CG</u>	[-----CUU]
A	<u>GGC</u> - <u>UC</u>	-	<u>GCC</u>	U	[-----]	<u>CG</u> - <u>CU</u> - <u>UGG</u>	[CUA-----]	<u>ACGG</u>	<u>AC</u>	[CUG--]	<u>GC</u>	[G--]	<u>CCGU</u>	[UA]	<u>CCG</u> -- <u>GG</u> - <u>CG</u>	[-----CUU]
A	<u>GGU</u> - <u>GA</u>	-	<u>GCC</u>	U	[-----]	<u>CGUCU</u> - <u>CGG</u>	[AUUUU----	<u>ACGG</u>	<u>AC</u>	[CUA--]	<u>GC</u>	[G--]	<u>CCGU</u>	[UG]	<u>UCC</u> -- <u>AG</u> - <u>CG</u>	[-----UUU]
A	<u>GGCUUU</u>	-	<u>AUC</u>	U	[-----]	<u>CG</u> - <u>CU</u> <u>ACGG</u>	[AUUUU----	<u>ACGG</u>	<u>AC</u>	[CUG--]	<u>GU</u>	[G--]	<u>CCGU</u>	[UG]	<u>CCG</u> -- <u>AG</u> - <u>CG</u>	[-----CUU]
A	<u>GGC</u> - <u>UC</u>	-	<u>GCC</u>	U	[-----]	<u>CG</u> - <u>CC</u> - <u>CGG</u>	[CGUUU----	<u>ACGG</u>	<u>AC</u>	[CUG--]	<u>GU</u>	[G--]	<u>CCGU</u>	[UG]	<u>UCG</u> -- <u>GG</u> - <u>CG</u>	[-----CUU]
A	<u>GGC</u> - <u>UC</u>	-	<u>GUC</u>	U	[-----]	<u>CG</u> - <u>CU</u> - <u>CGG</u>	[CUUUC----	<u>ACGG</u>	<u>AC</u>	[CUU--]	<u>GC</u>	[G--]	<u>CCGU</u>	[UG]	<u>UCG</u> -- <u>GG</u> - <u>CG</u>	[-----CUU]

500

3m'	RAA (19)	3l' * )))))	RAA (20)	3k-2' * )))))	RAA (21)	3k-1' * - *	3j' )))))	RAA (22)	3h' )))))	RAA (23)	REC "3q" (4)		
<u>GGC</u>	[-----]	-	<u>GU</u> GG <u>CU</u>	[-----GUUG]	<u>GGC</u> - <u>G</u>	[--]	<u>GCG</u> - <u>GUGU</u> - <u>C</u>	<u>CUC</u>	<u>GGAC</u>	[--U]	<u>GGCUC</u>	[UUAAU-----]	<u>AUUC</u> -----
<u>GGC</u>	[-----]	-	<u>U</u> - <u>C</u> - <u>UU</u>	[-----UCG]	<u>AUC</u> - <u>G</u>	[--]	<u>UCA</u> - <u>AUGU</u> - <u>U</u>	<u>CUC</u>	<u>GAAC</u>	[--C]	<u>GGCUC</u>	[G-----]	<u>A</u> -----
<u>GGU</u>	[-----]	-	<u>GU</u> GG <u>UU</u>	[-----GUG]	<u>GUC</u> - <u>G</u>	[--]	<u>ACG</u> - <u>AUGA</u> - <u>U</u>	<u>CUC</u>	<u>GAAC</u>	[--C]	<u>GGCUC</u>	[-----]	<u>UAAA</u> -----
<u>GGC</u>	[-----]	-	<u>U</u> - <u>UGCC</u>	[-----GUUUC]	<u>GCC</u> - <u>G</u>	[--]	<u>ACG</u> - <u>AUGU</u> - <u>C</u>	<u>CUC</u>	<u>GGAC</u>	[--G]	<u>GGCUC</u>	[-----]	[-----]
<u>GGU</u>	[-----]	-	<u>U</u> - <u>GGCC</u>	[-----GUUA]	<u>GUC</u> - <u>G</u>	[--]	<u>ACG</u> - <u>AUGU</u> - <u>C</u>	<u>CUC</u>	<u>GGAC</u>	[--C]	<u>GGUUU</u>	[-----]	[-----]
<u>GGU</u>	[AUUUCAA]	C	<u>G</u> - <u>GGCC</u>	[-----GUUA]	<u>GUC</u> - <u>G</u>	[--]	<u>UCG</u> - <u>AUGU</u> - <u>C</u>	<u>CUC</u>	<u>GUAC</u>	[--G]	<u>GGCUC</u>	[UCUUAU---	<u>GUUCAAUCCCC</u> ---
<u>GAC</u>	[-----]	-	<u>GCGCC</u>	[-----GCUC]	<u>GCC</u> - <u>G</u>	[--]	<u>ACG</u> - <u>AUGU</u> - <u>C</u>	<u>CUC</u>	<u>UGGC</u>	[--A]	<u>GGCUC</u>	[UUAU-----]	<u>AUUC</u> -----

RAA (24)	REC "3q" (4')	RAA (25)	3g'	3'	D2-1b'	D2-1a'	H563				
[GAAC-----]	[-----GGAU]	[-----]	)))))	)))))	.....	)))))	(((				
[CUA-----]	[-----U]	[-----]	AUACC	UGUCG	GCGACG	CUACUGC-	UUUGGG	UAC	UUUCAGG	AC	????
[CGCA-----]	[-----UAUA]	[-----]	UUACC	GGUCA	GCGACG	CUUUUGC-	UUUGGA	UAC	UUUCAGG	AC	CCGU
[UAUAAAGGGC]	[-----]	[-----NNNNN]	UUACC	UGUCU	GCGACG	CUUUUGC-	UUUGGG	UAC	UUUCAGG	AC	CCGU
[C-----]	[-----]	[-----]	NNNNN	NNNNN	NNNNN	NNNNNNN-	NNNNNN	NNN	NNNNNNN	NN	NNNN
[UCAC-----]	[-----GGGGAUAGGAC]	[-----]	-UACC	CGUCG	GCGACG	CUACUGC-	UUUGGG	UAC	UUUCAGG	AC	CCGU
[GAAC-----]	[-----GAU]	[-----]	GCGCA	AGUCG	GCGACG	CUACUGC-	UUUGGG	UAC	UUUCAGG	AC	CCGU
			UUACC	GGUCG	GCGACG	CUACUGC-	UUUGGG	UAC	UUUCAGG	AC	CCGU

550

H563'	H579	H589	H604	REC (5)	RAA (26)	REC (5')			
.....	)))))	.....	.....	(((	.....	.....			
?????AAC	ACGG	ACCAAG	GAGU	CUAACAUGUGCGC	GA	GUCAUUGGG	[UUCUAUACU-----]	[-----]	
CUUGAAAC	ACGG	ACCAAG	GAGU	CUAACAUGUACGC	GA	GUCAUUGGG	[ACUUGUAUAAUUUU]	[UUUAUU-----]	[AUACA AAAUAAUU]
CUUGAAAC	ACGG	ACCAAG	GAGU	CUAACAUGUACGC	GA	GUCAUUGGG	[AAAAAUCGUUGC--]	[CUCGUGCA-----]	[GCGAUGGAAAACU]
NNNNNNNN	ACGG	ACCAAG	GAGU	CUAACAUGUGCGC	GA	GUCAUUGGG	[ACUU-----]	[GUUAA-----]	[-----AAAU]
CUUGAAAC	ACGG	ACCAAG	GAGU	CUAACAUGUGCGC	GA	GUCAUUGGG	[A-----]	[CUUGUU-----]	[-----U]
CUUGAAAC	ACGG	ACCAAG	GAGU	CUAACAUGUACGC	GA	GUCAUUGGG	[ACU-----]	[UUGA-----]	[-----ACU]
CUUGAAAC	ACGG	ACCAAG	GAGU	CUAGCAUGUGCGC	GA	GUCAUUGGG	[AUUU-----]	[UAUC-----]	[-----AUUU]

600

H604'	H628	H628'	D3-1a	RAA (27)	D3-1b	RAA (28)	D3-1c *	REC (6)	RAA (29)	REC (6')				
...	)))))	..	(((	..	..	..	..	..	..	..				
AAA	CCUAAAGGC	GCA	AU	GAAA	GU	GAA	GGU	[--]	C	[---]	U-UC	[C-----]	[UUA-----]	[-----GC]
AAG	CCUAAAGGC	GCA	AU	GAAA	GU	AAA	GGC	[A-]	C	[---]	G-CG	[AGC-----]	[UUCGC---	[-----GCUC]
AAG	CCUAAAGGC	GCA	AU	GAAA	GU	GAA	GAC	[G-]	C	[---]	G-GC	[UCUC-----]	[UUUGU---	[-----GUGUU]
AAG	CCUAAAGGC	GCA	AU	GAAA	GU	GAA	GGU	[--]	C	[---]	C-GC	[U-----]	[CUG-----]	[-----AU]
AAG	CCUAAAGGC	GCA	AU	GAAA	GU	GAA	GGU	[--]	C	[---]	C-GC	[-----]	[UUCGC---	[-----]
AAG	CCUAAAGGC	GCA	AU	GAAA	GU	GAA	GGU	[--]	C	[---]	GUAC	[-----]	[CUCGC---	[-----]
AAA	CCUAAAGGC	GCA	AU	GAAA	GU	GAA	GAU	[--]	C	[---]	GCGG	[UCGC-----]	[CGUUAAAA]	[-----GCGG]

650

D3-1c'	D3-1b'	D3-1a'	D3-2a	RSC (5)	D3-2b	REC (7)	RAA (30)	REC (7')	D3-2b'	RSC (5')	D3-2a'	
..	..	..	..	..	..	..	..	..	..	..	..	
))	..	..	..	..	..	..	..	..	..	..	..	
GUU	-G	-GCC	GA	GGGAGGAUGGCU-CG-	[-----]	CGU	[-----]	[CACG---	[-----]	AUG	[-----]	[C-GAGCCCGCACUCCC
CGC	-G	-GCC	GA	GGGAGGAUGGUU-CG-	[-----]	CGU	[-----]	[CACGC--]	[-----]	AUA	[-----]	[C-GAACCCGCACUCCC
GUC	-G	CGUC	GA	GGGAGGAUGGCU-CG-	[-----]	CGU	[-----]	[UACG---	[-----]	AUG	[-----]	[C-GAGCUCGCACUCCC
GCG	CG	-ACC	GA	GGGAGGAUGGCUUUUU	[UUUU--]	CUU	[-----]	[UUCG---	[-----]	GAG	[AAAA]	[AG-GAGCCCGCACUCCC
GCG	CG	-ACC	GA	GGGAGGAUGGCU-CU-	[-----]	CGU	[-----]	[CACG---	[-----]	ACG	[---C]	[A-GAGCUCGCACUCCC
GUC	-G	-ACC	GA	GGGAGGAUGGCU-CG-	[-----]	CGU	[-----]	[CACG---	[-----]	AUG	[-----]	[C-GAGCCCGCACUCCC
CCC	-G	-AUC	GA	GGGAGGAUGACU-CG-	[-----]	CGA	[AAG-----]	[AAA-----]	[-----CGC]	UCG	[-----]	[C-GAGUUCGCACUCCC

700

	D3-3a	RSC (6)	D3-3b	REC (8)	RAA (31)	REC (8')	D3-3b'	RSC (6')	D3-3a'		H589'		H671	
.	(((((((		(((				)))		))))))		....	)))))))))	..	((...((((
G	GGGCGUCUC	[GU-]	GCUC	[-----]	[AUUGC-]	[-----]	GAGC	[A]	GAGGCGCAC	CAGA	GCGUACACGUUGG	GA	CCCGAAAGAUGGU	
G	GGGCGUCUC	[GU-]	GCUC	[-----]	[AUUGC-]	[-----]	GAGC	[U]	GAGGCGCAC	UAGA	GCGUACACGUUGG	GA	CCCGAAAGAUGGU	
G	GGGCGUCUC	[GU-]	GCUC	[-----]	[AUUGC-]	[-----]	GAGC	[U]	GAGGCGCAC	AUGA	GCGUACACGUUGG	GA	CCCGAAAGAUGGU	
G	GGGCGUCUC	[GU-]	GCUC	[-----]	[AUUGC-]	[-----]	GAGC	[U]	GAGGCGCAC	CAGA	GCGUACACGUUGG	GA	CCCGAAAGAUGGU	
G	GGGCGUCUC	[GU-]	GCUC	[-----]	[AUUGC-]	[-----]	GAGC	[A]	GAGGCGCAC	CAGA	GCGUACACGUUGG	GA	CCCGAAAGAUGGU	
G	GGGCGUCUC	[GC-]	GCUC	[-----]	[AUUGC-]	[-----]	GAGC	[G]	GAGGCGCAC	CAGA	GCGUACACGUCUG	GA	CCCGAAAGAUGGU	

750

	H687		H700		H700'		H736	t	H736'		H687'	
...	(((((((	.	(((	....	))))))	....	(((	.....	))))))	..	..	..
GAA	CUAUGCCUGGUC	A	GGACGAAGUCAGGG	GAAA	CCCUGAUGGAGGUCC	GUA	GCGAUUCUGA	CGUGCAAA	UCGAUCGU	CG	GAACUGGGUAUAG	
GAA	CUAUGCCUGGUC	A	GGACGAAGUCAGGG	GAAA	CCCUGAUGGAGGUCC	GUA	GCGAUUCUGA	CGUGCAAA	UCGAUCGU	CG	GAACUGGGUAUAG	
GAA	CUAUGCCUGGUC	A	GGACGAAGUCAGGG	GAAA	CCCUGAUGGAGGUCC	GUA	GCGAUUCUGA	CGUGCAAA	UCGAUCGU	CG	GAACUGGGUAUAG	
GAA	CUAUGCCUGGUC	A	GGACGAAGUCAGGG	GAAA	CCCUGAUGGAGGUCC	GUA	GCGAUUCUGA	CGUGCAAA	UCGAUCGU	CG	GAACUGGGUAUAG	
GAA	CUAUGCCUGGUC	A	GGACGAAGUCAGGG	GAAA	CCCUGAUGGAGGUCC	GUA	GCGAUUCUGA	CGUGCAAA	UCGAUCGU	CG	GAACUGGGUAUAG	
GAA	CUAUGCCUGGUC	A	GGACGAAGUCAGGG	GAAA	CCCUGAUGGAGGUCC	GUA	GCGAUUCUGA	CGUGCAAA	UCGAUCGU	CG	GAACUGGGUAUAG	

800

850

	H777	H777'		H671'		H812		
.	(((	.....	)))	.....	))))))	.....		
G	GGC	GAAAG	ACU	AAUCGA	ACCAUCUAGUAGCUGG	UU	CCUCC	GA
G	GGC	GAAAG	ACU	AAUCGA	ACCAUCUAGUAGCUGG	UU	CCUCC	GA
G	GGC	GAAAG	ACU	AAUCGA	ACCAUCUAGUAGCUGG	UU	CCUCC	GA
G	GGC	GAAAG	ACU	AAUCGA	ACCAUCUAGUAGCUGG	UU	??????	??
G	GGC	GAAAG	ACU	AAUCGA	ACCAUCUAGUAGCUGG	UU	??????	??
G	GGC	GAAAG	ACU	AAUCGA	ACCAUCUAGUAGCUGG	UU	CCUCC	GA
G	GGC	GAAAG	ACU	AAUCGA	ACCAUC????????	??	??????	??

900