
Compilation of small ribosomal subunit RNA sequences

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INTRODUCTION

Table 1 lists 275 small ribosomal subunit RNA (further abbreviated as srRNA) sequences (references 1–270) that have been published, or submitted to the EMBL or GenBank nucleotide sequence libraries, to our knowledge. The previous compilation (271) listed 106 srRNA sequences. There is a tendency towards publication of partial, rather than complete sequences. This is a consequence of the availability of new techniques for sequencing or DNA amplification, that allow to collect results faster, but do not allow to determine the complete sequence up to the termini. One such method uses reverse transcription of the RNA with primers complementary to universally conserved sequence areas (272), in which case the sequence adjacent to the 3'-terminus cannot be determined. In another approach (27), the rDNA is amplified by the polymerase chain reaction (273) rather than by cloning. Since the primers for the PCR bind to conserved sequences close to the termini but within the boundaries of the srRNA gene, neither of the terminal sequences is comprised in the analysis. Both these methods, however, can yield a continuous sequence spanning more than 90% of the molecule, provided a sufficient number of primers is used. Some authors (e.g. reference 274) use a limited set of primers, in which case a discontinuous set of partial sequences is obtained, which can nevertheless be aligned with complete sequences from other species and used for phylogenetic studies.

The set of 270 different srRNA sequences listed in Table 1 comprises complete sequences and continuous partial sequences, but no discontinuous partial sequences. In order to limit the space needed for the alignment, we have restricted it to 60 sequences. This comprises all the complete sequences that were published, or have become accessible in sequence libraries, since the last compilation (271), plus 8 previously listed sequences added as references in order to allow a comparison of the present alignment and secondary structure scheme with the previous one.

SEQUENCE ALIGNMENT

The 60 sequences are listed in 5 groups, consisting of eukaryotic (cytoplasmic) -, archaeobacterial -, eubacterial -, plastidial - and mitochondrial srRNAs. Each group comprises a sequence already aligned in the previous compilation, viz. *Homo sapiens* for the eukaryotic cytoplasmic srRNAs, *Halobacterium cutirubrum* for the archaeobacterial srRNAs, *Escherichia coli* for the eubacterial srRNAs, *Zea mays* for the plastid srRNAs. Because of the extreme variability in length and secondary structure of mitochondrial srRNA sequences, an animal -, a plant -, a fungal - and a flagellate sequence were added as references in this group. The species chosen are *H. sapiens*, *Glycine max*,

Saccharomyces cerevisiae and *Leishmania tarentolae*. The sequences are identified on each alignment page by a number corresponding with that in Table 1 and with the literature reference, and by the initials of the species name.

Alignment positions are numbered at the top and bottom of each page. In addition, *E. coli* srRNA nucleotide positions counting from its 5'-terminus are indicated above the eubacterial sequences. Regardless of the analytical method used, all sequences are listed using the ribonucleotide symbols U, C, A, and G. Posttranscriptional modifications are known for few sequences and not indicated in the alignment, but if data are available this is mentioned by a footnote in the last column of Table 1. The symbol X is used for unidentified -, and the symbols Y (pyrimidine nucleotide) and R (purine nucleotide) for incompletely identified nucleotides. These symbols point to uncertainty in the identification of a nucleotide in the case of analyses performed on cloned or amplified DNA, which examine the structure of a single gene. In the case of sequencing by reverse transcription of srRNA, however, they can point either to analytical uncertainty or to sequence heterogeneity, since the srRNA used as template may be a mixture of different sequences. Gaps introduced in order to optimize the alignment are filled with hyphens. On the contrary, dots are used for an interruption of the sequence due to partial sequencing. Hence, a sequence interrupted by 10 dots means that partial sequences are known to the left and to the right of the interruption, but that the length of the separating stretch is unknown. An interruption by 10 X's means that exactly 10 nucleotides are present, but their identity is unknown. A sequence starting or ending with dots means that sequencing has not reached the terminus. Lower case characters at termini are used to indicate length heterogeneity of the RNA molecules.

It should be noted that the alignment of the sequences for optimal similarity is straightforward in areas of relatively conserved primary and secondary structure, but is much more arbitrary in the structurally more variable areas. Alignment rests mostly on the periodic occurrence of conserved sequence motifs and on the observation of compensating substitutions in complementary areas of the secondary structure (see below). In the variable areas, conserved sequence motifs are rarer and at the same time the sequences differ in length. Whether compensating substitutions are seen or not then depends on how the gaps are placed, which makes their observation less meaningful.

Sequence segments presumably involved in base pairing according to the secondary structure model described below are indicated by shading superimposed on the alignment. Shaded

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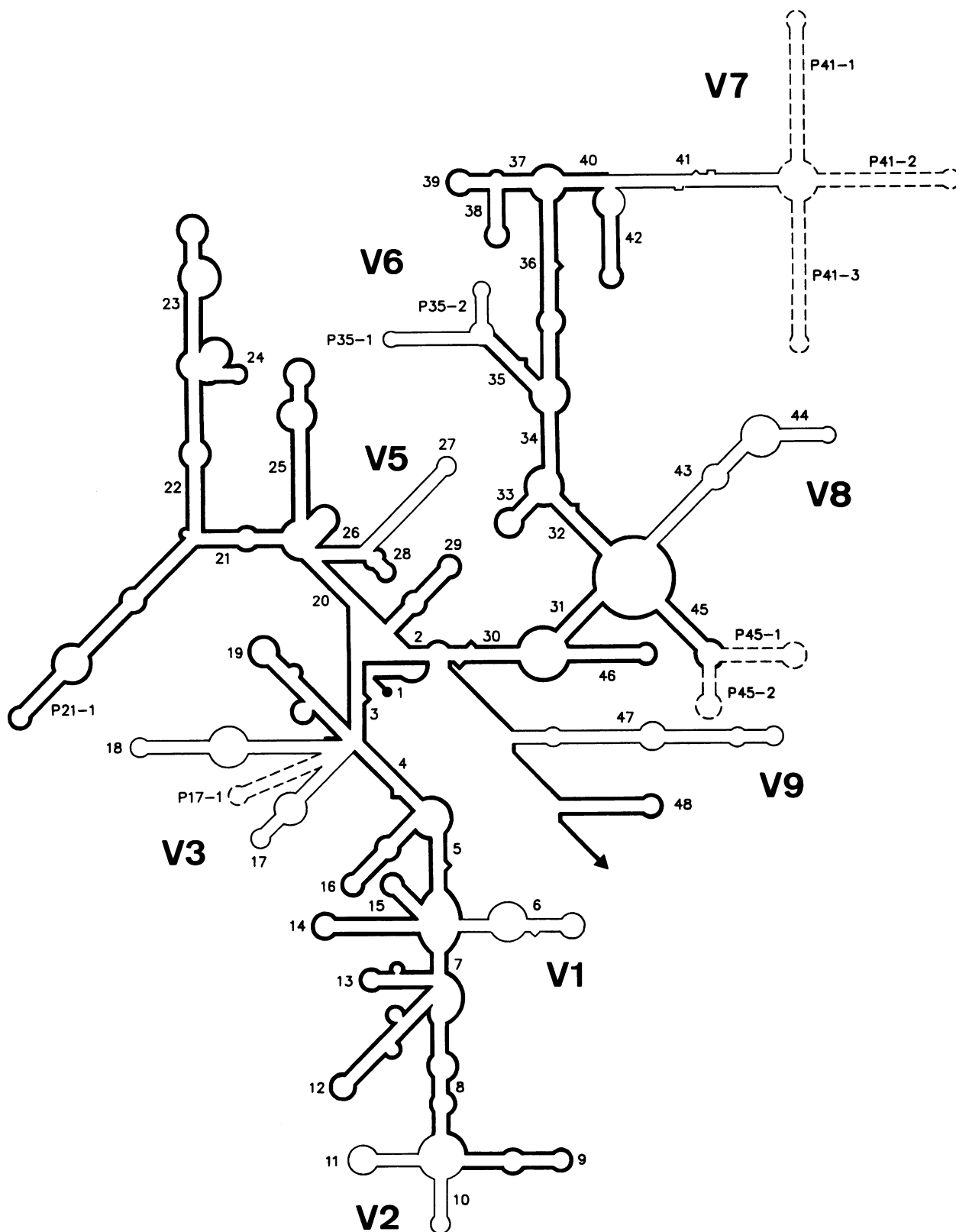


Fig. 1. Secondary structure model for prokaryotic srRNAs. The 5'-terminus is symbolized by a filled circle and the 3'-terminus by an arrowhead. Helices are numbered in the order of occurrence from 5'- to 3'-terminus. Helices bearing a single number are common to the prokaryotic and eukaryotic (Fig. 2) models. A composite number preceded by P points to a prokaryote-specific helix. Relatively conserved areas are drawn in bold lines, areas of sequence- and length variability in thin lines. Eight variable areas, numbered V1 to V9, are distinguished, V4 being absent in prokaryotic srRNAs. Helices drawn in broken lines are present in a small number of known structures only. Archaeobacterial sequences follow the prokaryotic pattern except for helix 35, which is unbranched as in eukaryotes.

areas corresponding to complementary strands of helices 1 to 48 of the secondary structure model are numbered 1 and 1' to 48 and 48'. Helix numbers are listed twice, the uppermost row applying to the eukaryotic sequences, and the lowermost row to the bacterial -, plastidial -, and mitochondrial sequences. Internal loops and bulges in a helix are indicated by interruption of the shading. Bases suspected to belong to pairs other than the Watson-Crick pairs G·C, A·U, or the wobble pair G·U, because they are intercalated between Watson-Crick and/or wobble pairs, are put in parentheses.

SECONDARY STRUCTURE MODEL

The secondary structure models adopted for indication of the double stranded areas in the alignment are shown in Fig. 1 and 2. The prokaryotic model of Fig. 1 applies to archaeobacterial, eubacterial, plastidial, and mitochondrial srRNAs. The model of Fig. 2 applies to eukaryotic srRNAs. Helices common to both models, further called universal helices, are numbered 1 to 48, in the order of occurrence of the 5'-proximal strand when the sequence is scanned from 5' to 3'-end. Helix numbers change

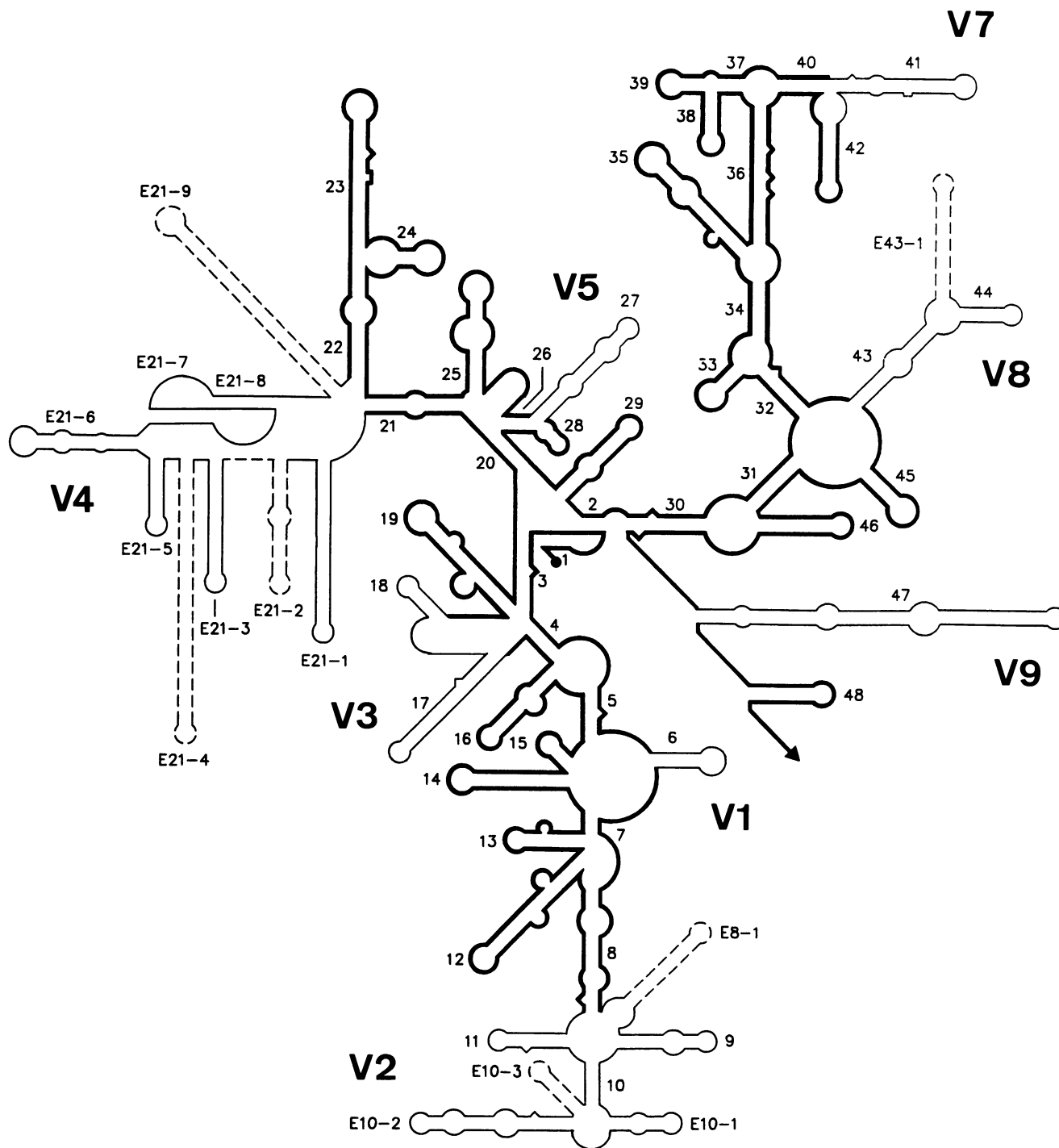


Fig. 2. Secondary structure model for eukaryotic srRNAs. Symbols are as in Fig. 1. Helices bearing a composite number preceded by E are eukaryote-specific. Variable area V6 is missing in eukaryotic srRNAs.

at branching points and at pseudoknot loops, not at internal- and bulge loops. Helices specific to the prokaryotic model are numbered Pa-b, where a is the number of the preceding universal helix and b is a serial number. Helices specific to the eukaryotic model are similarly numbered Ea-b.

Structurally conserved areas are drawn in bold lines, whereas structurally variable areas, labeled V1 to V9, are drawn in thin lines. Helices that are present in a limited number of species are drawn in broken lines. Such is the case for e.g. helices P41-1 to P41-3, specific for plant mitochondrial srRNAs, or helix E10-3, hitherto found only in *Euglena gracilis* cytoplasmic srRNA. Conversely, helices can be absent in certain srRNAs. As an example, the diplomonad *Giardia lamblia* misses helices E21-1 to E21-4. Even the 'universal' helices do not occur in all srRNAs, the exceptions being found among the mitochondrial srRNAs. Those from animal mitochondria retain only 36 of the universal helices, with most of the missing ones belonging to variable areas. In flagellate mitochondrial srRNAs the structure retains only 25 universal helices, with the entire area consisting of helices 31 to 45 missing. The Fig. 1 model should therefore be regarded, not so much as a general prokaryotic model, but rather as a model for eubacterial and plastidial srRNA secondary structure, from which mitochondrial srRNA structures can be derived by addition (in the case of plant mitochondria) or subtraction of sets of helices. As for the archaeobacterial srRNAs, these differ from the eubacterial ones only by lacking the branching point leading to helices P35-1 and P35-2.

The models of Fig. 1 and 2 concur with those proposed by Gutell et al. (275) as far as the conserved areas are concerned, and for a fraction of the variable areas. However, we propose a structure for a long insertion in area V7 found in plant mitochondrial srRNAs, and for area V4 in eukaryotic srRNAs, both left undefined in (275). The latter structure is different from that adopted in the previous compilation (271) and comprises a pseudoknot. In addition, for areas V2 and V3 of the eukaryotic model, we propose a base pairing scheme slightly different from that of Gutell et al. (275). Although most of the structures that we propose in the variable areas are supported by observation of compensating substitutions, (unpublished) they should nevertheless be regarded as tentative in view of the difficulties connected with alignment in these areas explained above.

AVAILABILITY OF THE DATA

Of the 270 different srRNA sequences listed in Table 1, 197 were in our computer file at the time of writing, in aligned form and with delimitation of secondary structure elements. The remaining ones, which are not listed in the papers reporting them but have been submitted to GenBank, have only recently become available in the file server of this library. They will be aligned as soon as possible. The sequences will be available on floppy disks, readable on microcomputers operating under MS-DOS, in the following three formats:

1) In the form of an alignment with indication of secondary structure elements. Aligned sequences will be listed on 42 pages each containing 100 alignment positions of all the sequences. This format is most useful for those wishing to produce a hardcopy of the complete alignment, rather than the sample of 60 sequences listed here. From this file, the complete alignment can be printed using a wide carriage printer, condensed print and reduced line spacing. Note, however, that this takes about 252 pages of 15 inch wide printer paper.

2) The sequences, listed one by one, without indication of secondary structure elements, but interspersed with the gaps required for alignment, i.e. with homologous nucleotides in the same position in each sequence.

3) The sequences, listed one by one, written continuously without gaps or secondary structure-describing symbols. The number of formatted floppy disks of different types that should be sent in order to obtain each of these files is listed in Table 2.

In addition, all these files can be obtained on a TK50 tape, suitable for a MicroVax computer operating under VMS 5.0 or higher.

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Table 1. List of srRNA sequences.

Nr (a)	Species	Specification (b)	Taxonomic position (c)	Length (d)	Access. (e)	Method (f)	Re-mark
* 1	EUKARYOTES						
2	Homo sapiens	pB pA4	Chordata (Ph.)	1869	X03205		9
3	Homo sapiens		Chordata (Ph.)	1868	M10098		
4	Mus musculus		Chordata (Ph.)	1870	K03432		
5	Rattus norvegicus	Male Sprague-Dawley, liver	Chordata (Ph.)	1869	X00686		
6	Rattus norvegicus	Male Sprague-Dawley, liver	Chordata (Ph.)	1869	M11188		
* 7	Oryctolagus cuniculus	Reticulocytes	Chordata (Ph.)	1874	X01117		h
8	Xenopus laevis		Chordata (Ph.)	1863	X06778		9
9	Xenopus borealis		Chordata (Ph.)	1826	X04025		
10	Artemia salina	Cysts	Arthropoda (Ph.)	1810	X01723		
* 11	Eurytemora californica	Whole organism	Arthropoda (Ph.)	1814	X13457		
* 12	Tenebrio molitor	Larvae	Arthropoda (Ph.)	1921	X07801		
* 13	Drosophila melanogaster		Arthropoda (Ph.)	1995			
14	Ctenorhabditis elegans		Nemathelminthes (Ph.)	1759	X03680		
15	Oryza sativa		Angiospermae (Ph.)	1812	X00755		
* 16	Lycopersicon esculentum		Angiospermae (Ph.)	1800	X51576		
18	Glycine max	Cultivar Black Mexican, leaves	Angiospermae (Ph.)	1809	X02202		
* 19	Arabidopsis thaliana	Variety Wayne lambda-SR1	Angiospermae (Ph.)	1807	X02623		
* 20	Zamia pumila	Variety Co 10	Angiospermae (Ph.)	1804	X16077		
* 21	Chlamydomonas reinhardtii	Leaves	Gymnospermae (Ph.)	1813			
* 22	Volvox carterii		Chlorophyceae (Cl.)	1791			
* 23	Chlorella vulgaris	f. nagariensis, HK 10 (UTEX 1885)	Chlorophyceae (Cl.)	1788	X13688	PCR	
* 24	Nannochloris eucaryotum	Type strain 211-11b	Chlorophyceae (Cl.)	1798	X06425		
* 25	Ochromonas danica		Chlorophyceae (Cl.)	1796			
26	Costaria costata		Chrysochyceae (Cl.)	1789			
* 27	Skeletonema costatum	Sporophytes	Phaeophyceae (Cl.)	(1595)			
28	Neurospora crassa	Culture 18/C, British Columbia	Bacillariophyceae (Cl.)	1795	X04971	PCR	
* 29	Saccharomyces cerevisiae	Strain A364A	Ascomycotina (Ph.)	1798	V01335		
30	Pneumocystis carinii	Isolate from rat lung	Ascomycotina (Ph.)	1774	X12708		
31	Achlya bisexualis	Strain Ax3	Mastigomycotina (Ph.)	1809			h
32	Dictyostelium discoideum	Strain CL	Myxomycota (Ph.)	1872	K02641		
* 33	Physarum polycephalum		Myxomycota (Ph.)	1964	X13160		
34	Euplates aediculatus		Ciliata (Ph.)	1882	X03949		
35	Oxytricha nova		Ciliata (Ph.)	1771	X03948		
36	Stylonychia pustulata		Ciliata (Ph.)	1771	X03947		
37	Tetrahymena thermophila	Strain A-17682a (intron+), ATCC 30377	Ciliata (Ph.)	1753	M10932		
38a	Tetrahymena pigmentosa	Strain UM 1286 (intron-)	Ciliata (Ph.)	1752			
38b	Tetrahymena hyperangularis	Strain EN 101, ATCC 30273	Ciliata (Ph.)	1752			
38c	Tetrahymena nanneyi	Strain X05, ATCC 30840	Ciliata (Ph.)	1752			
39	Tetrahymena negevischi	Strain KP7 (intron-), ATCC 30832	Ciliata (Ph.)	1752			
40	Tetrahymena australis	Strain MGO (intron-), ATCC 30831	Ciliata (Ph.)	1752			
41	Tetrahymena capricornis	Strain AU-F1-1 (intron-), ATCC 30291	Ciliata (Ph.)	1752			
42	Tetrahymena patula	Strain LFF (intron-), ATCC 50064	Ciliata (Ph.)	1752			
43a	Tetrahymena borealis	Strain UM 731 (intron-)	Ciliata (Ph.)	1752			
43b	Tetrahymena canadensis	Strain UM 1215, ATCC 30368	Ciliata (Ph.)	1752			
44	Tetrahymena tropicalis	Strain TC3 (intron-), ATCC 30352	Ciliata (Ph.)	1752			
45	Tetrahymena pyriformis	Strain GL-C (intron-, a-micronuclear)	Ciliata (Ph.)	1752			
46	Tetrahymena malaccensis	Strain MP75 (intron+), ATCC 50066	Ciliata (Ph.)	1753			
47	Paramecium tetraurelia		Ciliata (Ph.)	1753	X03772		
48	Proteromonas micans	Strain LB113614	Dinoflagellates (Assemblage)	1798	M14649		
49	Plasmodium berghei	Strain NUZ2	Sporozoa (Ph.)	2059	M14599		
* 50	Plasmodium falciparum		Sporozoa (Ph.)	2058			
* 51	Plasmodium falciparum		Sporozoa (Ph.)	2091			
* 52	Plasmodium falciparum		Sporozoa (Ph.)	2148			
* 53	Plasmodium lophurae		Sporozoa (Ph.)	2118			
54	Plasmodium vivax		Sporozoa (Ph.)	(1602)	X13706		
55	Acanthamoeba castellanii		Rhizopoda (Ph.)	2303	X13926		
* 56	Naegleria gruberi		Rhizopoda (Ph.)	2019	M13435		
57	Trypanosoma brucei		Amoebeina (O.)	2255	M18732		
58	Cribidia fasciculata		Euglenozoa (Assemblage)	2206	X03450		
* 59	Leishmania donovani	Strain Sudan 1	Euglenozoa (Assemblage)	2204	X07773		
60	Euglena gracilis		Euglenozoa (Assemblage)	2305	M12677		
61	Vairimorpha necatrix		Microsporidia (Assemblage)	1244	Y00266		
* 62	Giardia lamblia	Strain Portland 1	Polymastigotes (Assemblage)	1453	M19500		

Table 1. continued

Nr (a)	Species	Specification (b)	Taxonomic position (c)	Length (d)	Access. (e)	Method (f)	Re-mark
ARCHAEBACTERIA							
* 63	<i>Halobacterium cutirubrum</i>	Strain RI	Halobacteria	1472	K02971		
64	<i>Halobacterium halobium</i>	ATCC 17082	Halobacteria	1473	M11583		
65	<i>Halobacterium volcanii</i>	Strain JF1	Halobacteria	1472	K00421		
66	<i>Halococcus morrhuae</i>	DSM 1224	Methanomicrobium group	1475	X00662		
* 67	<i>Methanospirillum hungatei</i>	Strain PL-19	Methanomicrobium group	1464	X16932		
* 68	<i>Methanotrix soehngeni</i>	Strain P1	Methanobacter group	1471			
69	<i>Methanococcus vannielii</i>	Strain Marburg	Methanobacter group	1466	X15364		
70	<i>Methanobacterium formicicum</i>	DSM 1312	Methanobacter group	1476			
71	<i>Methanobacterium thermoautotrophicum</i>	Strain 2476	Thermoplasma group	1496			
* 72	<i>Thermoplasma celer</i>	DSM 2476	Thermoplasma group	1486			
* 73	<i>Thermoplasma acidophilum</i>	122-1B2	Thermoplasma group	1471			
74	<i>Desulfurococcus mobilis</i>	Strain PL-19	Extreme thermophiles	1495	M21087		
* 75	<i>Pyrodicticum occultum</i>	Strain P1	Extreme thermophiles	1497	X03235		
76	<i>Sulfolobus solfataricus</i>	Strain VC-16	Extreme thermophiles	1493			
77	<i>Thermoproteus tenax</i>		Extreme thermophiles	1504			
78	<i>Archaeoglobus fulgidus</i>		Extreme thermophiles	1492	X05567		
EUBACTERIA							
79	<i>Agrobacterium tumefaciens</i>	DSM 30105	Proteobacteria (Cl.)	1489	M11223		
80	<i>Brucella abortus</i>	Strain 11/19	Proteobacteria (Cl.)	(1429)	X13695	RT	
81	<i>Ehrlichia risticii</i>	ATCC VR986	Proteobacteria (Cl.)	(1489)	M21290		
82	<i>Hypomicrobium vulgare</i>	Strain MC-750	Proteobacteria (Cl.)	(1373)		RT	
83	<i>Rickettsia prowazekii</i>		Proteobacteria (Cl.)	1508	M21789		
84	<i>Rickettsia rickettsii</i>	ATCC VR891	Proteobacteria (Cl.)	(1443)	M21293	RT	
85	<i>Rickettsia typhi</i>		Proteobacteria (Cl.)	(1444)	M20499	RT	
86	<i>Rochalimaea quintana</i>	Strain Fuller	Proteobacteria (Cl.)	1492	M11927		
87	<i>Alcaligenes faecalis</i>	ATCC 8750	Proteobacteria (Cl.)	(1473)	M22508		
88	<i>Alcaligenes xylosoxidans</i>	ATCC 15173, subsp. denitrificans	Proteobacteria (Cl.)	(1463)	M22509		
89	<i>Chromobacterium fluviatiale</i>	ATCC 33051	Proteobacteria (Cl.)	(1470)	M22511	RT	
90	<i>Chromobacterium violaceum</i>	ATCC 12472	Proteobacteria (Cl.)	(1472)	M22510	RT	
91	<i>Eikenella corrodens</i>	ATCC 23834	Proteobacteria (Cl.)	(1487)	M22512	RT	
92a	<i>Eikenella corrodens</i>	FDC 373	Proteobacteria (Cl.)	(1486)	M22513	RT	
92b	<i>Eikenella corrodens</i>	FDC 558	Proteobacteria (Cl.)	(1486)	M22514	RT	
92c	<i>Eikenella corrodens</i>	ATCC 33394	Proteobacteria (Cl.)	(1486)	M22515	RT	
93	<i>Kingella denitrificans</i>	ATCC 33394	Proteobacteria (Cl.)	(1472)	M22516	RT	
94	<i>Kingella kingae</i>	ATCC 23330	Proteobacteria (Cl.)	(1473)	M22517	RT	
* 95	<i>Neisseria gonorrhoeae</i>	ATCC 49619	Proteobacteria (Cl.)	1544	X07714		
* 96	<i>Pseudomonas aeruginosa</i>	ATCC 27875	Proteobacteria (Cl.)	1537	X06884		
* 97	<i>Pseudomonas cepacia</i>	ATCC 11996	Proteobacteria (Cl.)	1537	M22518	RT	
98	<i>Pseudomonas testosteroni</i>	ATCC 25416	Proteobacteria (Cl.)	(1471)	M22519	RT	
99	<i>Vitreoscilla stercoraria</i>	ATCC 11996	Proteobacteria (Cl.)	1536	M11224		
*100	<i>Acyrtosyphon pisum symbiont P</i>	VT1	Proteobacteria (Cl.)	(1487)	M22519	RT	
*101	<i>Acyrtosyphon pisum symbiont S</i>		Proteobacteria (Cl.)	1547	M27039		
*102	<i>Chromatium vinosum</i>	Strain Q177	Proteobacteria (Cl.)	1542	M27040		
103	<i>Coxiella burnetii</i>	Operon rrmB	Proteobacteria (Cl.)	1526	M26629		
*104	<i>Ectothiorhodospira halophila</i>		Proteobacteria (Cl.)	(1484)	M21291	RT	
*105	<i>Escherichia coli</i>	ATCC 25922	Proteobacteria (Cl.)	(1494)	M26630		
106	<i>Proteus vulgaris</i>	ATCC 27880	Proteobacteria (Cl.)	1544	V00348		
107	<i>Ruminobacter amylophilus</i>	DSM 1361	Proteobacteria (Cl.)	1544	J01874		
108	<i>Wolbachia persica</i>	ATCC VR331	Proteobacteria (Cl.)	1539	M21292		
109	<i>Desulfosarcina variabilis</i>	Strain PG49, ATCC 29102	Proteobacteria (Cl.)	(1475)	M26632	RT	
110	<i>Desulfotobacter postgatei</i>	Strain 6-1, ATCC 27879	Proteobacteria (Cl.)	(1527)	M26633		
111	<i>Desulfotribium desulfuricans</i>	Strain JR, ATCC 27112	Proteobacteria (Cl.)	(1519)	M26633		
112	<i>Desulfuroximonas acetoxidans</i>	Strain 5LA	Proteobacteria (Cl.)	1551			
113	<i>Myxococcus xanthus</i>	Strain A-2, ATCC 43167	Proteobacteria (Cl.)	(1522)	M26634		
114	<i>Wolinella succinogenes</i>	Strain MD207	Proteobacteria (Cl.)	1537			
115	<i>Acholeplasma tatumii</i>	Strain TAC, ATCC 43706	uncertain affiliation	(1503)	M23931	RT	
116	<i>Acholeplasma entomophilum</i>	Strain LA1, ATCC 33453	Firmicuta (Ph.)	(1476)			
117	<i>Acholeplasma laidlawii</i>	Strain JAI	Firmicuta (Ph.)	1508	M23932		
118	<i>Acholeplasma modicum</i>	Strain PG49, ATCC 29102	Firmicuta (Ph.)	(1473)	M23933		
119	<i>Anaeroleptasma abactoclasticum</i>	Strain 6-1, ATCC 27879	Firmicuta (Ph.)	(1453)	M25050		
120	<i>Anaeroleptasma bacteriostaticum</i>	Strain JR, ATCC 27112	Firmicuta (Ph.)	(1436)	M25049		
121	<i>Anaeroleptasma intermedium</i>	Strain 5LA	Firmicuta (Ph.)				
122	<i>Anaeroleptasma varium</i>	Strain A-2, ATCC 43167	Firmicuta (Ph.)				
123	<i>Asteroleptasma anaerobium</i>	Strain 161, ATCC 27880	Firmicuta (Ph.)	(1471)	M23934		
124	<i>Bacillus subtilis</i>	Operon rrmB	Firmicuta (Ph.)	1550	M22351		
125	<i>Clostridium innocuum</i>	Strain B-3, ATCC 14501	Firmicuta (Ph.)	1550			
126	<i>Clostridium ramosum</i>	Strain 113-I, ATCC 25582	Firmicuta (Ph.)	1544	M23732		
127	<i>Clostridium sticklandii</i>	Strain alpha-PH5, ATCC 19414	Firmicuta (Ph.)	1530	M23731		
128	<i>Erysipelothrix rhusiopathiae</i>	Strain 1871, ATCC 25536	Firmicuta (Ph.)	(1476)	M26494		
129	<i>Lactobacillus catenaforme</i>	DSM 20196	Firmicuta (Ph.)	(1487)	M23728		
130	<i>Lactobacillus confusus</i>		Firmicuta (Ph.)	1549	M23729		
					M23036	RT	

Table 1. continued.

Nr (a)	Species	Specification (b)	Taxonomic position (c)	Length (d)	Access. (e)	Method (f)	Re-mark
131	<i>Lactobacillus haloterans</i>	DSM 20190	Firmicuta (Ph.)		M23037	RT	
132	<i>Lactobacillus kandleri</i>	DSM 20593	Firmicuta (Ph.)		M23038	RT	
133	<i>Lactobacillus minor</i>	DSM 20014	Firmicuta (Ph.)		M23039	RT	
134	<i>Lactobacillus viridescens</i>	ATCC 12706	Firmicuta (Ph.)		M23040	RT	
135	<i>Lactobacillus vitulinus</i>	Strain 185, ATCC 27783	Firmicuta (Ph.)	(1477)			
136	<i>Lactococcus garvieae</i>	NCDO 2156	Firmicuta (Ph.)	(1475)			
137	<i>Lactococcus lactis</i>	NCDO 2118, subsp. <i>lactis</i>	Firmicuta (Ph.)	(1472)			
138	<i>Lactococcus plantarum</i>	NCDO 1869	Firmicuta (Ph.)	(1473)			
139	<i>Lactococcus raffinolactis</i>	NCDO 617	Firmicuta (Ph.)	(1479)			
140	<i>Leuconostoc cremoris</i>	DSM 20346	Firmicuta (Ph.)		M23034	RT	
141	<i>Leuconostoc lactis</i>	DSM 20202	Firmicuta (Ph.)		M23031	RT	
142	<i>Leuconostoc mesenteroides</i>	DSM 20343	Firmicuta (Ph.)		M23035	RT	
143	<i>Leuconostoc oenos</i>	DSM 20252	Firmicuta (Ph.)		M23032	RT	
144	<i>Leuconostoc paramesenteroides</i>	DSM 20288	Firmicuta (Ph.)		M23033	RT	
145	<i>Mycoplasma agalactiae</i>	Strain PG2, NCTC 10123	Firmicuta (Ph.)	(1463)			
146	<i>Mycoplasma arginini</i>	Strain G230, ATCC 23838	Firmicuta (Ph.)	(1474)			
147	<i>Mycoplasma arthritidis</i>	Strain PG6, ATCC 19611	Firmicuta (Ph.)	(1480)			
148	<i>Mycoplasma bovigenitalium</i>	Strain PG11, ATCC 19852	Firmicuta (Ph.)	(1464)			
149	<i>Mycoplasma californicum</i>	Strain ST-6, ATCC 33461	Firmicuta (Ph.)	(1480)			
150	<i>Mycoplasma capricolum</i>	Operon rrmB	Firmicuta (Ph.)	1521	X00921		
151	<i>Mycoplasma elychniae</i>	Strain ELGN-1, ATCC 43707	Firmicuta (Ph.)	(1475)			
152	<i>Mycoplasma fermentans</i>	Strain PG18, ATCC 19989	Firmicuta (Ph.)	(1461)			
*153	<i>Mycoplasma gallisepticum</i>		Firmicuta (Ph.)	1519	M24481		
154	<i>Mycoplasma hominis</i>	Strain PG21, ATCC 23114	Firmicuta (Ph.)	(1468)			
155	<i>Mycoplasma hyopneumoniae</i>	ATCC 27719	Firmicuta (Ph.)	1537	Y00149		
156	<i>Mycoplasma hyorhinis</i>	Strain 695, ATCC 33552	Firmicuta (Ph.)	(1470)			
157	<i>Mycoplasma iowae</i>	Strain MaBy, ATCC 27104	Firmicuta (Ph.)	(1463)			
158	<i>Mycoplasma lipophilum</i>	Strain R134, ATCC 43663	Firmicuta (Ph.)	(1480)			
159	<i>Mycoplasma mobile</i>	Strain R114, ATCC 33757	Firmicuta (Ph.)	(1466)			
160	<i>Mycoplasma muris</i>	Strain UM30847, subsp. <i>mucooides</i>	Firmicuta (Ph.)	(1464)			
161	<i>Mycoplasma neurolyticum</i>	Strain type A, ATCC 19988	Firmicuta (Ph.)	(1474)			
162	<i>Mycoplasma orale</i>	Strain CH19299, ATCC 23714	Firmicuta (Ph.)	(1480)			
163	<i>Mycoplasma pirum</i>	Strain 70-159, ATCC 25960	Firmicuta (Ph.)	(1463)			
164	<i>Mycoplasma pneumoniae</i>	Strain PH, ATCC 15531	Firmicuta (Ph.)	(1465)			
165	<i>Mycoplasma pneumoniae</i>	Strain PG34, ATCC 19612	Firmicuta (Ph.)	(1476)			
166	<i>Mycoplasma pulmonis</i>	Strain KS-1, ATCC 15718	Firmicuta (Ph.)	(1476)			
167	<i>Mycoplasma putrefaciens</i>	Strain PG20, ATCC 23064	Firmicuta (Ph.)	(1470)			
168	<i>Mycoplasma salivarium</i>	Strain Mayfield B, ATCC 33004	Firmicuta (Ph.)	(1497)			
169	<i>Mycoplasma sualvi</i>	Strain 831-C4, ATCC 49193	Firmicuta (Ph.)	(1475)			
170	<i>Mycoplasma sp.</i>	Strain PG 50, Operon rrmA	Firmicuta (Ph.)	1523	M10588		
171	<i>Mycoplasma sp.</i>	Strain M1, ATCC 49191	Firmicuta (Ph.)	(1474)			
*172	<i>Oenothera hookeri</i> MLO		Firmicuta (Ph.)	1535	M24478		
174	<i>Spiroplasma apis</i>	Strain B-31, ATCC 33834	Firmicuta (Ph.)	(1469)			
175	<i>Spiroplasma citri</i>	Strain Maroc, ATCC 27556	Firmicuta (Ph.)	(1492)			
176	<i>Spiroplasma group II</i>	Strain DM1, ATCC 43153	Firmicuta (Ph.)	1523	M23942		
177	<i>Spiroplasma group IX (beetle)</i>	Strain CN-5, ATCC 33827	Firmicuta (Ph.)	(1468)			
178	<i>Spiroplasma group VI</i>	Strain Y32, ATCC 33835	Firmicuta (Ph.)	(1464)			
179	<i>Spiroplasma group VII (wasp)</i>	Strain MQ-1, ATCC 33825	Firmicuta (Ph.)	(1473)			
180	<i>Spiroplasma group XII (beetle)</i>	Strain DM-1, ATCC 43210	Firmicuta (Ph.)	(1458)			
181	<i>Spiroplasma group XIII (horsefly)</i>	Strain TG-1, ATCC 43525	Firmicuta (Ph.)	(1460)			
182	<i>Spiroplasma mirum</i>	Strain SMCA, ATCC 29335	Firmicuta (Ph.)	(1469)			
183	<i>Spiroplasma taiwanense</i> group XXII	Strain CT-1, ATCC 43302	Firmicuta (Ph.)	(1468)			
184	<i>Streptococcus pleomorphus</i>	Strain 60B, ATCC 29734	Firmicuta (Ph.)	(1467)			
185	<i>Ureaplasma urealyticum</i>	Strain 960, NCTC 10177	Firmicuta (Ph.)	1577	M23730		
186	<i>Vaccococcus fluviialis</i>	NCDO 2497	Firmicuta (Ph.)	(1484)			
187	<i>Corynebacterium polymorphus</i>		Firmicuta (Ph.)	(1484)			
*188	<i>Megaspheera elsdeni</i>		Firmicuta (Ph.)	1567	M26493		
*189	<i>Mycobacterium bovis</i>	Strain BCG	Firmicuta (Ph.)	1536	X15916		
190	<i>Mycobacterium kansasii</i>	DSM 43224	Firmicuta (Ph.)	(1463)			
191	<i>Nocardioides albus</i>	DSM 43109	Firmicuta (Ph.)	(1444)			
192	<i>Nocardioides jensenii</i>	DSM 29641	Firmicuta (Ph.)	(1443)			
193	<i>Nocardioides luteus</i>	NCIB 11455	Firmicuta (Ph.)	(1441)			
194	<i>Pimeolobacter simplex</i>	NCIB 8929	Firmicuta (Ph.)	(1444)			
195	<i>Propionibacterium acidipropionici</i>	DSM 20272	Firmicuta (Ph.)	(1351)			
196	<i>Propionibacterium acnes</i>	DSM 1897	Firmicuta (Ph.)	(1359)			
197	<i>Propionibacterium freudenreichii</i>	DSM 20271	Firmicuta (Ph.)	(1468)			
198	<i>Propionibacterium jensenii</i>	DSM 20535	Firmicuta (Ph.)	(1365)			
199	<i>Propionibacterium propionicum</i>	DSM 43307	Firmicuta (Ph.)	(1214)			
200	<i>Propionibacterium thoenii</i>	DSM 20276	Firmicuta (Ph.)	(1365)			
*201	<i>Streptomyces ambofaciens</i>	Operon rrmD	Firmicuta (Ph.)	1528	M27245		
*202	<i>Streptomyces coelicolor</i>	Strain A3 (2) M145, Operon rrmD	Firmicuta (Ph.)	1526	Y00411		
*203	<i>Streptomyces lividans</i>	Strain TK21 Operon rrmB	Firmicuta (Ph.)	1531			

Table 1. continued.

Nr (a)	Species	Specification (b)	Taxonomic position (c)	Length (d)	Access. (e)	Method (f)	Re-mark
204	<i>Terrabacter tumescens</i>	NCIB 8914	Firmicuta (Ph.)	(1444)		RT	
205	<i>Tsakumarella paurometabolum</i>	DSM 20162, NCTC 10741	Firmicuta (Ph.)	(1341)			
206	<i>Hellobacterium chlorum</i>		Firmicuta (Ph.)	1522	M11212		
*207	<i>Thermus thermophilus</i>	Strain UWO 298	Radioresistant micrococci & rel. (Ph.)	1515	X07998		
*208	<i>Deinococcus radiodurans</i>	ATCC 25285	Radioresistant micrococci & rel. (Ph.)	1502	M21413		
209	<i>Bacteroides fragilis</i>	IPO 42017 (ATCC 13125)	Bacteroides, Flavobact., Cytophaga (Ph.)	1533	M11656		
210	<i>Cytophaga hepatica</i>	Strain 58C	Bacteroides, Flavobact., Cytophaga (Ph.)	1528	M11657		
211	<i>Chlamydia psittaci</i>		Chlamydiae (Ph.)	1556	M13769		
212	<i>Chloroflexus aurantiacus</i>	J10FL (lyophilized cells)	Green non sulfur bacteria & rel. (Ph.)	1484	X01296		
213	<i>Thermotrophon roseum</i>	ATCC 27779 (frozen cell pellet)	Green non sulfur bacteria & rel. (Ph.)	1483			
214	<i>Thermomicrobium aurantiacum</i>	ATCC 27502 (frozen cell pellet)	Green non sulfur bacteria & rel. (Ph.)	1525			
215	<i>Clathrochloris sulfurica</i>	Strain 1	Cyanobacteria	(1335)		RT	
216	<i>Anacystis nidulans</i>	Strain 6301 (Berkeley)	Cyanobacteria	1487			
217	<i>Thermotoga maritima</i>	Strain MSB 8, DSM 3109	Thermophilic eubacteria	1563	M26631		
218	<i>Archaeomonas oleiferhydrans</i>			(1505)	M26635		
219	<i>Desulfomonile tiedjei</i>			(1532)	M26452		
220	<i>Syntrophomonas wolfei</i>			(1532)	M26491		
221	<i>Syntrophospora bryantii</i>						
PLASTIDS							
*222	<i>Zea mays</i> chl.		Angiospermae (Ph.)	1490	Z00028		
*223	<i>Oryza sativa</i> chl.		Angiospermae (Ph.)	1491	X15901		
224	<i>Nicotiana tabacum</i> chl.		Angiospermae (Ph.)	1486	V00165		
*225	<i>Glycine max</i> chl.	Variety Bright Yellow 4	Angiospermae (Ph.)	1470	X06428		
226	<i>Marchantia polymorpha</i> chl.		Bryophyta (Ph.)	1496	X04465		
227	<i>Chlamydomonas reinhardtii</i> chl.		Chlorophyceae (Cl.)	1475	X03269		
*228	<i>Chlamydomonas moewusii</i> chl.		Chlorophyceae (Cl.)	1481			
*229	<i>Chlamydomonas eugametos</i> chl.		Chlorophyceae (Cl.)	1481			
*230	<i>Chlorella ellipsoidea</i> chl.	Strain IAM-C87	Chlorophyceae (Cl.)	1583	X12742		
*231	<i>Chlorella vulgaris</i> chl.	Strain 211-11b	Chlorophyceae (Cl.)	1494	X16579		
232	<i>Ochromonas danica</i> chr.	Strain 933-7	Chlorophyceae (Cl.)	(1355)		PCR	
233	<i>Euglena gracilis</i> chl.	Strain 2	Euglenozoa (Assemblage)	1491		RT	
MITOCHONDRIA							
*234	<i>Homo sapiens</i> mit.	Placenta	Chordata (Ph.)	954	V00710		
235	<i>Pan troglodytes</i> mit.	Cultured cells	Chordata (Ph.)	948			
236	<i>Pan paniscus</i> mit.	Frozen tissue	Chordata (Ph.)	949			
237	<i>Gorilla gorilla</i> mit.	Frozen tissue	Chordata (Ph.)	948			
238	<i>Pongo pigmaeus</i> mit.	Frozen tissue	Chordata (Ph.)	950			
239	<i>Mus musculus</i> mit.	L-Cell, C2-1 line	Chordata (Ph.)	956			
240	<i>Rattus norvegicus</i> mit.	Liver	Chordata (Ph.)	953	V00680		
*241	<i>Rattus norvegicus</i> mit.	Variant A	Chordata (Ph.)	954	X14848		
242	<i>Bos taurus</i> mit.	Heart	Chordata (Ph.)	955	V00654		
*243	<i>Rana catesbeiana</i> mit.		Chordata (Ph.)	937	X12841		
244	<i>Xenopus laevis</i> mit.		Amphibia (Cl.)	819	X02890		
245	<i>Drosophila yakuba</i> mit.	Stock 3371.6, Ivory coast	Arthropoda (Ph.)	789	X03240		
246	<i>Drosophila virilis</i> mit.	Stock 2375.8, Chile	Arthropoda (Ph.)	789			
*247	<i>Strongylocentrotus purpuratus</i> mit.	Fresh eggs	Echinoidea (Cl.)	865	X12631		
248	<i>Paracentrotus lividus</i> mit.		Echinoidea (Cl.)	878	J04815		
249	<i>Zea mays</i> mit.		Echinoidea (Cl.)	1964	X00794		
250	<i>Zea mays</i> mit.		Monocotyledoneae (Cl.)	1967	M10248		
251	<i>Zea diploperennis</i> mit.		Monocotyledoneae (Cl.)	1964			
252	<i>Triticum aestivum</i> mit.		Monocotyledoneae (Cl.)	1967			
*253	<i>Glycine max</i> mit.		Monocotyledoneae (Cl.)	1955			
254	<i>Oenothera sp.</i> mit.		Monocotyledoneae (Cl.)	1950	K01229		
*255	<i>Chlamydomonas reinhardtii</i> mit.		Dicocotyledoneae (Cl.)	1897	M16859		
*256	<i>Saccharomyces cerevisiae</i> mit.		Dicocotyledoneae (Cl.)	1199	M22648		
257	<i>Saccharomyces cerevisiae</i> mit.	Strain MH41-7B	Hemiascomycetes (Cl.)	1686	V00702		
*258	<i>Saccharomyces cerevisiae</i> mit.	Strain D273-10B, wild-type	Hemiascomycetes (Cl.)	1651	V00704		
259	<i>Saccharomyces cerevisiae</i> mit.	Strain 777-3A	Hemiascomycetes (Cl.)	1649	X07799		
*260	<i>Aspergillus nidulans</i> mit.	Strain KL14-4A	Hemiascomycetes (Cl.)	1554	X07800		
*261	<i>Schizosaccharomyces pombe</i> mit.	Strain paba A1, bi A1	Plectocomycetes (Cl.)	1422	X15738		
*262	<i>Podospora anserina</i> mit.	Race A	Plectocomycetes (Cl.)	1978	X14734		
263	<i>Tetrahymena pyriformis</i> mit.	Strain ST	Plectocomycetes (Cl.)	1659	X05203		
264	<i>Tetrahymena pyriformis</i> mit.	Strain ST	Holotricha (O.)	1668	M12714		
265	<i>Paramecium primaurelia</i> mit.	Stock 513 (Edinburgh)	Holotricha (O.)	1691?	K01750		
266	<i>Paramecium tetraurelia</i> mit.	Stock 513 (Edinburgh)	Holotricha (O.)	1690?	K01751		
267	<i>Trypanosoma brucei</i> mit.	Strain 427	Kinetoplastida	611	V01390		
268	<i>Crithidia fasciculata</i> mit.		Kinetoplastida	612	X02548		
*269	<i>Leishmania tarentolae</i> mit.		Kinetoplastida	611			
*270	<i>Leptomonas sp.</i> mit.		Kinetoplastida	611			

Table 2. Number of formatted disks to be sent in order to obtain a copy of the database.

Size	Disk type Capacity	Database format (see text)		
		Format 1	Format 2	Format 3
5.25"	DSDD (360 Kbytes)	15	4	2
5.25"	DSHD (1.2 Mbytes)	5	2	1
3.5"	DSDD (720 Kbytes)	8	2	1
3.5"	DSHD (1.44 Mbytes)	4	1	1

Footnotes to Table 1

- a) This number corresponds with the literature reference and is preceded by an asterisk if the sequence is printed in the alignment. The same number, and the initials of the species name, precede or follow the sequence on each alignment page. Identical numbers, followed by a different lower case character, are attributed to srRNAs from related species, or from different strains of the same species, that have the same sequence (e.g. *Tetrahymena canadensis* and *Tetrahymena borealis*). In such cases only one sequence is listed in our computer file.
- b) This column contains the following data, if specified by the authors:
- Strain name for laboratory animals, (cultivated) variety for plants, culture collection and strain number in the case of microorganisms.
 - Tissue from which the DNA used for cloning or amplification was extracted in the case of differentiated organisms.
 - Ribosomal RNA operon to which belongs the cloned srRNA gene in the case of bacteria.
- c) The taxonomic position is described according to the following references: 277 for the metazoa (No. 1 to 14), 278 for the higher plants (No. 15 to 20), 279 for the algae (No. 21 to 27), 280 for the fungi (No. 28 to 33). The taxonomic position of the protista (No. 34–62) is described according to Wetzel (281) for the species numbered 34–47 and 49–56, but according to Corliss (282) for *Prorocentrum micans* (No. 48) and for Euglenozoa, Microsporidia and Polymastigotes (57–62). The archaeobacteria are classified according to Woese (283). The classification of the eubacteria is according to Stackebrandt et al. (284) for the Proteobacteria, according to Wayne et al. (285) for the Firmicuta, and according to Woese (283) for the remaining taxa. We have no information yet on the taxonomic position of species 218–221. Taxon designations corresponding to an established taxonomic level are followed by the abbreviation Ph. (phylum), Sph. (subphylum), Cl. (class), O. (order).
- d) The srRNA termini are located experimentally (e.g. by S1 nuclease mapping) by some authors, but more often deduced by comparison with structures from related species. In case of length heterogeneity the length of the longest variant is listed. A question mark following the length denotes uncertainty on the location of the termini. A number enclosed in brackets means that the sequence has been determined partially and gives the length of the sequenced area. No length is mentioned for sequences not yet accessible in sequence libraries at the time of writing.
- e) Accession number in the EMBL and Genbank nucleotide sequence libraries. The accession number for a sequence is the same in both libraries but there can be a delay before a sequence submitted to one library arrives in the other one.
- f) PCR: the DNA was amplified by the polymerase chain reaction.
RT: the srRNA was sequenced by the dideoxynucleotide method using reverse transcriptase.
In the remaining cases DNA was amplified by cloning and sequencing was performed in most cases by the dideoxynucleotide method.
- g) Complete data on nucleoside modification can be found in the paper reporting this sequence.
- h) Partial data on modified nucleosides are mentioned in this paper or other papers cited therein.
- i) Complete data on nucleoside modification can be found in (276), but the sequence listed there misses 1 nucleotide and has been corrected in (105).
- j) *Chlamydomonas reinhardtii* mitochondrial srRNA consists of a set of 4 discontinuous fragments, which in the rDNA are interspersed with genes coding for tRNAs, large ribosomal subunit RNA fragments, and proteins. The interruptions between the fragments correspond with alignment positions 239 to 312, 911 to 930, and 2643 to 2811.
- k) In the mature RNA, the nucleotides in alignment positions 431 to 618 are deleted by processing.

	10	20	30	40	50	60
1 Hs	-----	-----	-----	-----	-----	-----
7 Oc	-----	-----	-----	-----	-----	-----
11 Ec	-----	-----	-----	-----	-----	-----
12 Tm	-----	-----	-----	-----	-----	-----
13 Dm	-----	-----	-----	-----	-----	-----
16 Le	-----	-----	-----	-----	-----	-----
19 At	-----	-----	-----	-----	-----	-----
20 Zp	-----	-----	-----	-----	-----	-----
22 Vc	-----	-----	-----	-----	-----	-----
23 Cv	-----	-----	-----	-----	-----	-----
24 Ne	-----	-----	-----	-----	-----	-----
27 Sc	-----	-----	-----	-----	-----	-----
30 Pc	-----	-----	-----	-----	-----	-----
33 Pp	-----	-----	-----	-----	-----	-----
51 Pf	-----	-----	-----	-----	-----	-----
52 Pf	-----	-----	-----	-----	-----	-----
53 Pl	-----	-----	-----	-----	-----	-----
56 Ng	-----	-----	-----	-----	-----	-----
59 Ld	-----	-----	-----	-----	-----	-----
62 Gl	-----	-----	-----	-----	-----	-----
63 Hc	-----	-----	-----	-----	-----	-----
68 Ms	-----	-----	-----	-----	-----	-----
72 Tc	-----	-----	-----	-----	-----	-----
73 Ta	-----	-----	-----	-----	-----	-----
75 Po	-----	-----	-----	-----	-----	-----
95 Ng	-----	-----	-----	-----	-----	-----
96 Pa	-----	-----	-----	-----	-----	-----
100 Ap	-----	-----	-----	-----	-----	-----
101 Ap	-----	-----	-----	-----	-----	-----
102 Cv	-----	-----	-----	-----	-----	-----
105 Ec	-----	-----	-----	-----	-----	-----
153 Mg	-----	-----	-----	-----	-----	-----
173 Oh	-----	-----	-----	-----	-----	-----
188 Me	-----	-----	-----	-----	-----	-----
189 Mb	-----	-----	-----	-----	-----	-----
201 Sa	-----	-----	-----	-----	-----	-----
203 Sl	-----	-----	-----	-----	-----	-----
207 Tt	-----	-----	-----	-----	-----	-----
208 Dr	-----	-----	-----	-----	-----	-----
222 Zn	-----	-----	-----	-----	-----	-----
223 Os	-----	-----	-----	-----	-----	-----
225 Gm	-----	-----	-----	-----	-----	-----
228 Cn	-----	-----	-----	-----	-----	-----
229 Ce	-----	-----	-----	-----	-----	-----
230 Ce	-----	-----	-----	-----	-----	-----
231 Cv	-----	-----	-----	-----	-----	-----
234 Hs	-----	-----	-----	-----	-----	-----
241 Rn	-----	-----	-----	-----	-----	-----
243 Rc	-----	-----	-----	-----	-----	-----
247 Sp	-----	-----	-----	-----	-----	-----
248 Pl	-----	-----	-----	-----	-----	-----
253 Gm	-----	-----	-----	-----	-----	-----
255 Cr	-----	-----	-----	-----	-----	-----
256 Sc	-----	-----	-----	-----	-----	-----
258 Sc	-----	-----	-----	-----	-----	-----
260 An	-----	-----	-----	-----	-----	-----
261 Sp	-----	-----	-----	-----	-----	-----
262 Pa	GUGAUGUUAUUGUAAUUUAAUUUAAUUUAAUUUAAUUAUUAUCAUUAUUUGAUAAAGUGGUG					
269 Lt	-----	-----	-----	-----	-----	-----
270 Ls	-----	-----	-----	-----	-----	-----

	70	80	90	100	110	120	
-----					U A C C U G G U U	U - G A U C	Hs 1
-----					U A C C U G G U U	U - G A U C	Oc 7
-----					U A C C U G G U U	U - G A U C	Ec 11
-----					U C C C U G G U U	U - G A U C	Tm 12
-----					A U U C U G G U U	U - G A U C	Dm 13
-----					U A C C U G G U U	U - G A U C	Le 16
-----					U A C C U G G U U	U - G A U C	At 19
-----					U A C C U G G U U	U - G A U C	Zp 20
-----					U A C C U G G U U	U - G A U C	Vc 22
-----					A A C C U G G U U	U - G A U C	Cv 23
-----					U A C C U G G U U	U - G A U C	Ne 24
-----					A A C C U G G U U	U - G A U C	Sc 27
-----					U A C C U G G U U	U - G A U C	Pc 30
-----					U A C C U G G U U	U - G A U C	Pp 33
-----					A A C C U G G U U	U - G A U C	Pf 51
-----					A A C C U G G U U	U - G A U C	Pf 52
-----					A A C C U G G U U	U - G A U C	Pf 53
-----					U A C C U G G U U	U - G A U C	Ng 56
-----					G A U C U G G U U	U - G A U U	Ld 59
-----					C A U C C G G U C	U - G A U C	Gf 62

----- 1 ----- 2

-----					A U U C C G G U U	U - G A U C	Hc 63
-----					A U U C C G G U U	U - G A U C	Ms 68
-----					A U U C C G G U U	U - G A U C	Tc 72
-----					A C U C C G G U C	U - G A U C	Ta 73
-----					A C U C C G G U U	U - G A U C	Po 75

----- 10 -----

-----					U G A A C A U A A G A G U U U	U - G A U C	Ng 95
-----					G A A C U G A A G A G U U U	U - G A U C	Pa 96
-----					A A A U U G A A G A G U U U	U - G A U C	Ap 100
-----					A A A U U G A A G A G U U U	U - G A U C	Ap 101
-----					X X A C U G A A G A G U U U	U - G A U C	Cv 102
-----					A A A U U G A A G A G U U U	U - G A U C	Ec 105
-----					U U - U U C U G A G A G U U U	U - G A U C	Mg 153
-----					A U A C G - A A G A G U U U	U - G A U C	Oh 173
-----					U A U C A U G G A G A G U U U	U - G A U C	Me 188
-----					U U U G U U U G G A G A G U U U	U - G A U C	Mb 189
-----					U U - U C A C G G A G A G U U U	U - G A U C	Sa 201
-----					A U U C A C G G A G A G U U U	U - G A U C	Sf 203
-----					U U G - U U G G A G A G U U U	U - G A U C	Tt 207
-----					U U U A U G G A G A G U U U	U - G A U C	Dr 208

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-----					U C U C A U G G A G A G U U U	U - G A U C	Os 223
-----					U C U C A U G G A G A G U U U	U - G A U C	Gm 225
-----					A C C U A U G A U G A G U U U	U - G A U C	Cm 228
-----					A C C U A U G A U G A G U U U	U - G A U C	Ce 229
-----					U U U C A U G G A G A G U U U	U C G A U C	Ce 230
-----					U G C C U G C A G A G A G U U U	Y - G A U C	Cv 231

-----					A A U A G G U U U	U - G G U C	Hs 234
-----					A A - A G G U U U	U - G G U C	Rn 241
-----					C A A A G G U U U	U - G G U C	Rc 243
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-----					A U C A U A C U C - - A A A U A - -	A - G A U C	Gm 253
-----					A A A U U - - A G A G U U U	U - G G U G	Cr 255
-----					A G U A A A - - A A A U U A U A A	U - G A U G	Sc 256
-----					A G U A A A - - A A A U U A U A A	U - G A U G	Sc 258
-----					G G U A U A G A G U A A U A U C C C A U U U C C C U A U A C U A U G A A A A U U U - -	U - G A U G	An 260
-----					U U A A A U A A G G C G U G G C G C A A G C U C G C C U U A C U C A C U U A A C C A A A G U U	U - G G U G	Pa 261
-----					U A G - U - C A A - -		Lt 269
-----					U A G - U - C A A - -		Ls 270

----- 70 ----- 80 ----- 90 ----- 100 ----- 110 ----- 120



190 200 210 220 230 240

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- - - - - G C A C G G Hs 1
- - - - - G C A C G G Oc 7
- - - - - U A C A U G C Ec 11
- - - - - U A C A A Tm 12
- - - - - A C A C Dm 13
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- - - - - A C U G Vc 22
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G A A - G G C - (A) G - - - - - C U U G Pa 96
G A G A A G A G A G - - - - - C U U G Ap 100
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- - - - - G G G G - - - - - U U C G Cv 102
A G G A A G A - A G - - - - - C U U G Ec 105
- - - - - G A U G - D A - - - - - G C A A Mg 153
- - - - - G A A G - U U U A A - - - - - G C A A Oh 173
A G A U G A G A A G - - - - - C U U G Me 188
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C C - - - - - A C - - - - - U U C G S1 203
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- - - - - - - - - - - U U C G Dr 208
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A A U U G G - - - - - C U U Cv 231
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- - - - - - - - Rn 241
- - - - - C A G - - Rc 243
- - - - - C C A - - Sp 247
- - - - - C C A - - P1 248
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X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X X - X X X - - - - - C A A - - Cr 255
U U A - U U - - - - - G A U A A Sc 256
U U A - U U - - - - - G A U A A Sc 258
U U A G U U - - - - - A U U A - An 260
- - A A C A (A) A A A C A A U A C A U C C U - - - - - U U A G Sp 261
U U A A A U U U U A C C A G U U G C A G U A A A G U U A U U C U U U C C U U U C U G U A A A A C U G G U U - - - - - A U U A Pa 262
A A - - - - - U U U U Lt 269
A A A - - - - - U U G U Ls 270
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190 200 210 220 230 240

310 320 330 340 350 360

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|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
--- G U A C A G U G A A A C U G C G A A U G G C U C A U U A A A U C A G (U) U A U G G U U C C U U U G G U C G C U C G Hs 1
--- G U A C A G U G A A A C U G C G A A U G G C U C A U U A A A U C A G (U) U A U G G U U C C U U U G G U C G C U C G Oc 7
--- C U U A A G G C G A A A C C G C G A A A U G G C U C A U U A A A U C A G (U) U A U G G U U C C U U U G G U C G U A C C Ec 11
--- U U (A) A G G U G A A A C C G C G A A A U G G C U C A U U A A A U C A G (U) U A U G G U U C C U U U G G U C G U A C C Tm 12
G(A) U U A A A C A G U G A A A C C G C G A A A U G G C U C A U U A A A U C A G (U) U A U G G U U C C U U U G G U C G U A A C Dm 13
--- U U C A G A C U G U G A A A C U G C G A A A U G G C U C A U U A A A U C A G U U A A U A G U U U G U U U G G U A A C Lt 16
--- U U C A G A C U G U G A A A C U G C G A A A U G G C U C A U U A A A U C A G U U A A U A G U U U G U U U G G U A A C At 19
--- U U U G C A C G U G A A A C U G C G A A A U G G C U C A U U A A A U C A G U U A A U A G U U U C U U U G A U G G U A A C U Zp 20
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--- U U U A U A C U G U G A A A C U G C G A A A U G G C U C A U U A A A U C A G U U A A U A G U U U A U U U G A U G G U A A C U Vc 23
--- U U U A U A C U G U G A A A C U G C G A A A U G G C U C A U U A A A U C A G U U A A U A G U U U A U U U G A U G G U A A C C Ne 24
--- A U A C U U A U C U G A A A C U G C G A A C G G C U C A U U A A A U C A G U U A A U A G U U U A U U U G A U A A U C Y C Sc 27
--- U U A U A C A G U G A A A C U G C G A A A U G G C U C A U U A A A U C A G U U A A U A G U U U A U U U G A U G G U A A C Pc 30
--- U U C U C U C U G G A A A C U G C G A A C G G C U C C A U U A A C C A G U U A A A C C A U A G G A A G C A G C Pp 33
--- U A U A U G U A - G A A A C U G C G A A C G G C U C A U U A A A A C A G U U A A U A G U C U A C U U G A C A - U U - Pf 51
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U A U U A U A U - G A A A C U G C G A A C G G C U C A U U A A A A C A G U U A A U A U C U A C U U G A U G - U - P1 53
G U G U A U A U G A U (A) G U C G G A A G G C U C A U U A A A A C A G U U A A U A G U C C U A G G C A C U G G A A A Ng 56
--- A U U U G C A G - G A A U C U G C G A U G G C U C A U U A C A U C A G A C G U A A U C U G G C C C A A A A U C D Ld 59
--- G G A C G C G C G G A C G G C U C A G G A C A A C G G U U G C A C C C C G C G G C G U C C G G 62

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6' 7 8

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--- A C C C G G C A G C G G A A A G G C U C A G U A A C A C G U G G C C A A G C U A C C C U G U G G --- Hc 63
--- U A C A U G G C G G A A C U G C U C A G U A A C A C C G U G G A G A A C C U G C C C U A G G --- Ms 68
G C G C G C A C C G G C G G A A C G G C U C A G U A A C A C C G U G G G U A A C C U A C C C U C G G --- Tc 72
--- G G C A C C G G G C G G A A C A G C U C A G U A A C A C C G U G G A U A A U U A C C C U C A G G --- Ta 73
--- G G G G G C G C G G G G A C G G C U C A G U A A C A C C G U G G C C A A C C U A C C C U C G G --- Po 75

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90 100 110 120 130 140

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U C U C G G - G U G C G A G U G G C G A A C G G G U G A G U A A C A U A U C G G - A A C G U A C C G G U A G G --- Ng 95
U - - - U G G A U U C A G C G G C G G A A C G G G U G A G U A A U G C C U A G G - A A U C U G C C C G G U A G U --- Pa 96
C U C U U G U G G C A A G C C G G C A A A C G G G U G A G U A A U A U C U G G G - G A U C U A C C C A A A G A --- Ap 100
C U C U G G - G U G A C G A G C G G C G G A A C G G G U G A G U A A U G U C U G G G - A A A C U G C C U G A U G G C --- Av 101
G C C U - G A G U A G A G U G G C G G A C G G G U G A G U A A C G C A U G G G - A A U C U G C C U G G C A G A --- Cv 102
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C A U - - - G A G A G G C G G A A C G G G U G A G U A A C A C C U A U G C - A A U C U G C C C U A U A G U --- Mg 153
C U U - - - - A G U G G C G A A A C G G G U G A G U A A C G C G U A A G C A A U C U G C C C C U A A G A --- Oh 173
U C U A U G A U G A U G G A G U G G C G A A C G G G U G A G U A A C G C G U A A G G A A C C U G C C C U G C A G A --- Me 188
A(U) - - - A C U C G A G U G G C G A A C G G G U G A G U A A C A C C G U G A G G G A A C C U G C C C U G C A C U --- Mb 189
--- G G G A U U A G U G G C G A A C G G G U G A G U A A C A C C G U G G G A A U C U G C C C U G C A C U --- Sa 201
--- G G G A U U A G U G G C G A A C G G G U G A G U A A C A C C G U G G G A A U C U G C C C U G C A C U --- S1 203
--- A C U C C G U G G U C A G C G G C G G A C G G G U G A G U A A C G C G U G G U G A C C U A C C C G G A G A --- Tt 207
--- G A C C G A G U G C G C A C G G U G A G U A A C A C G U A A C U G A C C U A C C A G A A G U --- Dr 208

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6' 7 8

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--- G U U U C C A G U G G C G G A A C G G G U G A G U A A C G C C G U (A) A G - A A C C U G C C C U U G G G A --- Os 223
--- G U U U C C A G U G G C G G G A C G G G U G A G U A A C G C C G U (A) A G - A A C C U A C C C U U G G G A --- Gm 225
--- C U G U U A G U U A G U G G C G G A C G G G U G C G U A A C G C G U A A G - A A U G A A C A U U C U G G --- Cm 228
--- C U G U U A G U U A G U G G C G G A C G G G U G C G U A A C G C G U A A G - A A U C A A C A U U C U G G --- Ce 229
A A A G U A A U U C U U A G U G C G G A C G G G U G A G U A A C G C G U A A G - A A C C U A C C U U U A G G G --- Ce 230
C C A G A U G C G A U G G C G G A C G G G U G A G U A A C A C G U A A G - A A C C U A C C U (U) U U G G A --- Cv 231

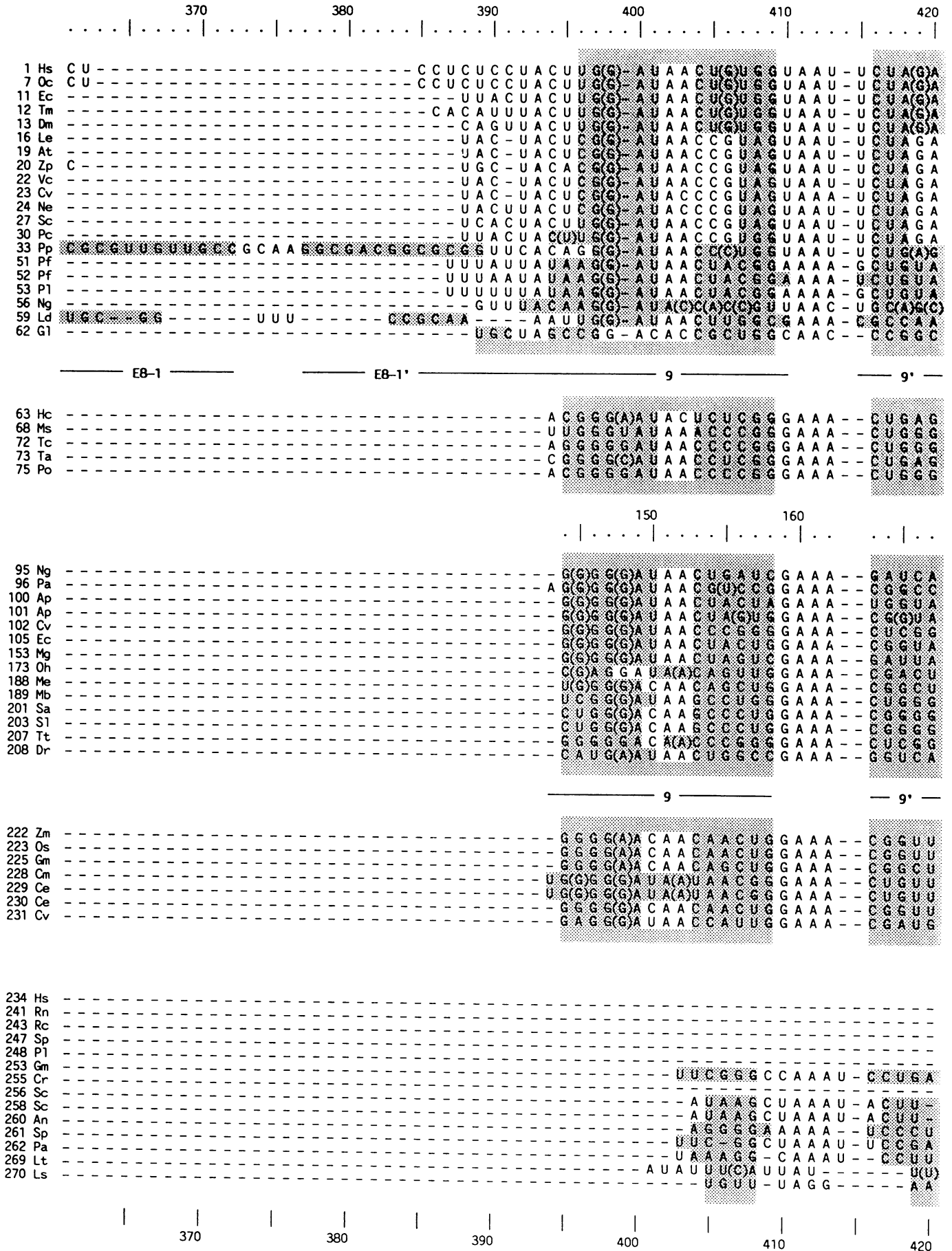
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--- C A C A C C C G U G A G - A A C G C C C U - U U A A A U C U - - - - Rc 243
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--- A U G A C A A A C C A G U G A - A A G U A A A A A - - U U U U G G - - - - P1 248
C A G U U G A A A A C A A A G U G C G A A C G G G U G C G U A A U C G U G G G - A A U C U G C C G A A C A G - - - - Gm 253
--- A A G U U G C - - - U A C G G U G A C C A - A U (A) C G G G - C A U C G G G C - A A - - - - Cr 255
G A U - A A U A A A U A U G U G G U G U A A C C G U G A G U A A U U U U A U G G A A U A A U G A A C U A U A G A Sc 256
G A U - A A U A A A U A U G U G G U G U A A A C G U G A G U A A U U U U A U U A G G A A U A A U G A A C U A U A G A Sc 258
A A C - U A A (G) A G U A G U G G U G U A C A G G U G A G U A A A A G A U A U U G G G A C C U U A A A G U A - An 260
U U U U U - - G U G A C G U G U G U A A C A G G U G A G U A A A A G G A A C G G A C C U U A A A U - - - - Sp 261
U U U U U A A A U A A A A G U G U G U A A C A G G U G A G U A A U A U G G U U U U U G U A C U A C C U A A A A G - Pa 262
--- - - - A U A U A G U U - - - - A U U - - - - G U U (U) A C - - - - A A A U U A A A U - - - - Lt 269
--- U U U A U A U A G U U - - - - A U U G A A A U - A C U U A - - - - U U U A U U U C (A) A - - - - Ls 270

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310 320 330 340 350 360



	430	440	450	460	470	480	
						
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G C U A A U(A) C C C G A U A	---	C G A C G G G G C	---	G C U G A C C C C U U	---		Oc 7
G C U A A U(A) C C C G A U A	---	C G A C G G G G C	---	G C U G A C C C C U U	---		Ec 11
G C U A A U(A) C C C G A U A	---	A A C A G A G G C	---	U C C A A C C C G A A	---		Tm 12
G C U A A U(A) C C C G A U A	---	A U U A A A A A C	---	A U G A A C C U U A U	---		Dm 13
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G C U A A U(A) C C C G A U A	---	A C A A A A C	---	C C G G A C U U C U	---		At 19
G C U A A U(A) C C C G A U A	---	C C A A A A U	---	C C G G A C U U U U	---		Zp 20
G C U A A U(A) C C C G A U A	---	C A C A A	---	C C G G A C U U	---		Vc 22
G C U A A U(A) C C C G A U A	---	U A A A A	---	U C C G G A C U U	---		Cv 23
G C U A A U(A) C C C G A U A	---	C A C A A	---	U C C G G A C U U	---		Ne 24
G C U A A U(A) C C C G A U A	---	U C A A A G	---	C G G A A C D C U	---		Sc 27
G C U A A U(A) C C C G A U A	---	C A A A A A U	---	C C G G A C U U	---		Pc 30
G C U A A U(A) C C C G A U A	---	A A C G U A C C C G C U U	---	C G A C C C G U A A	---		Pp 33
G C U A A U(A) C C C G A U A	---	C U U U A U U A	---	U C C U U G A U U U U	---		Pf 51
G C U A A U(A) C C C G A U A	---	U G A A A U A	---	C C U U U G A U A U A C A U A U	---		Pf 52
G C U A A U(A) C C C G A U A	---	U U U U C	---	A A A A C C C A	---		Pf 53
G C U A A U(A) C C C G A U A	---	C C U U C	---	G G G G U G G U A A G U A C U U U C C U G G U G	---		Ng 56
G C U A A U(A) C C C G A U A	---	A A C C G G G U	---	G U U C U C C A C U C C A G A C G G U G G G C	---		Ld 59
G C C A A G A C G U G C G C G C A A G G G C G G C G C C	---		---		---		G1 62

9' ----- 10 ----- E10-1 -----

G C U A A U(C) C C C G A U A	---	A C G C U U U G C U C C U G G A	---				Hc 63
U A U A A U C C C G A U A	---	G G U C U C G A U U G C U G G A A U	---				Ms 68
G C U A A U C C C G A U A	---	G C C C U G A G G U A C U G G A A U	---				Tc 72
G C U A A U(C) C C C G A U A	---	G U C A U U A C A A C U G G A A U	---				Ta 73
G C U A A U C C C G A U A	---	G G C G A G G G G G C C U G G A A C	---				Po 75

170 | . . . | . . . | . . . | 180 | . . . | . . . | 190

G C U A A U(A) C C C G A U A	---	C G U C U U G A	---				Ng 95
G C U A A U(A) C C C G A U A	---	C G U C C U G A	---				Pa 96
G C U A A U(A) C C C G A U A	---	A U G U U G A A A	---				Ap 100
G C U A A U(A) C C C G A U A	---	A C G U G G C A A	---				Ap 101
G C U A A U(A) C C C G A U A	---	C G C C C U A C G	---				Cv 102
G C U A A U(A) C C C G A U A	---	A C G U C G C A A	---				Ec 105
G C U A A U(A) C C C G A U A	---	A C A A G U U A A C U(A) U C G C A U	---				Mg 153
G C U A A U(A) C C C G A U A	---	G G A G A C A A G A A G G C A U	---				Oh 173
G C U A A U(A) C C C G A U A	---	C G U U C U U U U G U C C	---				Me 188
U C U A A U(A) C C C G A U A	---	G G A C C A C G G G A	---				Mb 189
U C U A A U(A) C C C G A U A	---	C U G A U C C G C U U	---				Sa 201
U C U A A U(A) C C C G A U A	---	C U G A C C C U C G C	---				S1 203
G C U A A U C C C C A U G	---	U G G A C C C G C C C U U U G	---				Tt 207
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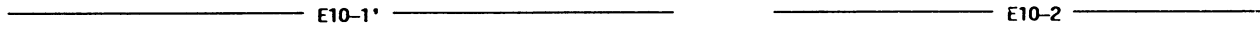
9' ----- 10 -----

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G C U A A U(A) C C C G A U A	---	G G C U G A G G	---				Os 223
G C U A A U(A) C C C G A U A	---	G G C U G A G G	---				Gm 225
G(G)U A A U(A) C C C G A U A	---	A A A C U G A G G	---				Cm 228
G(G)U A A U(A) C C C G A U A	---	A A A C U G A G G	---				Ce 229
G C U A A U(A) C C C G A U A	---	A G C U G A G G	---				Ce 230
G C U A A U(A) C C C G A U A	---	U U G C U G A G A	---				Cv 231

							Hs 234
							Rn 241
							Rc 243
							Sp 247
							P1 248
A	---	G A A A	---	G C U A A A A	---		Gm 253
							Cr 255
A U A U A	---		---	U A U U A D A U A A A A U A A	---		Sc 256
A A U A U A	---		---	U A U U A U A U A A A A U A A	---		Sc 258
A U A U A A A A G A A	---		---		---		An 260
A U A A	---		---	A C A C A C U C U	---		Sp 261
U A U A G U A U A A A	---		---		---		Pa 262
A G	---		---	G A U A G U A A	---		Lt 269
U A	---		---	G U A A U A A	---		Ls 270

430 | 440 | 450 | 460 | 470 | 480

		490	500	510	520	530	540
						
1 Hs	---	---	---	---	---	---	---
7 Oc	---	---	---	---	---	---	---
11 Ec	---	---	---	---	---	---	---
12 Tm	---	---	---	---	---	---	---
13 Dm	---	---	---	---	---	---	---
16 Le	---	---	---	---	---	---	---
19 At	---	---	---	---	---	---	---
20 Zp	---	---	---	---	---	---	---
22 Vc	---	---	---	---	---	---	---
23 Cv	---	---	---	---	---	---	---
24 Ne	---	---	---	---	---	---	---
27 Sc	---	---	---	---	---	---	---
30 Pc	---	---	---	---	---	---	---
33 Pp	---	---	---	---	---	---	---
51 Pf	---	---	---	---	---	---	---
52 Pf	---	---	---	---	---	---	---
53 P1	---	---	---	---	---	---	---
56 Ng	A G C (C)U A G(C)U A U U G U(A) C C U A G U U U U U C G - G G U - - - - -						
59 Ld	A C C A - U C G U C - - - - - G U G A G A(C) G C C C A G C G - - - - -						
62 G1							



63 Hc	-----
68 Ms	-----
72 Tc	-----
73 Ta	-----
75 Po	-----

95 Ng	-----
96 Pa	-----
100 Ap	-----
101 Ap	-----
102 Cv	-----
105 Ec	-----
153 Mg	-----
173 Oh	-----
188 Me	-----
189 Mb	-----
201 Sa	-----
203 S1	-----
207 Tt	-----
208 Dr	-----

222 Zm	-----
223 Os	-----
225 Gm	-----
228 Cm	-----
229 Ce	-----
230 Ce	-----
231 Cv	-----

234 Hs	-----
241 Rn	-----
243 Rc	-----
247 Sp	-----
248 P1	-----
253 Gm	-----
255 Cr	-----
256 Sc	-----
258 Sc	-----
260 An	-----
261 Sp	-----
262 Pa	-----
269 Lt	-----
270 Ls	-----



		610	620	630	640	650	660
1 Hs	U A G A U A A	---	---	C C H C G G G C C G A U C G G A C - - G C C	---	---	C C C C G U - - - G
7 Oc	U A G A U A A	---	---	C C U D G G G C C G A U C G G A C - - (C) C C	---	---	U C C C G U - - - G C
11 Ec	U G A U A A	---	---	C U U U A G G C U G A U C G G A C - - G G G U	---	---	C U U G U - - - A
12 Tm	U G A U A A	---	---	C U U U A G G C U G A U C G G A C - - G G G U	---	---	C U U G C - - - A
13 Dm	U - - C U A G A	---	---	U A A C A U G C A G A U C G U A U - - G G U U	---	---	C U U G U - - - A
16 Le	A U G A U A A	---	---	C U (C) G A C G - - G A U C G G A C - - G G G U	---	---	C A U C G U - - - G
19 At	A U G A U A A	---	---	C U (C) G A C G - - G A U C G G A C - - G G G U	---	---	C U C U G U - - - G
20 Zp	A U G A U A C	---	---	C U U G A U G - - G A U U G G A U - - G G C C	---	---	C C U C G A - - - G
22 Vc	A U G A U A A	---	---	C U U C A C G - - A A U C G G A U - - G G C C	---	---	C A C G U - - - G
23 Cv	A U G A U A A	---	---	C U U C A C G - - A A U C G G A U - - G G C C	---	---	C U U G U - - - G
24 Ne	A U G A U A A	---	---	C U U C A C G - - A A U C G G A U - - G G C C	---	---	C U C G U - - - G
27 Sc	A U A A U A A C	---	---	C U U U C G - - A A U U G G A U - - G C A	---	---	C A U G U - - - U
30 Pc	A U G A U A A	---	---	C U U C G C G - - G A U C G G A U - - G G C C	---	---	C U U G U - - - G
33 Pp	A C G G U A U C G	---	---	C U U C G A A A G C U U C G G U S - - A G U	---	---	A A C G G C G G - - A
51 Pf	A U A A C A A A	---	---	C U C A G U A A C A C G U A A U - - A A A	---	---	U U U A U - - U U A
52 Pf	A U A A C A A A	---	---	G A A G A A A C A C A U A A - - A A A	---	---	A A U A - - - U
53 P1	A U A A C A A A	---	---	G A A G C A A C A C A U A A U - - A A A G	---	---	C U G U - - - C U U A
56 Ng	U (U) U C A U	---	---	A A G C C U - - U (U) C - - - A G G	---	---	U U U G C U U U - - U
59 Ld	A A U U C A U	---	---	U C C G U G C - - G A A (A) G C - - G G	---	---	C U U G U - - - U
62 G1	- - - - -	---	---	C C G C G G G C G A G C (A) - - G C G	---	---	U G A - - - -

E10-2

10'

11

63 Hc	- - - - -	---	---	A G G G G C A A A G C C G G - A A A C G C - - - - -	---	---	U C C G - - - - -
68 Ms	- - - - -	---	---	G C A U C C G A G A - U U U A A A - G C - - - - -	---	---	U C C G - - - - -
72 Tc	- - - - -	---	---	G G U C C U C A G G C C G - A A A G G G G C - - - - -	---	---	U C U - - - - -
73 Ta	- - - - -	---	---	G G U U G U A A U G A U G - A A A - G C - - - - -	---	---	U U C U - - - - -
75 Po	- - - - -	---	---	G G G U C C C U C G C C G - A A A - G G G C G C G C G (A) G - C C U - C (C) C C G C	---	---	- - - - -

200

210

95 Ng	- - - - -	---	---	G A G G G - A A A G C A G G G G - - - - -	---	---	A C C U U C G G G - - - -
96 Pa	- - - - -	---	---	G G G A G - A A A G U C G G G G - - - - -	---	---	A U C U U C G G A - - - -
100 Ap	- - - - -	---	---	A A C C - A A A - G U G G G G - - - - -	---	---	G A C C U U U G G - - - -
101 Ap	- - - - -	---	---	A A C C - A A A - G U G G G G - - - - -	---	---	G A C C U U C G G - - - -
102 Cv	- - - - -	---	---	G G G G - A A A - G G G G G C - - - - -	---	---	U U C G - - - - -
105 Ec	- - - - -	---	---	G A C C - A A A - G A G G G G - - - - -	---	---	G A C C U U C G G - - - -
153 Mg	- - - - -	---	---	G A (G) A A U A A C U U U - A A A G A A G C - - - - -	---	---	A A C U - - - - -
173 Oh	- - - - -	---	---	C U U C U U G U U U U - A A A A (G) A C C U A - - - - -	---	---	G C A - - - - -
188 Me	- - - - -	---	---	G C A U G G C A G A G G A G - A A A G G G A G G C U C - - - - -	---	---	U U C G - - - - -
189 Mb	- - - - -	---	---	U G C A U G U C - - - - U U G (U) G G U U - - - - -	---	---	G A A A G - - - - C
201 Sa	- - - - -	---	---	G G G C A U C - - - - A G G C G G U U - - - - -	---	---	C G A A - - - - A
203 S1	- - - - -	---	---	A G S C A U C - U - - - G C G A G G U U - - - - -	---	---	C G A A - - - - A
207 Tt	- - - - -	---	---	G G G U G (U) U C C - A A A - G G G C - - - - -	---	---	U U U - - - - -
208 Dr	- - - - -	---	---	G C A A A U C A C U - A A A - G A - - - - -	---	---	U U U A - - - - -

10'

11

222 Zm	- - - - -	---	---	A G C A - A A A G G A - - - - -	---	---	G A A A - - - - -
223 Os	- - - - -	---	---	A G C A - A A A G G A - - - - -	---	---	G A A A - - - - -
225 Gm	- - - - -	---	---	A G C A - A A A G G A - - - - -	---	---	G G A - - - - -
228 Cm	- - - - -	---	---	A G U U - A A A C A A U - - - - -	---	---	G A A A - - - - -
229 Ce	- - - - -	---	---	A G U U - A A A C A A U - - - - -	---	---	G A A A - - - - -
230 Ce	- - - - -	---	---	A G U A - A A A G G A A U - - - - -	---	---	A C U - - - - -
231 Cv	- - - - -	---	---	A G U G - A A A G A U - - - - -	---	---	G A A A - - - - -

234 Hs	- - - - -	---	---	- - - - -	---	---	A C C A - - - - -
241 Rn	- - - - -	---	---	- - - - -	---	---	G C C U A - - - - -
243 Rc	- - - - -	---	---	- - - - -	---	---	U A C C C - - - - -
247 Sp	- - - - -	---	---	- - - - -	---	---	C C U A A - - - - -
248 P1	- - - - -	---	---	- - - - -	---	---	U C U C C - - - - -
253 Gm	- - - - -	---	---	A G C - - - - -	---	---	- - - - -
255 Cr	- - - - -	---	---	- - - - -	---	---	- - - - -
256 Sc	- - - - -	---	---	U U U A U A U A A U A A - A A A G G A U A U - A U A U - A U A - - - - A U	---	---	- - - - -
258 Sc	- - - - -	---	---	U U U A U A U A A U A A - A A A G G A U A U - - A U A U - A U A - - - - A U	---	---	- - - - -
260 An	- - - - -	---	---	- - - - -	---	---	G G A - - - - -
261 Sp	- - - - -	---	---	U U G G A G U G U U S U G A A A G A A - G U - - - - -	---	---	A A A G A A G G - - - -
262 Pa	- - - - -	---	---	- - - - -	---	---	G A A A - - - - -
269 Lt	- - - - -	---	---	A U A A U A A U U U A U A A U U - - - - -	---	---	C U G A U U A - - - -
270 Ls	- - - - -	---	---	U A A U U U A U A A U U - - - - -	---	---	U U G A U - - - - -

610

620

630

640

650

660

		670	680	690	700	710	720		
GC	GG	GC	GC	GC	GC	GC	GC	Hs	1
GG	GG	GC	GC	GC	GC	GC	GC	Oc	7
CC	GG	GC	GC	GC	GC	GC	GC	Ec	11
CC	GG	GC	GC	GC	GC	GC	GC	Tm	12
CC	GG	GC	GC	GC	GC	GC	GC	Dm	13
CC	GG	GC	GC	GC	GC	GC	GC	Le	16
CC	GG	GC	GC	GC	GC	GC	GC	At	19
CC	GG	GC	GC	GC	GC	GC	GC	Zp	20
CC	GG	GC	GC	GC	GC	GC	GC	Zv	22
CC	GG	GC	GC	GC	GC	GC	GC	Cv	23
CC	GG	GC	GC	GC	GC	GC	GC	Ne	24
CC	GG	GC	GC	GC	GC	GC	GC	Sc	27
CC	GG	GC	GC	GC	GC	GC	GC	Pc	30
CC	GG	GC	GC	GC	GC	GC	GC	Pp	33
CC	GG	GC	GC	GC	GC	GC	GC	Pf	51
CC	GG	GC	GC	GC	GC	GC	GC	Pf	52
CC	GG	GC	GC	GC	GC	GC	GC	P1	53
CC	GG	GC	GC	GC	GC	GC	GC	Ng	56
CC	GG	GC	GC	GC	GC	GC	GC	Ld	59
CC	GG	GC	GC	GC	GC	GC	GC	G1	62

		11'	8'	12		
GC	GG	GC	GC	GC	Hc	63
GG	GG	GC	GC	GC	Ms	68
CC	GG	GC	GC	GC	Ta	72
CC	GG	GC	GC	GC	Tc	73
CC	GG	GC	GC	GC	Po	75

		220	230	240		
CC	UC	GC	GC	GC	Ng	95
CC	UC	GC	GC	GC	Pa	96
CC	UC	GC	GC	GC	Ap	100
CC	UC	GC	GC	GC	Ap	101
CC	UC	GC	GC	GC	Cv	102
CC	UC	GC	GC	GC	Ec	105
CC	UC	GC	GC	GC	Mg	153
CC	UC	GC	GC	GC	Oh	173
CC	UC	GC	GC	GC	Me	188
CC	UC	GC	GC	GC	Mb	189
CC	UC	GC	GC	GC	Sa	201
CC	UC	GC	GC	GC	Sl	203
CC	UC	GC	GC	GC	Tt	207
CC	UC	GC	GC	GC	Dr	208

		11'	8'	12		
CC	UC	GC	GC	GC	Zm	222
CC	UC	GC	GC	GC	Os	223
CC	UC	GC	GC	GC	Gm	225
CC	UC	GC	GC	GC	Cm	228
CC	UC	GC	GC	GC	Ce	229
CC	UC	GC	GC	GC	Ce	230
CC	UC	GC	GC	GC	Cv	231

CC	UC	GC	GC	GC	Hs	234
CC	UC	GC	GC	GC	Rn	241
CC	UC	GC	GC	GC	Rc	243
CC	UC	GC	GC	GC	Sp	247
CC	UC	GC	GC	GC	P1	248
CC	UC	GC	GC	GC	Gm	253
CC	UC	GC	GC	GC	Cr	255
CC	UC	GC	GC	GC	Sc	256
CC	UC	GC	GC	GC	Sc	258
CC	UC	GC	GC	GC	An	260
CC	UC	GC	GC	GC	Sp	261
CC	UC	GC	GC	GC	Pa	262
CC	UC	GC	GC	GC	Lt	269
CC	UC	GC	GC	GC	Ls	270

		670	680	690	700	710	720
--	--	-----	-----	-----	-----	-----	-----

730 740 750 760 770 780

1 Hs C G A U G G U A G G - U C G C C G U G C C U A C C A - - - U G G U G A C C A C G G G - U S A A C G G G G A A U C A G G G - G U
7 Oc C G A U G G U A G G - U C U U C U G C C C U A C C A - - - U G G G U C U - A A C G G G - U A A A C C G G G A A U C A G G G - G U
11 Ec C G A U G G U A G G - U C U U C U G C C C U A C C A - - - U G G G U C U - A A C G G G - U A A A C C G G G A A U C A G G G - G U
12 Tm C G A U G G U A G G - U C U U C U G C C C U A C C A - - - U G G G U C U - A A C G G G - U A A A C C G G G A A U C A G G G - G U
13 Dm C G A U G G U A G G - U C U U C U G C C C U A C C A - - - U G G G U C U - A A C G G G - U A A A C C G G G A A U C A G G G - G U
16 Le C G A U G G U A G G - A U A G U G G C C U A C C A - - - U G G G U G G U A A C G G G - U G A A C C G G G A A U U A G G G - G U
19 At C G A U G G U A G G - A U A G U G G C C U A C C A - - - U G G G U G G U A A C G G G - U G A A C C G G G A A U U A G G G - G U
20 Zp C G A U G G U A G G - A U A G A G G C C U A C C A - - - U G G G U G G U A A C G G G - U G A A C C G G G A A U U A G G G - G U
22 Vc C G A U G G U A G G - A U A G A G G C C U A C C A - - - U G G G U G G U A A C G G G - U G A A C C G G G A A U U A G G G - G U
23 Cv C G A U G G U A G G - A U A G A G G C C U A C C A - - - U G G G U G G U A A C G G G - U G A A C C G G G A A U U A G G G - G U
24 Ne C G A U G G U A G G - A U A G A G G C C U A C C A - - - U G G G U G G U A A C G G G - U G A A C C G G G A A U U A G G G - G U
27 Sc G G A U G G U A G G - G U A U U G G A C C U A C C A - - - U G G G U U U C G A C G G G - U A A A C C G G G A A U U A G G G - G U
30 Pc C G A U G G U A G G - A U A G A G G C C U A C C A - - - U G G G U U U C G A C G G G - U A A A C C G G G A A U U A G G G - G U
33 Pp A U G G C A G C G G - A A C G G A G C C U A A C C A - - - U G G G U A A C G A C G G G - U A A A C C G G G A A U U A G G G - G U
51 Pf U G A U G G U A G G - G U A U U G G C C U A A C C A - - - U G G G C U A U G A C G G G - U A A A C C G G G A A U U A G G A - G U
52 Pf U G A U G G U A G G - G U A U U G G C C U A A C C A - - - U G G G C U A U G A C G G G - U A A A C C G G G A A U U A G G A - G U
53 Pt U G A U G G U A G G - G U A A U U G G C C U A A C C A - - - U G G G C U A U U G A C G G G - U A A A C C G G G A A U U A G G A - G U
56 Ng C G A U G G U A G G - U U A A A G G A C A C C (C) - - - A G G G C U U U G A C G G G - U A A A C C G G G A A U U C A G G U - G U
59 Ld U G A U G G U A G G - G U A G U G G A C C U A C C A - - - U G G G C U U U G A C G G G - U A A A C C G G G A A U U C A G G G - G U
62 Gt G G U C G G C G C G - G U C G C G C G C G C C G - - - A G G G C C C G A C C G C C - U G G C G G G A A U C A G G G - G U

12 12' 13

63 Hc A G A C G G U G G G - G U A A C G G C C C A C C G - - - U G C C C A U A A U C G G U - - - A C G G G U U G U G A G A - G C
68 Ms A G U A G G U G G G - G U A A C G G A C C U A C C U - - - A G C C C A C G A C G G G U - - - A C G G G U U G U G A G A - G C
72 Ta A G U A G G U G G G - G U A A C G G A C C A C C A - - - A G C C C G A A A B A U C G G U - - - A C G G G C C A U G A G A - G U
73 Tc A G U A G G U G G G - G U A A C G G A C C A C C U - - - A G C C C U A A B A C G G G U - - - A C G G G C C C U G A A A - G G
75 Po A G U A G G U G G G - G U A A C G G C C C G C C A - - - A G C C C G A U A A C G G G U - - - A G G G G C C G U G A G A - G C

250 260 270 280 290 300

95 Ng G G U U G G (C) G G - G U A A A G G C C C A C C A - - - A G G G G A C G A U C A G U - - - A G C C G G G U C U G A G A - G G
96 Pa A G U U G G U G G G - G U A A A G G C C U A C C A - - - A G G G G A C G A U C C G U - - - A A C C U G G G U C U G A G A - G G
100 Ap U G U U G G U A G G - G U A A A G G C C U A C C A - - - A G G G G A C G A U C C C U - - - A G C C U G G G U C U G A G A - G G
101 Ap G G U A G G U G G G - G U A A A C G G C C U A C C U - - - A G G G C G A C G A U C C C U - - - A G C C U G G G U C U G A G A - G G
102 Cv A G U U G G U G G G - G U A A A C G G C C C A C C A - - - A G G G G G A C G A U C C G U - - - A G C C U G G G U C U G A G A - G G
105 Ec A G U A G G U G G G - G U A A C G G C C U A C C U - - - A G G G G G A C G A U C C C U - - - A G C C U G G G U C U G A G A - G G
153 Mg A G U U G G U G (A) G G - G U A A A G G C C C A C C A - - - A G G G G A U G A C G G U G - - - A G U U A G G C U G A G A - G G
173 Oh A G U U G G U G G G - G U A A A G G C C U A C C A - - - A G G A C U A U G A U S U G U - - - A G C C C G G G C U G A G A - G G
188 Me A G U U G G U G (A) G G - G U A A C G G C C C A C C A - - - A G G G G A C G A U C A G U - - - A G C C G G G U C U G A G A - G G
189 Mb U G U U G G U G G G - G U G A C G G C C U A C C A - - - A G G G G A C G A C G G G U - - - A G C C G G G C C U G A G A - G G
201 Sa U G U U G G U G A G - G U A A U G G C C U A C C A - - - A G G G G A C G A C G G G U - - - A G C C G G G C C U G A G A - G G
203 S1 U G U U G G U G A G - G U A A U G G C C U A C C A - - - A G G G G A C G A C G G G U - - - A G C C G G G C C U G A G A - G G
207 Tt A G U U G G U G G G - G U A A A G G C C C A C C A - - - A G G G G A C G A C G G G U - - - A G C C G G G C C U G A G A - G G
208 Dr G G U U G G U G G G - G U A A A G G C C U A C C A - - - A G G G G A C G A C G G A - - - A G C C G G G C C U G A G A - G G

12 12' 13

222 Zm A G U U G G U G A G - G C A A U A G C U U A C C A - - - A G G G G A U G A U C A G U - - - A G C U G G G U C C G A G A - G G
223 Os A G U U G G U G A G - G C A A U A G C U U A C C A - - - A G G G G G A U G A U C A G U - - - A G C U G G G U C C G A G A - G G
225 Gm A G U U G G U G A G - G U A A A G G C U U A C C A - - - A G G G C G A U G A U C A G U - - - A G C U G G G U C U G A G A - G G
228 Cm A G U U G G U A A G - G U A A A G G C U U A C C A - - - A G G G C C A C G A U C A G U - - - A G C U G G G U C U G A G A - G G
229 Ce A G U U G G U A A G - G U A A A A G C U U A C C A - - - A G G G C C A C G A U C A G U - - - A G C U G G G U C U G A G A - G G
230 Co U G U U G G U G A G - G U A A U U G C U U A C C A - - - A G G G C A A C G A U C A G U - - - A G C U G G G U C U G A G A - G G
231 Cv U G U U G G U G A G - G U A A U U G C U U A C C A - - - A G G G C A A U G A U C A G U - - - A G C U G G G U C U G A G A - G G

234 Hs - - - - - C A A G C - - - A C G C A - - - - - G C A U G C - - - - - A G C U - - - C A A A A C G C - U
241 Rn - - - - - C A A G C - - - A C A U A A U - - - - - A U A - - - G C U - - - G C U C A A G A - C G C C - - - - - - - -
243 Sc - - - - - C A G G C - - - A C A A A C - - - - - G C U - - - C C G C C A C A - - - A C C A C C U - - - - - - - -
247 Sp - - - - - G A A A A - - - G A G A A G - - - - - A C C A G U - - - (A) U C A - - - - - G G C C - - - C U - - - A A G U - - -
248 Pl - - - - - A G C A A A - - - A A - - - - - U U C A G U - - - (A) U C A - - - - - G G C C - - - C U - - - A A C - - -
253 Gm A G U U G G U C A G - G U A A A G G C U G A C C C A - - - A G G C C A A U G A U C C U U - - - A G C C U G G U C U U A U C - G G
255 Cr G G G U C G G A C - G C C A A U A C A G C G G C C C A - - - C A U G G C - - - U U A U C C U - - - A G C C U G G U C U U A U C - G G
256 Sc A G U A G G U U A - U U A A G A G U U A A A C C U - - - A G C C A A C G A (U) C A U - - - A A U C C G A U A A U G A A A G G U
258 Sc A G U A G G U U A - U U A A G A G A C U U A A C C U - - - A G C C A A C G A (U) C A U - - - A A U C C G A U A A U G A A A G G U
260 An A G U A G G U A A G - G U A A A G A C U U A C C U - - - A G C C U A A A U U C C G - - - A G U C G G A U A C U G A G A G G U
261 Sp A G U U G G A G A G - G U A A A A G C U U A A C A - - - A G C C U A - - - A A U C C G U A - - - A U C A G G A (A) C C U A G A G G U
262 Pa A G U U G U A A G - G U A A A U G C U U A A C A - - - A G C C U A G U A U U C U C U A - - - A U C A G G A A G C U A G A G G U
269 Lt -
270 Ls -

730 740 750 760 770 780

790 800 810 820 830 840

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U C G - A U U C C G G A G A G G (G) G G C - C U G A G A G A A A C C G G C U (A) C G A C (A) U C C C A A - - - - G G - A C (A) G G C A G G Hs 1
U C C G - A U U C C C G G A G A G G (G) G G C C - C U G A G A G A A A C C G G C U (A) C C A C (A) U C C C A A - - - - G G - A C (A) G G C A G G Oc 7
U U C C G - A U U C C C G G A G A G G (G) G G C C - C U G A G A G A A A C C G G C U (A) C C A C (A) U C C C A A - - - - G G - A C (A) G G C A G G Ec 11
U U C C G - A U U C C C G G A G A G G (G) G G C C - C U G A G A G A A A C C G G C U (A) C C A C (A) U C C C A A - - - - G G - A C (A) G G C A G G Tm 12
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U U C C G - A U U C C C G G A G A G G (G) G G C C - C U G A G A G A A A C C G G C U (A) C C A C (A) U C C C A A - - - - G G - A C (A) G G C A G G Le 16
U U C C G - A U U C C C G G A G A G G (G) G G C C - C U G A G A G A A A C C G G C U (A) C C A C (A) U C C C A A - - - - G G - A C (A) G G C A G G At 19
U U C C G - A U U C C C G G A G A G G (G) G G C C - C U G A G A G A A A C C G G C U (A) C C A C (A) U C C C A A - - - - G G - A C (A) G G C A G G Zp 20
U U C C G - A U U C C C G G A G A G G (G) G G C C - C U G A G A G A A A C C G G C U (A) C C A C (A) U C C C A A - - - - G G - A C (A) G G C A G G Cv 22
U U C C G - A U U C C C G G A G A G G (G) G G C C - C U G A G A G A A A C C G G C U (A) C C A C (A) U C C C A A - - - - G G - A C (A) G G C A G G Cv 23
U U C C G - A U U C C C G G A G A G G (G) G G C C - C U G A G A G A A A C C G G C U (A) C C A C (A) U C C C A A - - - - G G - A C (A) G G C A G G Ne 24
U U C C G - A U U C C C G G A G A G G (G) G G C C - C U G A G A G A A A C C G G C U (A) C C A C (A) U C C C A A - - - - G G - A C (A) G G C A G G Sc 27
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U U C C G - A U U C C C G G A G A G G (G) G G C C - C U G A G A G A A A C C G G C U (A) C C A C (A) U C C C A A - - - - G G - A G G G C A G G Ld 59
U U C C G - A U U C C C G G A G A G G (G) G G C C - C U G A G A G A A A C C G G C U (A) C C A C (A) U C C C A A - - - - G G - A C (A) G G C A G G Gt 62

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13' 7' 14' 14' 15 15' 16

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A A G - A G C C C G G A G A C G G A U U - C U G A G A G A C A A G A U U C C G G G C C C U A C - - - - G G - G G G G C A G G Hc 63
A A G - A G C C C C G G A G A U U G G A U U - C U G A G A C A C C G G G U C C A G G C C C C U A C - - - - G G - G G C C C C A G G Ms 68
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G G G - A G X C C C C G G A G A U G G G C C (A) - C U G A G A C A A G (G) C C C A G G C C C C U A C - - - - G G - G G C C C C A G G Ta 73
G G G - A G C C C C G G A G A U G G G C C (A) - C U G A G A C A A G (G) C C C A G G C C C C U A C - - - - G G - G G C C C C A G G Po 75

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310 320 330 340 350

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A A U G - A U C C A G G C C C A C A C U G G G A A A - C U G A G A G A C A C C G G U C C C A G A C U C C C U A C - - - - G G - G A G G C A G G Pa 96
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13' 7' 14' 14' 15 15' 16

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A U G - A U C A G G C C A C A C U G G G A A - C U G A G A G A C A C C G G C C C A G A C U C C C U A C - - - - G G - G A G G C A G G Zn 222
A U G - A U C A G G C C A C A C U G G G A A A - C U G A G A G A C A C C G G C C C A G A C U C C C U A C - - - - G G - G A G G C A G G Os 223
A U G - A U C A G G C C A C A C U G G G A A A - C U G A G A G A C A C C G G C C C A G A C U C C C U A C - - - - G G - G A G G C A G G Gm 225
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A U G - A U C A G G C C A C A C U G G G A A A - C U G A G A G A C A C C G G U C C C A G A C U C C C U A C - - - - G G - G A G G C A G G Ce 229
A U G - A U C A G G C C A C A C U G G G A A A - C U G A G A G A C A C C G G U C C C A G A C U C C C U A C - - - - G G - G A G G C A G G Ce 230
A U G - A U C A G G C C A C A C U G G G A A A - C U G A G A G A C A C C G G C C C A G A C U C C C U A C - - - - G G - G A G G C A G G Cv 231

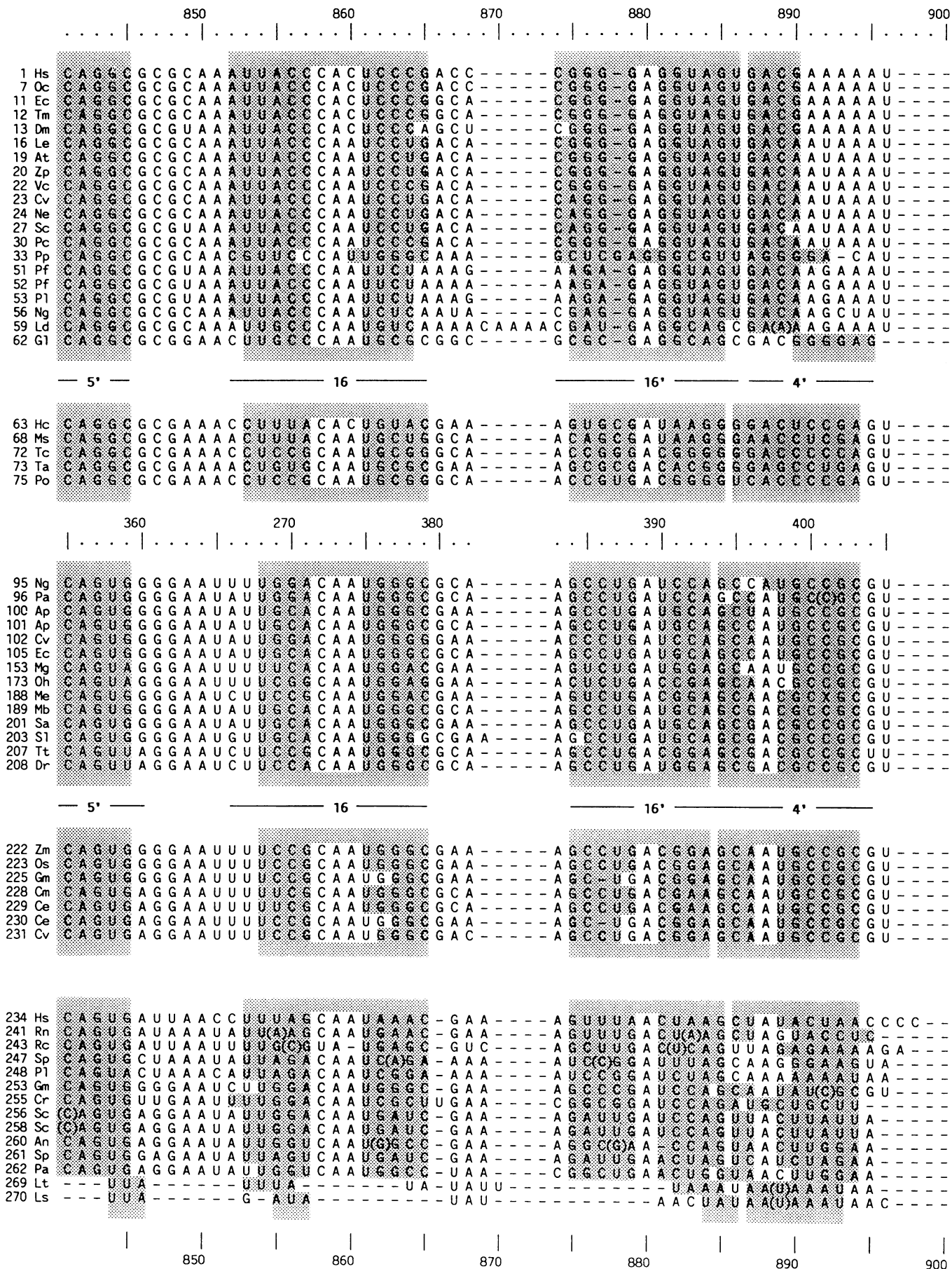
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- A G U C U - C A C C A C A G A C A C - - - - C C C C C A G A G A G U C G G G U A A A C A G Sp 243
C A G - A U A G C C C C A C A C - - - - U A A G C A A U - - - - G G - G C A C A A C U G P1 248
A U G - A U A G G C C C A C A C G U G G A - C U G A G A C A C G G C C C A G A C U C C C U A C - - - - G G - G A G A C A G Gm 253
U A G - A U A G G C C C A C A C G U G G A - C U G A G A A A G - G G C C C A G A C U C C C U A U - - - - G U - G A A A C A G Cr 255
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U U C G - A U C G A U C A C A U U G G A U - C U - - - - G A A C A A A C C C A A G U C G U U U - - - - U A - G A U A - C A G Sc 258
G U G C - A U C G A C C A C A U U G G G (C) U G - G A G A A A A C A G G A U G A A C A U U U A G U U C A G An 260
U U G - A U C G A C C A C A U U G G G - A U - G A G A A A A A U C C A A G G C A A A C - - - - G A A G U A - C A G Sp 261
G U G - - - U G G A A A U - A G U - - - - G U U A A - - - - A U G - - - - G A A G A A - - - - Ls 270

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790 800 810 820 830 840



		970	980	990	1000	1010	1020	
							
1 Hs	CUGUA	AUUG	-----	-----	-----	GA AUGAGU	UCCACU	UUU--A
7 Oc	CUGUA	AUUG	-----	-----	-----	GA AUGAGU	UCCACU	UUU--A
11 Ec	CCGUA	AUUG	-----	-----	-----	GA AUGAGU	UCCACU	UUU--A
12 Tm	CCGUA	AUUG	-----	-----	-----	GA AUGAGU	UCCACU	UUU--A
13 Dm	CUGUA	AUUG	-----	-----	-----	GA AUGAGU	UCCACU	UUU--A
16 Le	-GGUA	AUUG	-----	-----	-----	GA AUGAGU	UCCACU	UUU--A
19 At	-GGUA	AUUG	-----	-----	-----	GA AUGAGU	UCCACU	UUU--A
20 Zp	-GGUA	AUUG	-----	-----	-----	GA AUGAGU	UCCACU	UUU--A
22 Vc	-GGUA	AUUG	-----	-----	-----	GA AUGAGU	UCCACU	UUU--A
23 Cv	-GGUA	AUUG	-----	-----	-----	GA AUGAGU	UCCACU	UUU--A
24 Ne	-GGUA	AUUG	-----	-----	-----	GA AUGAGU	UCCACU	UUU--A
27 Sc	-GGUA	AUUG	-----	-----	-----	GA AUGAGU	UCCACU	UUU--A
30 Pc	-GGUA	AUUG	-----	-----	-----	GA AUGAGU	UCCACU	UUU--A
33 Pp	-GGUA	AUUG	-----	-----	-----	GA AUGAGU	UCCACU	UUU--A
51 Pf	UUGUA	AUUG	-----	-----	-----	GA AUGAGU	UCCACU	UUU--A
52 Pf	UUGUA	AUUG	-----	-----	-----	GA AUGAGU	UCCACU	UUU--A
53 P1	UUGUA	AUUG	-----	-----	-----	GA AUGAGU	UCCACU	UUU--A
56 Ng	G(G)G	A G(S)U	-----	UUGUCUUCUGAC	-----	GA AUGAGU	UCCACU	UUU--A
59 Ld	UUG(U)C	AUUG	-----	-----	-----	GA AUGAGU	UCCACU	UUU--A
62 G1	-----	-----	-----	-----	-----	GA AUGAGU	UCCACU	UUU--A

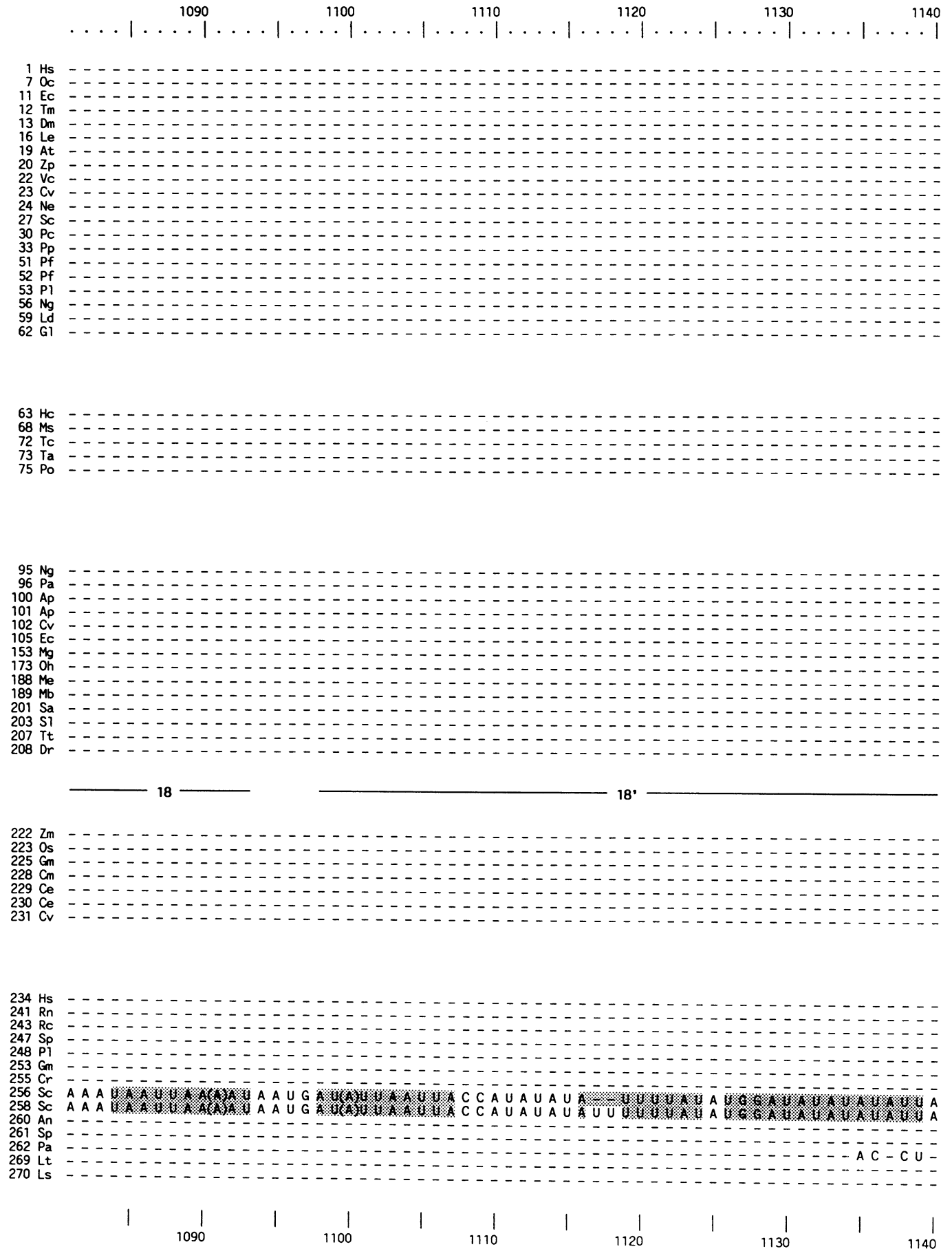
	----- 17' -----		----- 18 -----
63 Hc	----- UUCAC	-----	UUUUUUA(A)
68 Ms	----- CUGGC	-----	UUUCGAG
72 Tc	----- ACGGC	-----	UUUCCG
73 Ta	----- AAGGC	-----	UUUCUG
75 Po	----- GC(U)SU	-----	U(C)C(C)C(G)C

	430		440

95 Ng	G U A A A G G A C	-----	U U U U G U
96 Pa	G U A A A G C A C	-----	U U U A A G
100 Ap	G U A A A G U A C	-----	U U U C(A)G
101 Ap	G U A A A G C A C	-----	U U U C(A)G
102 Cv	G U A A A G C C C	-----	U U U C(S)G
105 Ec	G U A A A G U A C	-----	U U U C(A)G
153 Mg	G U A A A G U D C	-----	U U U D A U
173 Oh	(G)U A A A G U U C	-----	U U U U A U
188 Me	G U A A A G U U C	-----	U G U U(A)U
189 Mb	G U A A A C C U C	-----	U U U C(A)C
201 Sa	G U A A A C C U C	-----	U U U C(A)G
203 S1	G U A A A C C U C	-----	U U U C(A)G
207 Tt	G U A A A C U C C	-----	U G - A(A)C
208 Dr	G U A A A C U U C	-----	U G - A(A)U

	----- 17' -----	----- P17-1 -----	----- P17-1' -----	----- 18 -----
222 Zm	G U C A A C U U C	-----	-----	U U U U C - U
223 Os	G U C A A C U U C	-----	-----	U U U U C - U
225 Gm	A U G A A C U U C	-----	-----	U U U U C - C
228 Cm	G U A A A C U U C	-----	-----	U U U U U - U
229 Ce	G U A A A C U U C	-----	-----	U U U U U - U
230 Ce	G U A A A C U U C	-----	-----	U U U U C - U
231 Cv	(G)U A A A C U U C	-----	-----	U U U U C - U

234 Hs	-----	-----	-----	-----
241 Rn	-----	-----	-----	-----
243 Rc	-----	-----	-----	-----
247 Sp	-----	-----	-----	-----
248 P1	-----	-----	-----	-----
253 Gm	U G U A A A G C U C	-----	-----	U U U C(G)U
255 Cr	U G U	-----	-----	-----
256 Sc	U - A U U U A U U U A G U U C C G G S G C C C G G C C A C G G A G C C G A A C C C G A A A G S A G A A A U A U U A A A	-----	-----	-----
258 Sc	U - A U U U A U U U A U	-----	-----	-----
260 An	C A U A A C G A U U	-----	-----	-----
261 Sp	U - U A U A G C U C	-----	-----	-----
262 Pa	U - A U - C G A U U U	-----	-----	-----
269 Lt	U	-----	-----	-----
270 Ls	U U	-----	-----	-----



	1150	1160	1170	1180	1190	1200	
						
-----	-----	-----	-----	-----	-----	-----	
-----	-----	-----	-----	-----	-----	-----	Hs 1
-----	-----	-----	-----	-----	-----	-----	Oc 7
-----	-----	-----	-----	-----	-----	-----	Ec 11
-----	-----	-----	-----	-----	-----	-----	Tm 12
-----	-----	-----	-----	-----	-----	-----	Dm 13
-----	-----	-----	-----	-----	-----	-----	Le 16
-----	-----	-----	-----	-----	-----	-----	At 19
-----	-----	-----	-----	-----	-----	-----	Zp 20
-----	-----	-----	-----	-----	-----	-----	Vc 22
-----	-----	-----	-----	-----	-----	-----	Cv 23
-----	-----	-----	-----	-----	-----	-----	Ne 24
-----	-----	-----	-----	-----	-----	-----	Sc 27
-----	-----	-----	-----	-----	-----	-----	Pc 30
-----	-----	-----	-----	-----	-----	-----	Pp 33
-----	-----	-----	-----	-----	-----	-----	Pf 51
-----	-----	-----	-----	-----	-----	-----	Pf 52
-----	-----	-----	-----	-----	-----	-----	Pf 53
-----	-----	-----	-----	-----	-----	-----	Pf 54
-----	-----	-----	-----	-----	-----	-----	Pf 55
-----	-----	-----	-----	-----	-----	-----	Pf 56
-----	-----	-----	-----	-----	-----	-----	Pf 57
-----	-----	-----	-----	-----	-----	-----	Pf 58
-----	-----	-----	-----	-----	-----	-----	Pf 59
-----	-----	-----	-----	-----	-----	-----	Pf 60
-----	-----	-----	-----	-----	-----	-----	Pf 61
-----	-----	-----	-----	-----	-----	-----	Pf 62

----- 18' ----- 19 -----

-----	-----	-----	-----	-----	-----	-----	
-----	-----	-----	-----	-----	-----	-----	Hc 63
-----	-----	-----	-----	-----	-----	-----	Ms 68
-----	-----	-----	-----	-----	-----	-----	Tc 72
-----	-----	-----	-----	-----	-----	-----	Ta 73
-----	-----	-----	-----	-----	-----	-----	Po 75

470|.....|.....|.....|.....|.....|.....|.....| 500|.....|.....|.....|.....|.....|.....|.....| 510

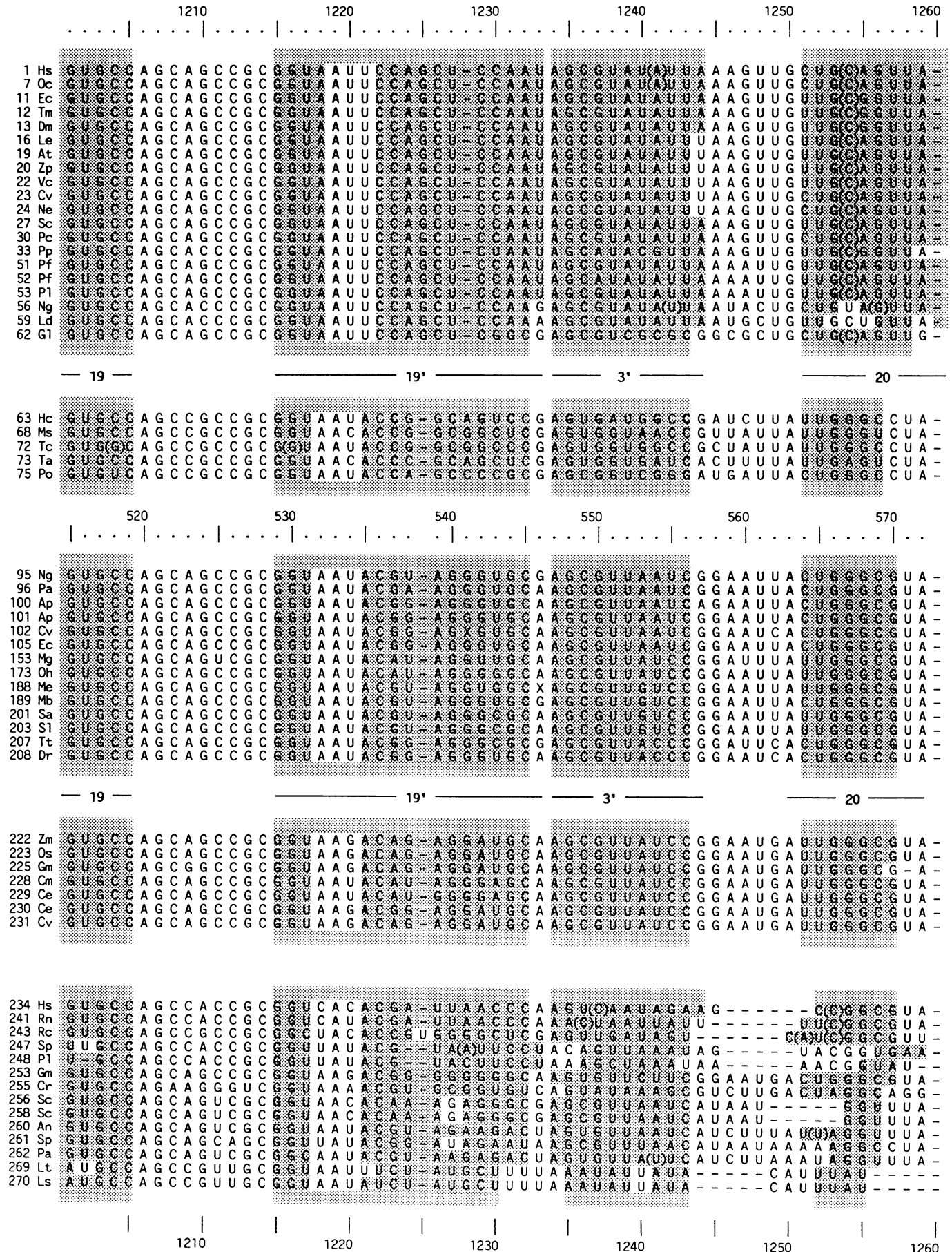
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-----	-----	-----	-----	-----	-----	-----	Ng 95
-----	-----	-----	-----	-----	-----	-----	Pa 96
-----	-----	-----	-----	-----	-----	-----	Ap 100
-----	-----	-----	-----	-----	-----	-----	Ap 101
-----	-----	-----	-----	-----	-----	-----	Cv 102
-----	-----	-----	-----	-----	-----	-----	Ec 105
-----	-----	-----	-----	-----	-----	-----	Mg 153
-----	-----	-----	-----	-----	-----	-----	Oh 173
-----	-----	-----	-----	-----	-----	-----	Me 188
-----	-----	-----	-----	-----	-----	-----	Mb 189
-----	-----	-----	-----	-----	-----	-----	Sa 201
-----	-----	-----	-----	-----	-----	-----	S1 203
-----	-----	-----	-----	-----	-----	-----	Tt 207
-----	-----	-----	-----	-----	-----	-----	Dr 208

----- 18' ----- 19 -----

-----	-----	-----	-----	-----	-----	-----	
-----	-----	-----	-----	-----	-----	-----	Zn 222
-----	-----	-----	-----	-----	-----	-----	Os 223
-----	-----	-----	-----	-----	-----	-----	Gm 225
-----	-----	-----	-----	-----	-----	-----	Cm 228
-----	-----	-----	-----	-----	-----	-----	Ce 229
-----	-----	-----	-----	-----	-----	-----	Ce 230
-----	-----	-----	-----	-----	-----	-----	Cv 231

-----	-----	-----	-----	-----	-----	-----	
-----	-----	-----	-----	-----	-----	-----	Hs 234
-----	-----	-----	-----	-----	-----	-----	Rn 241
-----	-----	-----	-----	-----	-----	-----	Rc 243
-----	-----	-----	-----	-----	-----	-----	Sp 247
-----	-----	-----	-----	-----	-----	-----	P1 248
-----	-----	-----	-----	-----	-----	-----	Gm 253
-----	-----	-----	-----	-----	-----	-----	Cr 255
-----	-----	-----	-----	-----	-----	-----	Sc 256
-----	-----	-----	-----	-----	-----	-----	Sc 258
-----	-----	-----	-----	-----	-----	-----	An 260
-----	-----	-----	-----	-----	-----	-----	Sp 261
-----	-----	-----	-----	-----	-----	-----	Pa 262
-----	-----	-----	-----	-----	-----	-----	Lt 269
-----	-----	-----	-----	-----	-----	-----	Ls 270

1150|.....|.....|.....|.....|.....|.....|.....| 1180|.....|.....|.....|.....|.....|.....|.....| 1190|.....|.....|.....|.....|.....|.....|.....| 1200



		1330	1340	1350	1360	1370	1380
						
1 Hs	-----	-----	-----	-----	-----	-----	-----
7 Oc	-----	-----	-----	-----	-----	-----	-----
11 Ec	-----	-----	-----	-----	-----	-----	-----
12 Tm	-----	-----	-----	-----	-----	-----	-----
13 Dm	-----	-----	-----	-----	-----	-----	-----
16 Le	-----	-----	-----	-----	-----	-----	-----
19 At	-----	-----	-----	-----	-----	-----	-----
20 Zp	-----	-----	-----	-----	-----	-----	-----
22 Vc	-----	-----	-----	-----	-----	-----	-----
23 Cv	-----	-----	-----	-----	-----	-----	-----
24 Ne	-----	-----	-----	-----	-----	-----	-----
27 Sc	-----	-----	-----	-----	-----	-----	-----
30 Pc	-----	-----	-----	-----	-----	-----	-----
33 Pp	-----	-----	-----	-----	-----	-----	-----
51 Pf	-----	-----	-----	-----	-----	-----	-----
52 Pf	-----	-----	-----	-----	-----	-----	-----
53 P1	-----	-----	-----	-----	-----	-----	-----
56 Ng	-----	-----	-----	-----	-----	-----	-----
59 Ld	-----	-----	-----	-----	-----	-----	-----
62 G1	-----	-----	-----	-----	-----	-----	-----

E21-1

63 Hc	GGGCAGG	CGUCCAGCGGA	AA-ACUGUUC	AGC	-----	-----	-----
68 Ms	UGUCAGG	CUUUCAGGGA	GAU-ACUGUCU	GGC	-----	-----	-----
72 Tc	CGUGGGG	CUUUGCUGGGGA	U-ACUGCGG	GCC	-----	-----	-----
73 Ta	GSAAAGAA	CUUCUGSAA	GA-G-ACUGUAA	GAC	-----	-----	-----
75 Po	CCGGGA	GUUGGGG	GGAU-ACUGCGG	GGC	-----	-----	-----

.....|.....|.....|.....|.....|.....|.....|.....

95 Ng	CCGGGAACUG	CGUUCUGA	AA-ACUGGGU	GAC	-----	-----	-----
96 Pa	CUUGGGAACUG	CAUUC	CAAAAAGC	U(C)UG	AGC	-----	-----
100 Ap	CUAAGGAACUG	CAUUCUGAA	AA-ACUGGAA	AAC	-----	-----	-----
101 Ap	CUUGGGAACUG	CAUUCUGAG	AA-ACUGGCA	AGC	-----	-----	-----
102 Cv	CUUGGGAACUG	CAUUCUGAU	AA-ACUGCCG	(C)CC	-----	-----	-----
105 Ec	CUUGGGAACUG	CAUUCUGAU	AA-ACUGGCA	AGC	-----	-----	-----
153 Mg	GAUUGUGAU	G-CAUUCUGAA	AA-ACUUCUA	GUC	-----	-----	-----
173 Oh	AUUGUGAU	G-CAUUCUGAA	AA-ACUGUUU	AGC	-----	-----	-----
188 Me	CCCUGUCAGGG	GACC	GAA-ACUGGCA	UGC	-----	-----	-----
189 Mb	UGUGAGGUGG	CGGG	CGAU-ACGGGCA	GAC	-----	-----	-----
201 Sa	CCCUGGUCUG	CGG	CGAU-ACGGGCA	GGC	-----	-----	-----
203 S1	CCCUGGUCUG	CGG	CGAU-ACGGGCA	GGC	-----	-----	-----
207 Tt	CGUGGGGGA	G-CGUGGGA	U-ACGUC	GAC	-----	-----	-----
208 Dr	CUUGGGAUG	GACU	GGAU-ACUGGA	GUC	-----	-----	-----

P21-1'

222 Zm	CUUGGACAGG	CGGU	GGAA	AA-ACUACCA	AGC	-----	-----
223 Os	CUUGGACAGG	CGGU	GGAA	AA-ACUACCA	AGC	-----	-----
225 Gm	CUUGGACAGG	CGGU	GGAA	AA-ACUACCA	AGC	-----	-----
228 Cm	CUUGGUCGCG	CAGU	CGAGU	ACUUUUU	AAC	-----	-----
229 Ce	CUUGGUCGCG	CAGU	CGAGU	ACUUUUU	AAC	-----	-----
230 Se	CCUGAGUCGG	CAGU	AGAA	ACUAAUG	AGC	-----	-----
231 Cv	CCUGGGCGCG	CAGG	AGAA	ACU(C)UA	GGC	-----	-----

234 Hs	-----	-----	-----	-----	-----	-----	-----
241 Rn	-----	-----	-----	-----	-----	-----	-----
243 Rc	-----	-----	-----	-----	-----	-----	-----
247 Sp	-----	-----	-----	-----	-----	-----	-----
248 P1	-----	-----	-----	-----	-----	-----	-----
253 Gm	GGUGSAAUG	CU(C)U	CGAA	AA-ACC(A)UU	CAC	-----	-----
255 Cr	-----	-----	-----	-----	-----	-----	-----
256 Sc	-----	-----	-----	U-A	UAAUU	-----	-----
258 Sc	-----	-----	-----	U-A	UAAUU	-----	-----
260 An	-----	-----	-----	GAGU	ACUUUUU	UACU	-----
261 Sp	-----	-----	-----	U-(C)	UUUUU	C	-----
262 Pa	-----	-----	-----	GGGA	ACAAUUU	UAC	-----
269 Lt	GU	-----	-----	CAA	UAAA	-----	-----
270 Ls	GU	-----	-----	CAA	UAAAA	-----	-----

.....|.....|.....|.....|.....|.....|.....|.....

	1390	1400	1410	1420	1430	1440	
CG	GU	CCGCC		GCGA			Hs 1
CG	GU	CCGCC		GCGA			Oc 7
CG	GU	CCGCC		UAAC			Ec 11
CA	UCG	UUCGCGGUCUUAAACUGG		CGUG		CCGCGGGA	Tm 12
CA	GU	AUGGUGGU		UAGU		ACU	Dm 13
CG	GU	CCGCC		CUA			Le 16
CG	GU	CCGCC		CUUUGGU			At 19
CG	GU	CCGCC		CUUUUU			Zp 20
CG	GU	CCGCC		UCU			Vc 22
CG	GU	CCGCCG		UUU			Cv 23
CG	GU	CCGCCG		UUU			Ne 24
CG	GU	CCGCCG		UUU			Sc 27
UG	GU	CCGCCG		ACU			Pc 30
CA	UCG	UUCGCGGUCUU		AAGUUG			Pf 33
UA	UCUA	GGGGAAC		CUUUGG		AACAGCGCGCCAA	Pp 51
UG	GU	CCGCCG		CUUUGG		CUUUAAUACGCGUU	Pf 52
CU	UAU	CGAAUAGC		UUUG		CAAAUAAGGU	Pf 53
UAG	UUU	UACG		AGGAC		GUUUCAUUUA	Ng 56
U	GU	CCGCCG		UCGU		CCGU	Ld 59
							Gt 62

E21-1

E21-1*

							Hc 63
							Ms 68
							Tc 72
							Ta 73
							Po 75

							Ng 95
							Pa 96
							Ap 100
							Ap 101
							Cv 102
							Ec 105
							Mg 153
							Oh 173
							Me 188
							Mb 189
							Sa 201
							Sl 203
							Tt 207
							Dr 208

							Zm 222
							Os 223
							Gm 225
							Cm 228
							Ce 229
							Ce 230
							Cv 231

							Hs 234
							Rn 241
							Rc 243
							Sp 247
							Pf 248
							Gm 253
							Cr 255
							Sc 256
							Sc 258
							An 260
							Sp 261
							Pa 262
							Lt 269
							Ls 270

1390

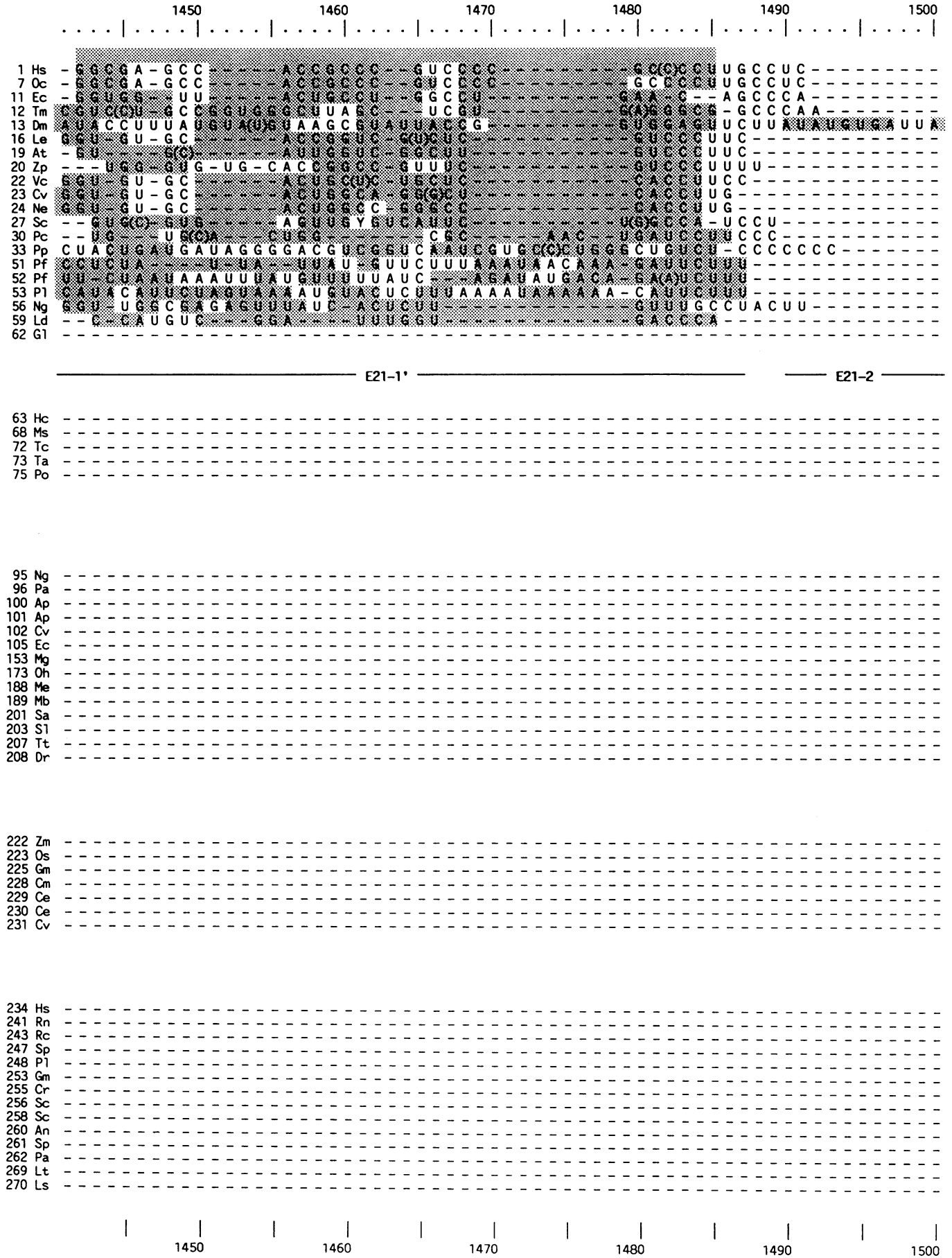
1400

1410

1420

1430

1440



		1570	1580	1590	1600	1610	1620
1 Hs	---	---	UUA	GCU	---	GAA	---
7 Oc	---	---	UUA	GCU	---	GAA	---
11 Ec	---	---	UUC	ACC	---	GG	---
12 Tm	---	---	UUC	GUU	---	GAA	---
13 Dm	---	---	UUA	AAC	---	GAA	---
16 Le	---	---	UUA	AUU	---	GGCC	---
19 At	---	---	UUA	AUU	---	GGCC	---
20 Zp	---	---	UUA	ACU	---	G(U)CU	---
22 Vc	---	---	UUC	ACU	---	GU(A)U	---
23 Cv	---	---	UUC	ACU	---	GUCC	---
24 Ne	---	---	UUC	ACU	---	GUCC	---
27 Sc	---	---	UUA	AGU	---	UGUC	---
30 Pc	---	---	UUC	GCU	---	GGGUGU	---
33 Pp	---	---	UUC	GC	---	G(A)UC	---
51 Pf	---	---	UUUU	---	---	GCUUUUUU	---
52 Pf	---	---	UUUU	AUU	---	GC(U)U	---
53 P1	---	---	UU	A	---	AUGUGA	---
56 Ng	---	---	---	---	---	GCUGGA	---
59 Ld	A	C	A	A	G	A	A
62 G1	A	C	A	A	G	A	A

E21-3

E21-3'

63 Hc	---
68 Ms	---
72 Tc	---
73 Ta	---
75 Po	---

95 Ng	---
96 Pa	---
100 Ap	---
101 Ap	---
102 Cv	---
105 Ec	---
153 Mg	---
173 Oh	---
188 Me	---
189 Mb	---
201 Sa	---
203 S1	---
207 Tt	---
208 Dr	---

222 Zm	---
223 Os	---
225 Gm	---
228 Cm	---
229 Ce	---
230 Ce	---
231 Cv	---

234 Hs	---
241 Rn	---
243 Rc	---
247 Sp	---
248 P1	---
253 Gm	---
255 Cr	---
256 Sc	---
258 Sc	---
260 An	---
261 Sp	---
262 Pa	---
269 Lt	---
270 Ls	---

1570

1580

1590

1600

1610

1620

		1690	1700	1710	1720	1730	1740
1 Hs	-	-	-	-	-	-	-
7 Oc	-	-	-	-	-	-	-
11 Ec	-	-	-	-	-	-	-
12 Tm	-	-	-	-	-	-	-
13 Dm	-	-	-	-	-	-	-
16 Le	-	-	-	-	-	-	-
19 At	-	-	-	-	-	-	-
20 Zp	-	-	-	-	-	-	-
22 Vc	-	-	-	-	-	-	-
23 Cv	-	-	-	-	-	-	-
24 Ne	-	-	-	-	-	-	-
27 Sc	-	-	-	-	-	-	-
30 Pc	-	-	-	-	-	-	-
33 Pp	-	-	-	-	-	-	-
51 Pf	-	-	-	-	-	-	-
52 Pf	-	-	-	-	-	-	-
53 Pl	-	-	-	-	-	-	-
56 Ng	-	-	-	-	-	-	-
59 Ld	-	-	-	-	-	-	-
62 G1	-	-	-	-	-	-	-

----- E21-4' -----

63 Hc	-	-	-	-	-	-	-
68 Ms	-	-	-	-	-	-	-
72 Tc	-	-	-	-	-	-	-
73 Ta	-	-	-	-	-	-	-
75 Po	-	-	-	-	-	-	-

95 Ng	-	-	-	-	-	-	-
96 Pa	-	-	-	-	-	-	-
100 Ap	-	-	-	-	-	-	-
101 Ap	-	-	-	-	-	-	-
102 Cv	-	-	-	-	-	-	-
105 Ec	-	-	-	-	-	-	-
153 Mg	-	-	-	-	-	-	-
173 Oh	-	-	-	-	-	-	-
188 Me	-	-	-	-	-	-	-
189 Mb	-	-	-	-	-	-	-
201 Sa	-	-	-	-	-	-	-
203 S1	-	-	-	-	-	-	-
207 Tt	-	-	-	-	-	-	-
208 Dr	-	-	-	-	-	-	-

222 Zm	-	-	-	-	-	-	-
223 Os	-	-	-	-	-	-	-
225 Gm	-	-	-	-	-	-	-
228 Cm	-	-	-	-	-	-	-
229 Ce	-	-	-	-	-	-	-
230 Ce	-	-	-	-	-	-	-
231 Cv	-	-	-	-	-	-	-

234 Hs	-	-	-	-	-	-	-
241 Rn	-	-	-	-	-	-	-
243 Rc	-	-	-	-	-	-	-
247 Sp	-	-	-	-	-	-	-
248 P1	-	-	-	-	-	-	-
253 Gm	-	-	-	-	-	-	-
255 Cr	-	-	-	-	-	-	-
256 Sc	-	-	-	-	-	-	-
258 Sc	-	-	-	-	-	-	-
260 An	-	-	-	-	-	-	-
261 Sp	-	-	-	-	-	-	-
262 Pa	-	-	-	-	-	-	-
269 Lt	-	-	-	-	-	-	-
270 Ls	-	-	-	-	-	-	-

	1690	1700	1710	1720	1730	1740	

	1750	1760	1770	1780	1790	1800	
U U U A C U U U G A A A A A A U U A G A G U G U U C A A A G C A G G C C C - - G - - - - - A G C C G C C C - - - Hs 1							
U U U A C U U U G A A A A A A U U A G A G U G U U C A A A G C A G G C C C - - G - - - - - A G C C G C C C - - - Oc 7							
U U U A C U U U G A A A A A A U U A G A G U G U U C A A A G C A G G C C C - - G - - - - - A G C C G C C C - - - Ec 11							
U U U A C U U U G A A C A A A U U A G A G U G C U U A A A G C A G G C U A A A A C U U G - - - - - G C C U - - - - - Tm 12							
A U U A C U U U G A A C A A A U U A G A G U G C U U A A A G C A G G C U U C A A A U G - - - - - G C C U G A A - - - Dm 13							
G U U A C U U U G A A G A A A U U A G A G U G C U C A A A G C (A) A G C C - - - - U (C) G C - - - - - U C U - - - - - Le 16							
G U U A C U U U G A A A A A A U U A G A G U G C U C A A A G C (A) A G C C - - - - U (A) C G - - - - - U C U - - - - - At 19							
G U U A C U U U G A A A A A A U U A G A G U G C U C A A A G C A A G C U - - - - U A U - - - - - G C U C U G - - - Zp 20							
G U U A C U U U G A G U A A A U U A G A G U G U U C A A A G C (A) G G C C - - - - U A - - - - - C G C U C - - - - - Vc 22							
G U U A C U U U G A G U A A A U U A G A G U G U U C A A A G C (A) G G C C - - - - U A C G - - - - - C U C - - - - - Cv 23							
G U U A C U U U G A G U A A A U U A G A G U G U U C A A A G C (A) G G C C - - - - U A C G - - - - - C U C - - - - - Ne 24							
U U U A C U (G) U G A A A A A U U A (G) A G U G U U U A A A G C (A) G G C U - - - - U A U (G) C - - - - - C G U U - - - - - Sc 27							
U U U A C U U U G A G A A A A U U A G A G U G U U C A A A G C (A) G G C G U - - - - - U U - - - - - G C U C G - - - - - Pc 30							
A U C A C (A) U G A U U A A A C C G U (A) G U G A C C A A A G C A C G U (C) U U - - - - - U A G A C G G G C A C - - - Pp 33							
U - U A C U U U G A G U A A A U U A G A G U G U U C A A A G C A A A C A G U U A A A G C A - - - - - U U U A C U G U - - - Pf 51							
U - U A C U U U G A G U A A A U U A G A G U G U U C A A A A C A G A C G G G U A G (U) C A U G A U U G A G U U C A U U G U - - - Pf 52							
U - U A C U U U G A G U A A A U U A G A G U G U U C A A A G C A A A C A G U U U A A A C A G - - - - - C U A A A A C U G U - - - P1 53							
G C A A C (U) G (A) A U A A A U (C) G U (U) G U G C U U A A A G C G G (G) C U (A) U G (A) A C U C U G G - - - - - C A G A - - - - - G C G A Mg 56							
U U (A) C U G U G A C U A A A G A A G C G U C A C U A A A G C A G U C - - - - - A U U U G - - - - - A C U - - - - - Ld 59							
G C C G C (A) C G A G G A A A C G (G) G A G C C C U C G A G G G A G G - - - - - G C C G U - - - - - U G G - - - - - Gt 62							

----- E21-5 ----- E21-5* ----- E21-6 -----

- - - - -	Hc 63
- - - - -	Ms 68
- - - - -	Tc 72
- - - - -	Ta 73
- - - - -	Po 75

- - - - -	Ng 95
- - - - -	Pa 96
- - - - -	Ap 100
- - - - -	Ap 101
- - - - -	Cv 102
- - - - -	Ec 105
- - - - -	Mg 153
- - - - -	Oh 173
- - - - -	Me 188
- - - - -	Mb 189
- - - - -	Sa 201
- - - - -	S1 203
- - - - -	Tt 207
- - - - -	Dr 208

- - - - -	Zm 222
- - - - -	Os 223
- - - - -	Gm 225
- - - - -	Cm 228
- - - - -	Ce 229
- - - - -	Ce 230
- - - - -	Cv 231

- - - - -	Hs 234
- - - - -	Rn 241
- - - - -	Rc 243
- - - - -	Sp 247
- - - - -	P1 248
- - - - -	Gm 253
- - - - -	Cr 255
- - - - -	Sc 256
- - - - -	Sc 258
- - - - -	An 260
- - - - -	Sp 261
- - - - -	Pa 262
- - - - -	Lt 269
- - - - -	Ls 270

1750 1760 1770 1780 1790 1800

		1810	1820	1830	1840	1850	1860
						
1 Hs	---	U G G A U A C C	- G C A G C U A G G A A	U A A U G G A A U A	G - G	---	A C - C(G)C G G
7 Oc	---	U A G A U A C C	- G C A G C U A G G A A	U A A U G G A A U A	G - G	---	A C - C(G)C G G
11 Ec	---	U G(A)A U A A U G	- G U G C A U G G A A	U A A U G G A A U A	G - G	---	A C - U U C G G U
12 Tm	---	- - - A A U A C U G	- G U G C A U G G A A	U A A U G G A A U A	G - G	---	A C - C U C G G G
13 Dm	---	- - - U A U U C U	- G U G C A U G G G A	U A A U G G A A U A	A - G	---	A C - C U C U G U
16 Le	---	- - - G U(A)U A C A U	- U(A)G C A U G G G A	U A A C(A)U(U)A U A	G - G	---	A U - U U C G G G
19 At	---	- - - G(G)A U A C A U	- U(A)G C A U G G G A	U A A C A U(C)A U A	G - G	---	A U - U U C G A
20 Zp	---	- - - A A U A C A U	- U A G C A U G G A A	U A A C G G U A U A	G - G	---	A U - U C U G G G
22 Vc	---	- - - U G A A U A C A U	- U(A)G C A U G G A A	U A A C A C C A U A	G - G	---	A C - U C U G G G
23 Cv	---	- - - U G A A U A C A U	- U(A)G C A U G G A A	U A A C A(C)G A U A	G - G	---	A C - U C U G G G
24 Ne	---	- - - U G A A U A C A U	- U(A)G C A U G G A A	U A A C A(C)G A U A	G - G	---	A C - U C U G G G
27 Sc	---	- - - G(A)A U A U A U	- U(A)G Y A U G G A A	U A A U A A G A U A	G - G	---	A C - U U U G G A
30 Pc	---	- - - A A U A C(A)U	- U(A)G C A U G G A A	U A A U A A A A U A	G - G	---	A C A U G U G G
33 Pp	---	- - - - - G G(C)A	- C A G C A U G G	- - - G A(C)G A A A(C)G C	C - G	---	- - - C A C - C G G G
51 Pf	G U U U G A A U A C U	- A U A G C A U G G A A	U A A C A A A A U U G	- - -	- - -	- - -	A A C - - - A A G
52 Pf	G(U)U U G A A U A C U	- A C A G C A U G G A A	U A A C(A)A A A U U G	- - -	- - -	- - -	A A U - - - A A G
53 P1	G U U U G A A U A C U	- A C A G C A U G G A A	U A A C A A A A U U G	- - -	- - -	- - -	A A C - - - A A G
56 Ng	U U U A(G)C A U G G G(A)	- C U G C A G A G U A	G C U G U A U U(U)G	A G C G	---	---	A A G G - - - U U G
59 Ld	---	U G A A U A G	- A A G C A U G G G A	U A A C A A A G G A	G C A	---	- G C - C U(C)U A
62 G1	---	A C C C G C C	- G C - G U G - G G A C	- - - C G C G C A	G -	---	- - - - - C G G

----- E21-6' ----- E21-7 ----- E21-8 -----

63 Hc	---	-----
68 Ms	---	-----
72 Tc	---	-----
73 Ta	---	-----
75 Po	---	-----

95 Ng	---	-----
96 Pa	---	-----
100 Ap	---	-----
101 Ap	---	-----
102 Cv	---	-----
105 Ec	---	-----
153 Mg	---	-----
173 Oh	---	-----
188 Me	---	-----
189 Mb	---	-----
201 Sa	---	-----
203 S1	---	-----
207 Tt	---	-----
208 Dr	---	-----

222 Zm	---	-----
223 Os	---	-----
225 Gm	---	-----
228 Cm	---	-----
229 Ce	---	-----
230 Ce	---	-----
231 Cv	---	-----

234 Hs	---	-----
241 Rn	---	-----
243 Rc	---	-----
247 Sp	---	-----
248 P1	---	-----
253 Gm	---	-----
255 Cr	---	-----
256 Sc	---	-----
258 Sc	---	-----
260 An	---	-----
261 Sp	---	-----
262 Pa	---	-----
269 Lt	---	-----
270 Ls	---	-----

-----|-----|-----|-----|-----|-----|-----|-----

1810 1820 1830 1840 1850 1860

	1870	1880	1890	1900	1910	1920	
--UUCUAUUUUU--GUUGG				UUUUCGGA	--ACU--G(A)--GGCC		Hs 1
--UUCUAUUUUU--GUUGG				UUUUCGGA	--ACU--G(A)--GGCC		Oc 7
--UUCUAUUUUU--GUUGG				UUUUCGGA	--AUA--CGA--GGUA		Ec 11
--UUCUAUUUUU--GUUGG				UUUUCGGA	--AUA--CGA--GGUA		Tm 12
--(U)UCUGCUUU--CAUUGG				UUUUCAGG	--(U)CA--AGA--GGUA		Dm 13
--UCCUAU(U)GU--GUUGG				CCUUCGGG	--AUC--GG--AGUA		Le 16
--UCCUAU(U)GU--GUUGG				CCUUCGGG	--AUC--GG--AGUA		At 19
--UCCUAUUGC--GUUGG				CCUUCGGG	--ACC--GG--AGUA		Zp 20
--CCUAUC--U--GUUGG				UCUGUAGG	--AUC--GG--AGUA		Vc 22
--CCUAUC(C)U--GUUGG				UCUGUAGG	--ACC--GG--AGUA		Cv 23
--CCUAUC(C)U--GUUGG				UCUGUAGG	--ACC--GG--AGUA		Ne 24
--(G)UCUAUUUU--GUUGG				UUUUCGGA	--(G)UC--AA--AGUA		Sc 27
--UUCUAUUUU--GUUGG				UUUUCUAGG	--ACC--AU--UGUA		Pc 30
--C(U)GC(C)UUUU--U(U)UU				UUUUCUAG(U)--GAC--UCGUA			Pp 33
--CUAAA(U)UUUU--UGUUU	CU--U--			UUUUCUUAUUUUUGGCUU	AGUUU		Pf 51
--CUAAA(U)UUUU--GUUUU	CU--U--			UUUUCUUAUUUUAGCUU	AGUUU		Pf 52
--CUAAA(U)UUUU--GUUUU	CU--U--			UUUUCUUAUUUUUGGCUU	AGUUU		Pf 53
--(C)ACC(U)GGUGGCUUGGAG				--CU--UGGU--(A)CAGGGC--UUGUA			Ng 56
--GGCUACGGUU--CGGCUU				UUUGUGGU--UUU--A(A)A--GGUCUAUUGGA			Ld 59
--GCGCGGCGCG--CC--				GCGGCA--GC--CCC--G			Gl 62

-- E21-8 ----- E21-7' ----- E21-8' -----

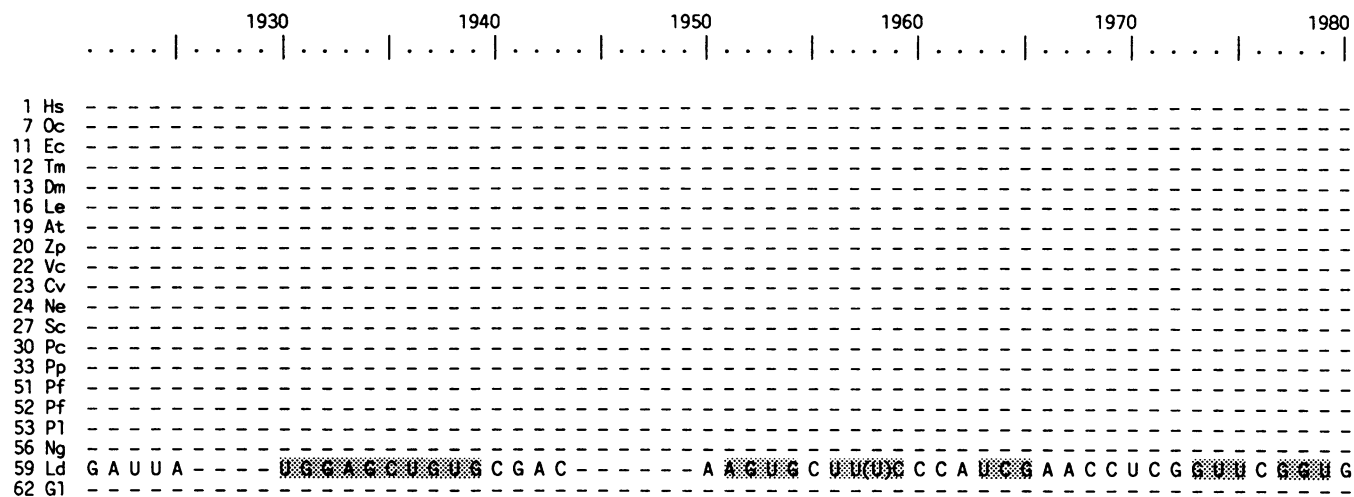
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-----	Ms 68
-----	Tc 72
-----	Ta 73
-----	Po 75

-----	Ng 95
-----	Pa 96
-----	Ap 100
-----	Ap 101
-----	Cv 102
-----	Ec 105
-----	Mg 153
-----	Oh 173
-----	Me 188
-----	Mb 189
-----	Sa 201
-----	S1 203
-----	Tt 207
-----	Dr 208

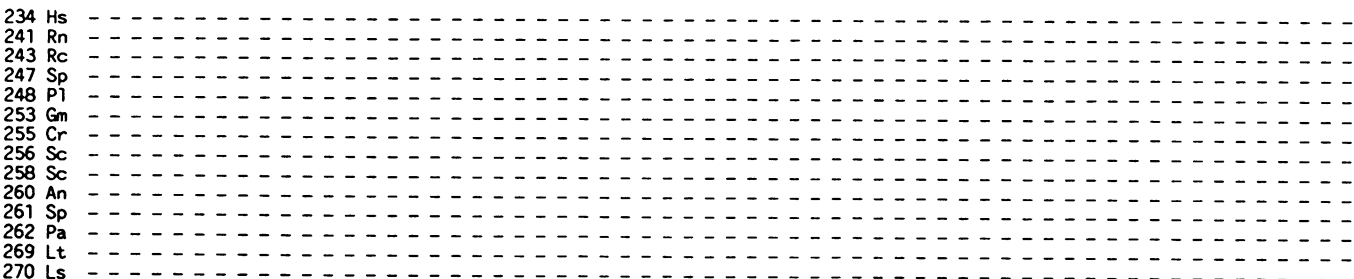
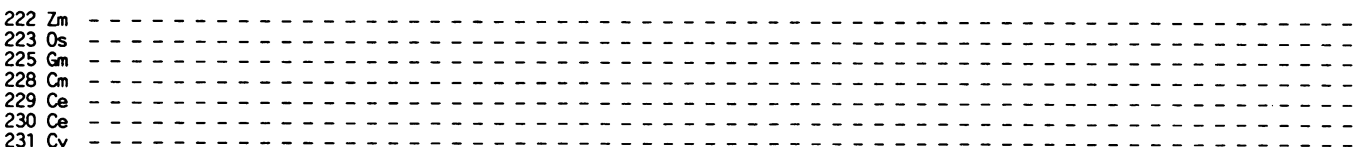
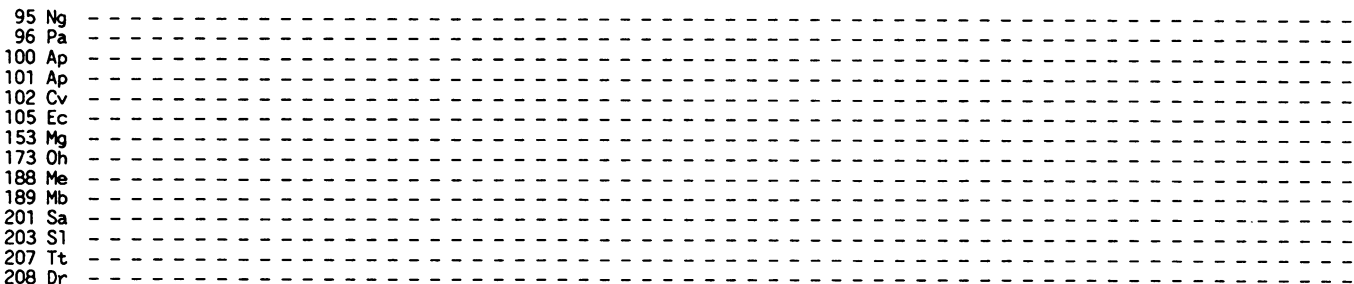
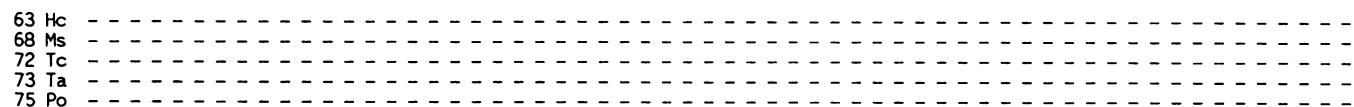
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-----	Os 223
-----	Gm 225
-----	Cm 228
-----	Ce 229
-----	Ce 230
-----	Cv 231

-----	Hs 234
-----	Rn 241
-----	Rc 243
-----	Sp 247
-----	P1 248
-----	Gm 253
-----	Cr 255
-----	Sc 256
-----	Sc 258
-----	An 260
-----	Sp 261
-----	Pa 262
-----	Lt 269
-----	Ls 270

1870 1880 1890 1900 1910 1920



E21-9



1930 1940 1950 1960 1970 1980

1990 2000 2010 2020 2030 2040

-----	Hs	1
-----	Oc	7
-----	Ec	11
-----	Tm	12
-----	Dm	13
-----	Le	16
-----	At	19
-----	Zp	20
-----	Vc	22
-----	Cv	23
-----	Ne	24
-----	Sc	27
-----	Pc	30
-----	Pp	33
-----	Pf	51
-----	Pf	52
-----	P1	53
-----	Ng	56
-----	Ld	59
-----	G1	62

U G(U)G G C G C C U U U G A G G(G)G U U U A G U G C(G)U C C G G U A C G A C C U(C)C G G U U C C G G C C G(U)A A

E21-9

E21-9'

-----	Hc	63
-----	Ms	68
-----	Tc	72
-----	Ta	73
-----	Po	75

-----	Ng	95
-----	Pa	96
-----	Ap	100
-----	Ap	101
-----	Cv	102
-----	Ec	105
-----	Mg	153
-----	Oh	173
-----	Me	188
-----	Mb	189
-----	Sa	201
-----	S1	203
-----	Tt	207
-----	Dr	208

-----	Zm	222
-----	Os	223
-----	Gm	225
-----	Cm	228
-----	Ce	229
-----	Ce	230
-----	Cv	231

-----	Hs	234
-----	Rn	241
-----	Rc	243
-----	Sp	247
-----	P1	248
-----	Gm	253
-----	Cr	255
-----	Sc	256
-----	Sc	258
-----	An	260
-----	Sp	261
-----	Pa	262
-----	Lt	269
-----	Ls	270

1990

2000

2010

2020

2030

2040

	2050	2060	2070	2080	2090	2100
1 Hs	---	---	---	---	---	---
7 Oc	---	---	---	---	---	---
11 Ec	---	---	---	---	---	---
12 Tm	---	---	---	---	---	---
13 Dm	---	---	---	---	---	---
16 Le	---	---	---	---	---	---
19 At	---	---	---	---	---	---
20 Zp	---	---	---	---	---	---
22 Vc	---	---	---	---	---	---
23 Cv	---	---	---	---	---	---
24 Ne	---	---	---	---	---	---
27 Sc	---	---	---	---	---	---
30 Pc	---	---	---	---	---	---
33 Pp	---	---	---	---	---	---
51 Pf	---	---	---	---	---	---
52 Pf	---	---	---	---	---	---
53 P1	---	---	---	---	---	---
56 Ng	---	---	---	---	---	---
59 Ld	C G C C U U U U C A A C U C A C G G C C U C U A	---	---	---	---	---
62 G1	---	---	---	---	---	---

E21-9*

22

63 Hc	---	---	---	---	---	---
68 Ms	---	---	---	---	---	---
72 Tc	---	---	---	---	---	---
73 Ta	---	---	---	---	---	---
75 Po	---	---	---	---	---	---

660

670

95 Ng	---	---	---	---	---	---
96 Pa	---	---	---	---	---	---
100 Ap	---	---	---	---	---	---
101 Ap	---	---	---	---	---	---
102 Cv	---	---	---	---	---	---
105 Ec	---	---	---	---	---	---
153 Mg	---	---	---	---	---	---
173 Oh	---	---	---	---	---	---
188 Me	---	---	---	---	---	---
189 Mb	---	---	---	---	---	---
201 Sa	---	---	---	---	---	---
203 S1	---	---	---	---	---	---
207 Tt	---	---	---	---	---	---
208 Dr	---	---	---	---	---	---

22

222 Zn	---	---	---	---	---	---
223 Os	---	---	---	---	---	---
225 Gm	---	---	---	---	---	---
228 Cm	---	---	---	---	---	---
229 Ce	---	---	---	---	---	---
230 Ce	---	---	---	---	---	---
231 Cv	---	---	---	---	---	---

234 Hs	---	---	---	---	---	---
241 Rn	---	---	---	---	---	---
243 Rc	---	---	---	---	---	---
247 Sp	---	---	---	---	---	---
248 P1	---	---	---	---	---	---
253 Gm	---	---	---	---	---	---
255 Cr	---	---	---	---	---	---
256 Sc	---	---	---	---	---	---
258 Sc	---	---	---	---	---	---
260 An	---	---	---	---	---	---
261 Sp	---	---	---	---	---	---
262 Pa	---	---	---	---	---	---
269 Lt	---	---	---	---	---	---
270 Ls	---	---	---	---	---	---

2050

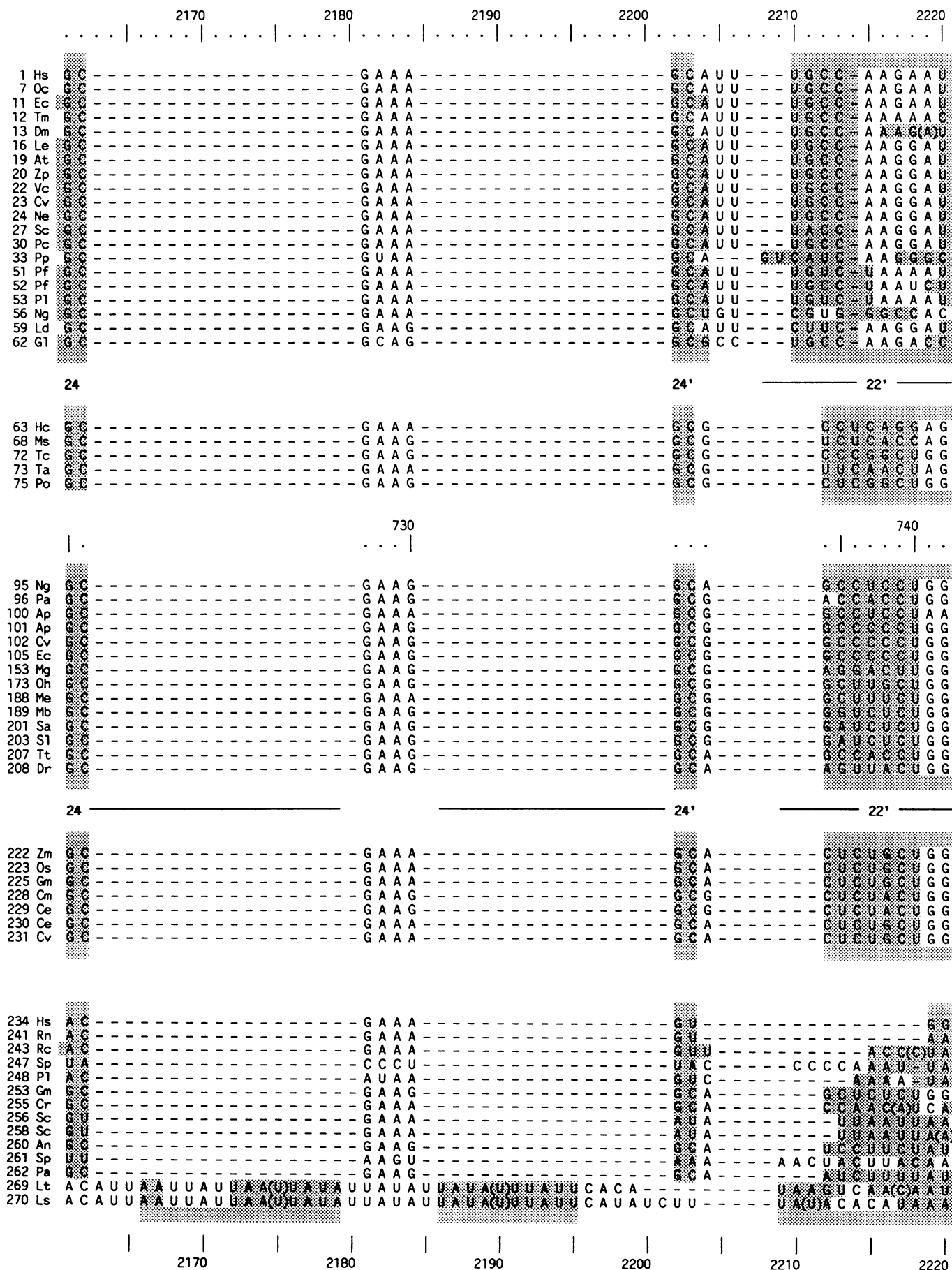
2060

2070

2080

2090

2100



2290 2300 2310 2320 2330 2340

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1 Hs G U C G U A G U U C C - - G A C C A U A A A C G A U G C C G A C C G G C G A U G C G G C G G C G U A U - - - - -
7 Oc G U C G U A G U U C C - - G A C C C A U A A A C G A U G C C G A C C U G G C G A U G C G G C G G C G U A U - - - - -
11 Ec G C C C U A G U U C C U - - A A C C C A U A A A C G A U G C C C A A C C U A G C G A U C C G C C G A G U U - - - - -
12 Tm G C C C U A G U U C C U - - A A C C C A U A A A C G A U G C C C A G C U A G C C G A U C C G C C G A C G U U - - - - -
13 Dm G C C C U A G U U C C U - - A A C C C A U A A A C G A U G C C C A G C U A G C C G A U C C G C C G A G U U - - - - -
16 Le G U C C U A G U U C C U - - A A C C C A U A A A C G A U G C C C A G C U A G C C G A U C C G C C G A G U U - - - - -
19 At G U C C U A G U U C C U - - A A C C C A U A A A C G A U G C C C G A C C A G G G A U C C A G C C G G A U G U U - - - - -
20 Zp G U C C U A G U U C C U - - A A C C C A U A A A C G A U G C C C G A C C A G G G A U C C G C C G G A U G U U - - - - -
22 Vc G U C C U A G U U C C U - - A A C C C A U A A A C G A U G C C C G A C C A G G G A U C C G C C G G A U G U U - - - - -
23 Cv G U C C U A G U U C C U - - A A C C C A U A A A C G A U G C C C G A C C U A G G G A U C C G C C G G A U G U U - - - - -
24 Ne G U C C U A G U U C C U - - A A C C C A U A A A C G A U G C C C G A C C U A G G G A U C C G C C G G G U U - - - - -
27 Sc A U C G U A A U C C U - - A A C C C A U A A A C U A U G C C C G A C U A G G G A U C C G G G A U G U - - - - -
30 Pc G U C G U A G U C C U - - A A C C C A U A A A C U A U G C C C G A C U A G G G A U C C G G G C A G U U - - - - -
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62 G1 (A) C C G U A U U C C C - - G G C C G U A A A C G A U G C C G A C C C G G C G G C C G G C - - - - -
    
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25* 26 27

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63 Hc C G G G U A G U C C U - - A G C U G U A A A C G A U G U C C G C U A G G U G U G G C G C A G G C U - - - - -
68 Ms C G G G U A G U C C U - - A G C C G U A A A C G A U G C C U C G C U A G G U G U C G G C (C) A C G G U - - - - -
72 Tc C G G G U A G U C C U - - G G C U G U A A A G G A U G C G G G C U A G G U G U C G G G C G A G C U - - - - -
73 Ta C G G G U A G U C C U - - A G C U G U A A A C G C U G C C C A C U U G G U G U U G C U U C U C C - - - - -
75 Po C G G G U A G U C C C - - G G C U G U A A A C G A U G C G G G C U A G G U G U U G G G C G G G C U - - - - -
    
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800 810 820 830 840

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100 Ap C U G G U A G U C C A - - U G C C G U A A A C G A U G U C C A C U U G G G A G G U U G U U U C - - - - -
101 Ap C U G G U A G U C C A - - C G C U G U A A A C G A U G U C G A U U U G G A G G U U G C G C C - - - - -
102 Cv C U G G U A G U C C A - - C G C U G U A A A C G C U G U C G A C U A G C C G U U U G G U U C C - - - - -
105 Ec C U G G U A G U C C A - - C G C C G U A A A C G A U G U C C G A C U U G G G A G G U U G U G C - - - - -
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173 Oh C U G G U A G U C C A - - C G C C C G U A A A C G A U G G A U G U U A A A C G U U G G G - - - - -
188 Me C C G G U A G U C C U - - G G C C C G U A A A C G A U G G A U A C U A G G U G U A G G G U - - - - -
189 Mb C C G G U A G U C C A - - C G C C C G U A A A C G G U G G G U A C U A G G U G U G G G U U U C - - - - -
201 Sa C U G G U A G U C C A - - C G C C G U A A A C G G U G G G C A C U A G G U G U G G G C A A C - - - - -
203 S1 C U G G U A G U C C A - - C G C C C U A A A C G G U G G G C A C U A G G U G U G G G C A A C - - - - -
207 Tt C G G G U A G U C C A - - C G C C C U A A A C G A U G C C G C U A G G U C U C U G G G - - - - -
208 Dr C G G G U A G U C C A - - C A C C C U A A A C G A U G U A C G U G C U A G C U A G C G C A G - - - - -
    
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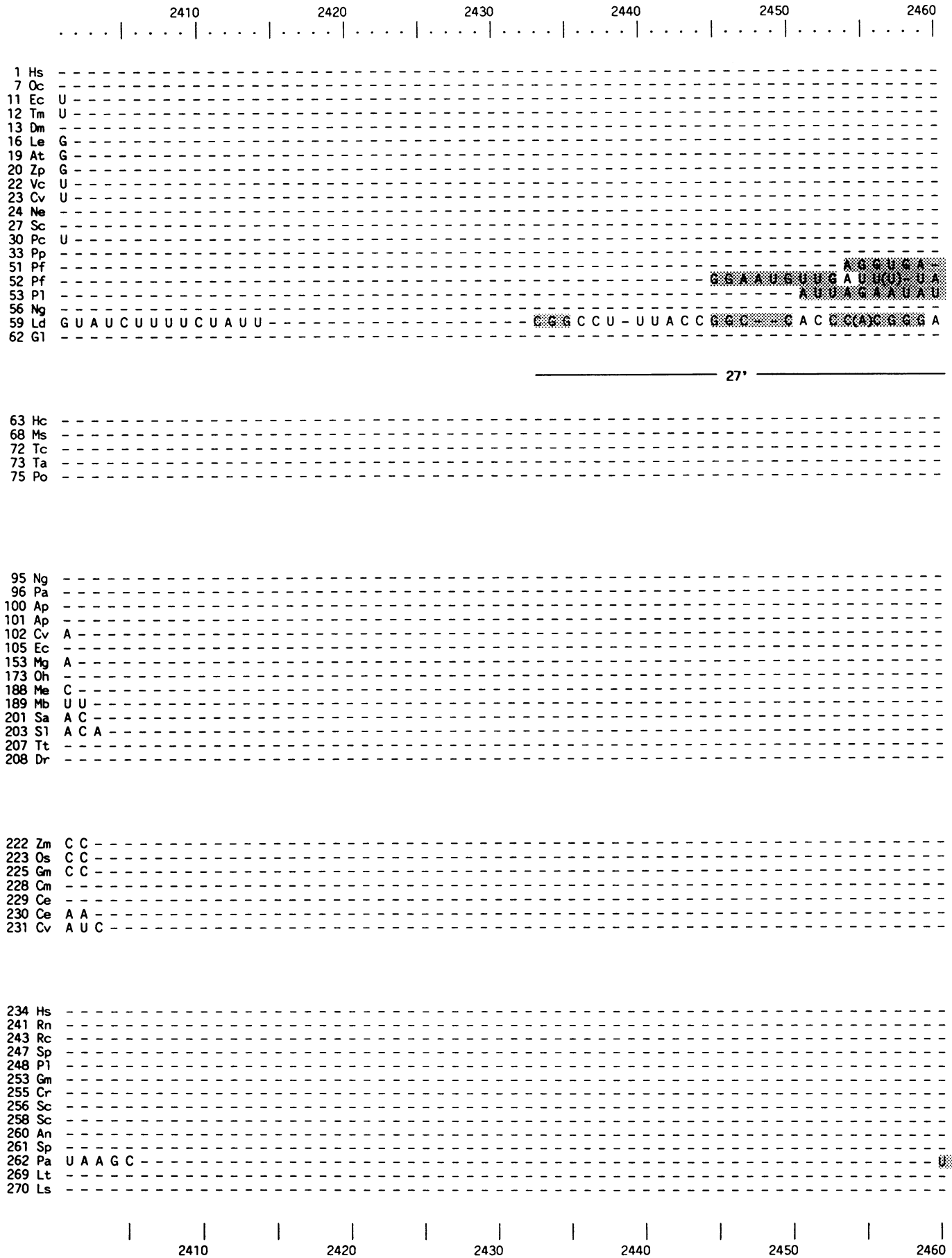
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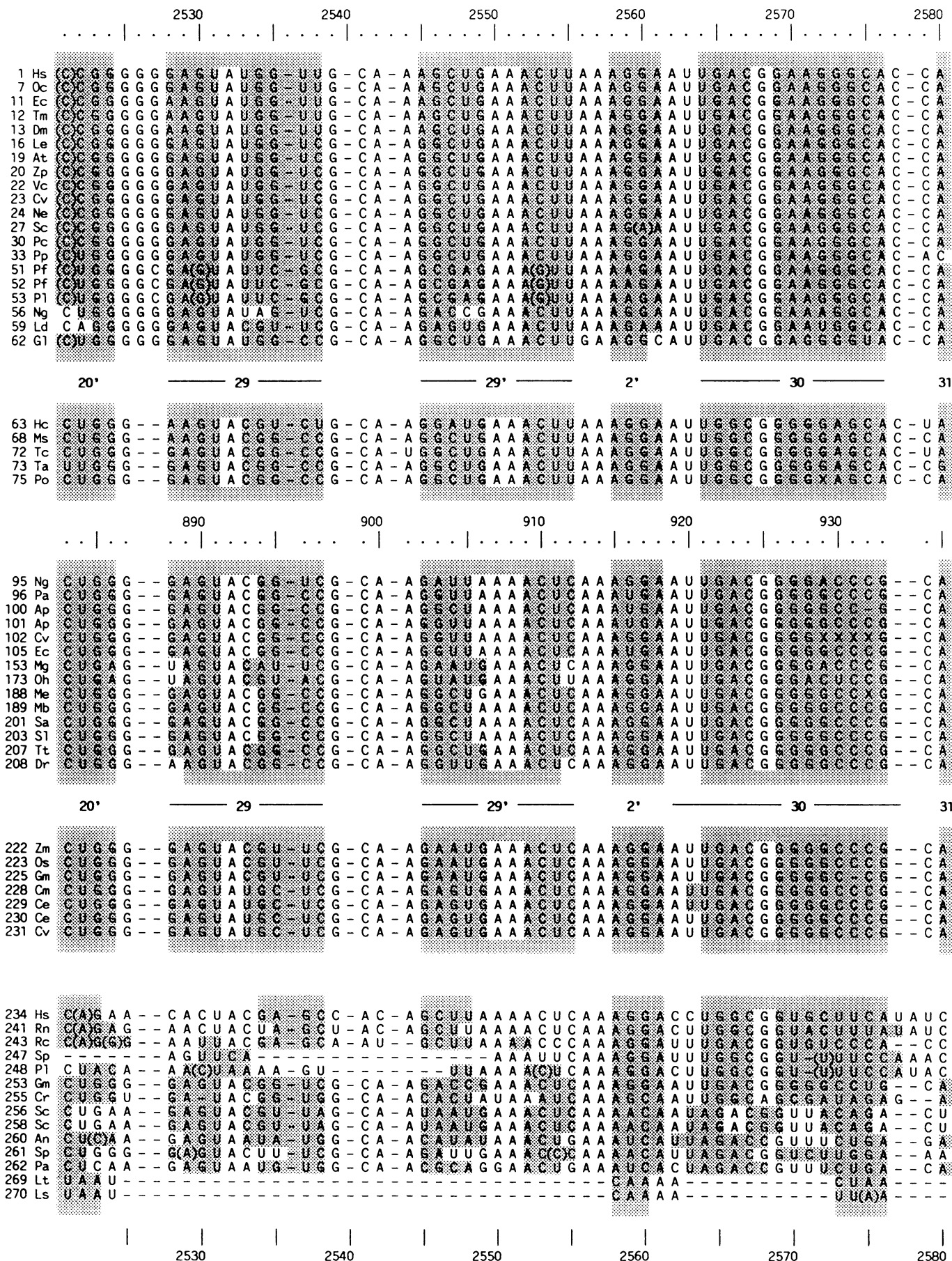
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230 Co C C A G U A G U C C U - - A G C C G U A A A C G A U G G A U A C U A A G U G C U G (U) G C G - - - - -
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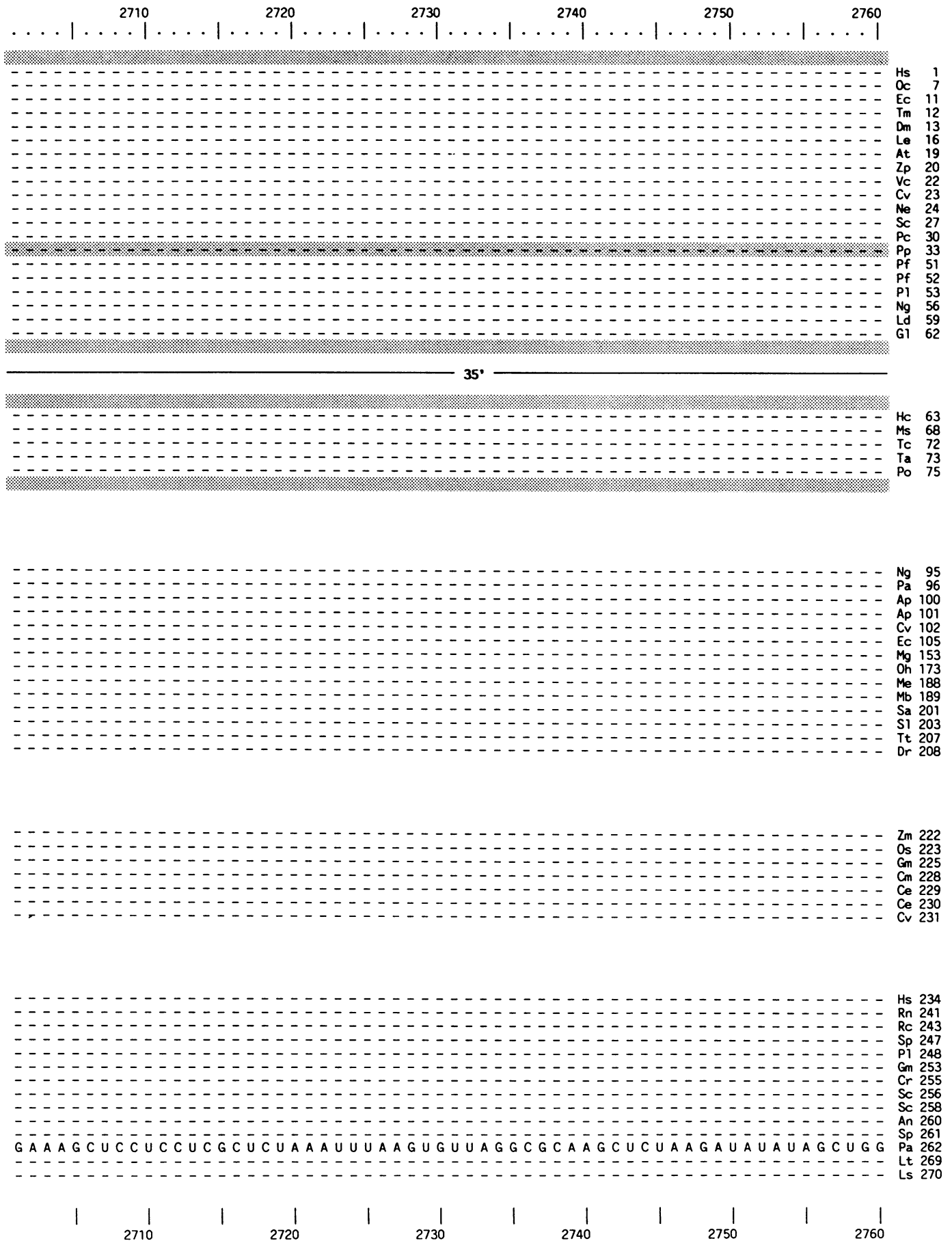
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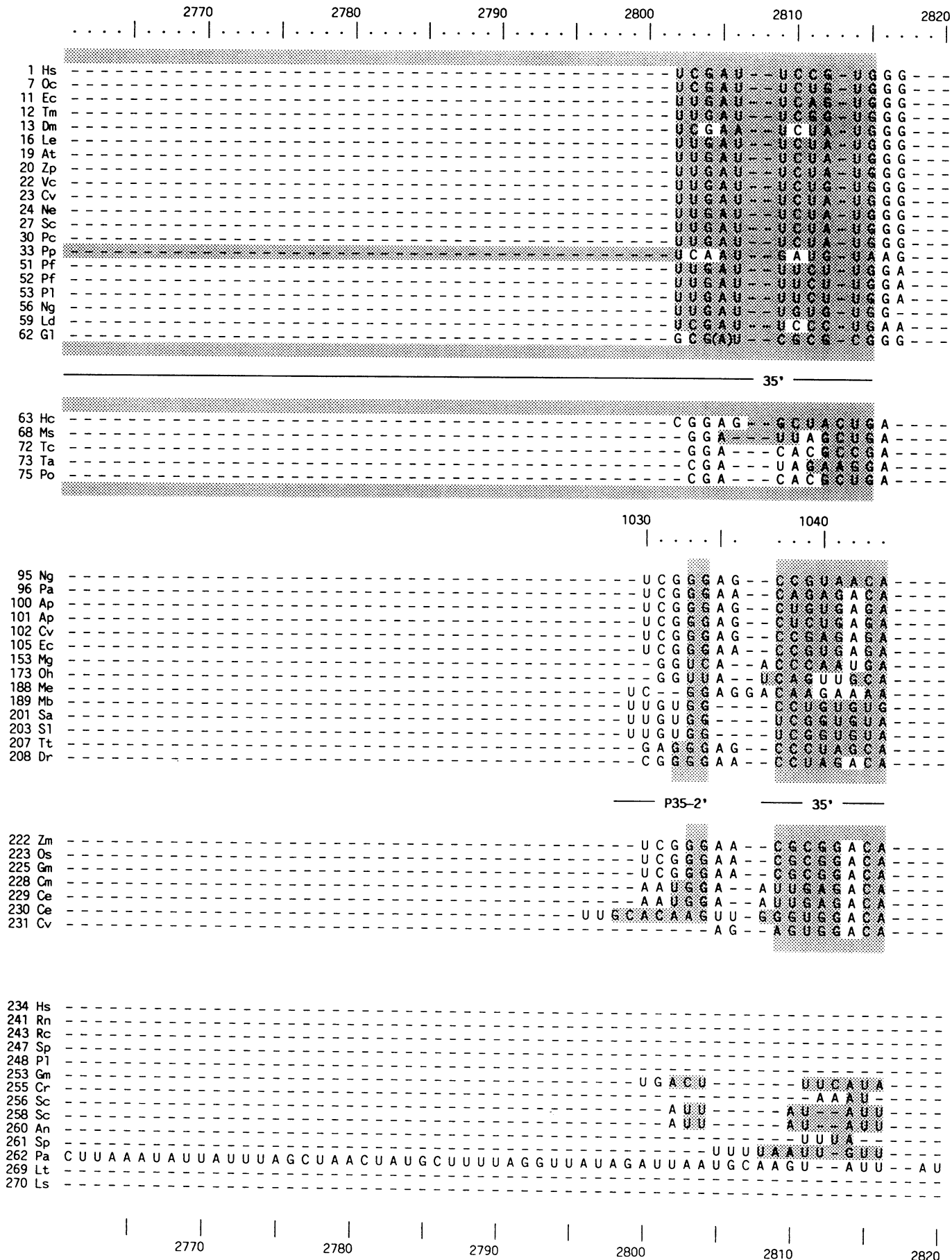
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243 Rn C C A C U A U G C C U - - A G C C C G U A A A C A A U U A - - - - -
247 Sp C U G U A U A C U U - - A G A G U G U A A C A C C C U A A - - - - -
248 Pl C U A C U A U A C U U - - A G A C - - G U A A A C A A C C U A A - - - - -
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262 Pa C A A G U A G U C U (U) - - A G C A G U C A A U U A U G A A U G C - C A U A G G U A G A U - A U A G U U (A) A U A C (A) A
269 Lt U U - A U A A U (U) U - - U - - - - -
270 Ls U U - G U A U A U U - - U - - - - -
    
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2290 2300 2310 2320 2330 2340









										2830											2840											2850											2860											2870											2880										
-	U	G	G	(U)	G	G	G	C	A	U	G	G	C	C	G	U	U	(C)	U	A	G	U	G	G	-	U	G	-	G	A	G	-	C	G	A	U	U	G	U	C	U	G	U	U	A	A	U	U	C	C	G	A	Hs	1																					
-	U	G	G	(U)	G	G	G	C	A	U	G	G	C	C	G	U	U	(C)	A	U	A	G	U	G	G	-	U	G	-	G	A	G	-	C	G	A	U	U	G	U	C	U	G	U	U	A	A	U	U	C	C	G	A	Oc	7																				
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-	U	G	G	(U)	G	G	G	C	A	U	G	G	C	C	G	U	U	(C)	U	A	A	G	U	G	G	-	U	G	-	G	A	G	-	U	G	A	U	U	G	U	C	U	G	U	U	A	A	U	U	C	C	G	A	Dm	13																				
-	U	G	G	(U)	G	G	G	C	A	U	G	G	C	C	G	U	U	(C)	U	A	A	G	U	G	G	-	U	G	-	G	A	G	-	U	G	A	U	U	G	U	C	U	G	U	U	A	A	U	U	C	C	G	U	At	16																				
-	U	G	G	(U)	G	G	G	C	A	U	G	G	C	C	G	U	U	(C)	U	A	A	G	U	G	G	-	U	G	-	G	A	G	-	C	G	A	U	U	G	U	C	U	G	U	U	A	A	U	U	C	C	G	U	Le	19																				
-	U	G	G	(U)	G	G	G	C	A	U	G	G	C	C	G	U	U	(C)	U	A	A	G	U	G	G	-	U	G	-	G	A	G	-	C	G	A	U	U	G	U	C	U	G	U	U	A	A	U	U	C	C	G	U	Zp	20																				
-	U	G	G	(U)	G	G	G	C	A	U	G	G	C	C	G	U	U	(C)	U	A	A	G	U	G	G	-	U	G	-	G	A	G	-	U	G	C	C	U	U	G	U	C	A	G	G	U	U	G	A	U	U	C	C	G	G	Vc	22																		
-	U	G	G	(U)	G	G	G	C	A	U	G	G	C	C	G	U	U	(C)	U	A	A	G	U	G	G	-	U	G	-	G	G	U	-	U	G	C	C	U	U	G	U	C	A	G	G	U	U	G	A	U	U	C	C	G	G	Cv	23																		
-	U	G	G	(U)	G	G	G	C	A	U	G	G	C	C	G	U	U	(C)	U	A	A	G	U	G	G	-	U	G	-	G	G	U	-	U	G	C	C	U	U	G	U	C	A	G	G	U	U	G	A	U	U	C	C	G	G	Ne	24																		
-	U	G	G	(U)	G	G	G	C	A	U	G	G	C	C	G	U	U	(C)	U	A	A	G	U	G	G	-	U	G	-	G	A	G	-	U	G	A	U	U	G	U	C	U	G	U	U	A	A	U	U	C	C	G	G	Sc	27																				
-	U	G	G	(U)	G	G	G	C	A	U	G	G	C	C	G	U	U	(C)	U	A	A	G	U	G	G	-	U	G	-	A	A	G	-	U	G	A	U	U	G	U	C	U	G	U	U	A	A	U	U	C	C	G	A	Pc	30																				
-	U	G	G	(U)	G	G	G	C	A	U	G	G	C	C	G	U	U	(C)	U	A	A	G	U	G	G	-	U	G	-	G	A	G	-	U	G	A	U	U	G	U	C	U	G	U	U	A	A	U	U	C	C	G	A	Pp	33																				
-	U	G	G	(U)	G	A	U	G	C	A	U	G	G	C	C	G	U	U	(U)	U	A	G	U	G	G	-	U	G	-	A	A	U	-	U	G	A	U	U	G	U	C	U	G	U	U	A	A	U	U	C	C	G	A	Pf	51																				
-	U	G	G	(U)	G	A	U	G	C	A	U	G	G	C	C	G	U	U	(U)	U	A	G	U	G	G	-	U	G	-	A	A	U	-	U	G	A	U	U	G	U	C	U	G	U	U	A	A	U	U	C	C	G	A	Pf	52																				
-	U	G	G	(U)	G	A	U	G	C	A	U	G	G	C	C	G	U	U	(U)	U	A	G	U	G	G	-	U	G	-	A	A	U	-	U	G	A	U	U	G	U	C	U	G	U	U	A	A	U	U	C	C	G	A	P1	53																				
-	U	G	G	(U)	G	A	U	G	C	A	U	G	G	C	C	G	U	U	(U)	U	A	G	U	G	G	-	U	G	-	A	A	U	-	U	G	A	U	U	G	U	C	U	G	U	U	A	A	U	U	C	C	G	A	Ng	56																				
-	U	G	G	(U)	G	G	G	C	A	U	G	G	C	C	G	U	U	(U)	U	A	G	U	G	G	-	U	G	-	G	A	G	-	U	G	A	U	U	G	U	C	U	G	U	U	A	A	U	U	C	C	G	U	Ld	59																					
-	U	G	G	(U)	G	G	G	C	A	U	G	G	C	C	G	U	U	(U)	U	A	G	U	G	G	-	U	G	-	G	A	G	-	U	G	A	U	U	G	U	C	U	G	U	U	A	A	U	U	C	C	G	U	G1	62																					
-	C	G	G	(U)	G	G	G	C	A	U	G	G	C	C	G	U	U	(C)	C	A	G	G	C	C	G	-	U	G	-	G	C	G	-	C	G	A	U	U	G	U	C	U	G	U	U	C	A	U	U	C	C	G	A																						

-----																														36	-----																														37	-----																														38	-----																														38'	-----																														39	-----																														39'
-	G	A	G	G	A	G	G	U	G	C	A	U	G	G	C	C	G	C	G	-	G	U	C	A	G	C	U	G	G	-	U	(A)	-	C	C	G	-	U	G	A	G	G	(C)	G	U	C	U	G	U	U	A	A	G	U	C	A	G	G	Hc	63																																																																																																																													
-	G	A	G	G	A	G	G	U	G	C	A	U	G	G	C	C	G	U	C	-	G	U	C	A	G	C	U	G	G	-	U	(A)	-	C	C	G	-	U	G	A	A	G	(C)	A	U	C	U	G	U	U	A	A	G	U	C	A	G	G	Ms	68																																																																																																																													
-	G	A	G	G	A	G	G	U	G	C	A	U	G	G	C	C	G	U	C	-	G	U	C	A	G	C	U	G	G	-	U	(A)	-	C	C	G	-	U	G	A	A	G	(C)	G	U	C	C	A	C	U	U	A	A	G	U	G	U	G	A	Tc	72																																																																																																																												
-	G	A	G	G	A	G	G	U	G	C	A	U	G	G	C	C	G	U	C	-	G	U	C	A	G	C	U	G	G	-	U	(A)	-	C	C	G	-	U	G	A	A	G	(C)	G	U	C	A	C	U	U	A	A	G	U	G	U	G	A	Ta	73																																																																																																																													
-	G	A	G	G	A	G	G	U	G	C	A	U	G	G	C	C	G	U	C	-	G	U	C	A	G	C	U	G	G	-	U	(A)	-	C	C	G	-	U	G	A	A	G	(C)	G	U	C	C	G	U	U	A	A	G	U	C	C	G	Po	75																																																																																																																														

										1050											1060											1070											1080											1090										
-	C	A	G	G	(U)	G	C	U	G	C	A	U	G	G	C	U	G	(U)	C	-	G	U	C	A	G	C	U	G	G	-	U	G	-	U	C	G	-	U	G	A	A	G	A	U	G	U	G	G	U	U	A	A	G	U	C	C	C	G	G	Ng	95			
-	C	A	G	G	(U)	G	C	U	G	C	A	U	G	G	C	U	G	(U)	C	-	G	U	C	A	G	C	U	G	G	-	U	G	-	U	C	G	-	U	G	A	A	G	A	U	G	U	G	G	U	U	A	A	G	U	C	C	C	G	G	Pa	96			
-	C	A	G	G	(U)	G	C	U	G	C	A	U	G	G	C	U	G	(U)	C	-	G	U	C	A	G	C	U	G	G	-	U	G	-	U	C	G	-	U	G	A	A	G	A	U	G	U	G	G	U	U	A	A	G	U	C	C	C	G	G	Ap	100			
-	C	A	G	G	(U)	G	C	U	G	C	A	U	G	G	C	U	G	(U)	C	-	G	U	C	A	G	C	U	G	G	-	U	G	-	U	C	G	-	U	G	A	A	G	A	U	G	U	G	G	U	U	A	A	G	U	C	C	C	G	G	Ap	101			
-	C	A	G	G	(U)	G	C	U	G	C	A	U	G	G	C	U	G	(U)	C	-	G	U	C	A	G	C	U	G	G	-	U	G	-	U	C	G	-	U	G	A	A	G	A	U	G	U	G	G	U	U	A	A	G	U	C	C	C	G	G	Cv	102			
-	C	A	G	G	(U)	G	C	U	G	C	A	U	G	G	C	U	G	(U)	C	-	G	U	C	A	G	C	U	G	G	-	U	G	-	U	C	G	-	U	G	A	A	G	A	U	G	U	G	G	U	U	A	A	G	U	C	C	C	G	G	Ec	105			
-	C	A	G	G	(U)	G	C	U	G	C	A	U	G	G	C	U	G	(U)	C	-	G	U	C	A	G	C	U	G	G	-	U	G	-	U	C	G	-	U	G	A	A	G	A	U	G	U	G	G	U	U	A	A	G	U	C	C	C	G	G	Mg	153			
-	C	A	G	G	(U)	G	C	U	G	C	A	U	G	G	C	U	G	(U)	C	-	G	U	C	A	G	C	U	G	G	-	U	G	-	U	C	G	-	U	G	A	A	G	A	U	G	U	G	G	U	U	A	A	G	U	C	C	C	G	G	Oh	173			
-	C	A	G	G	(U)	G	C	U	G	C	A	U	G	G	C	U	G	(U)	C	-	G	U	C	A	G	C	U	G	G	-	U	G	-	U	C	G	-	U	G	A	A	G	A	U	G	U	G	G	U	U	A	A	G	U	C	C	C	G	G	Me	188			
-	C	A	G	G	(U)	G	C	U	G	C	A	U	G	G	C	U	G	(U)	C	-	G	U	C	A	G	C	U	G	G	-	U	G	-	U	C	G	-	U	G	A	A	G	A	U	G	U	G	G	U	U	A	A	G	U	C	C	C	G	G	Mb	189			
-	C	A	G	G	(U)	G	C	U	G	C	A	U	G	G	C	U	G	(U)	C	-	G	U	C	A	G	C	U	G	G	-	U	G	-	U	C	G	-	U	G	A	A	G	A	U	G	U	G	G	U	U	A	A	G	U	C	C	C	G	G	Sa	201			
-	C	A	G	G	(U)	G	C	U	G	C	A	U	G	G	C	U	G	(U)	C	-	G	U	C	A	G	C	U	G	G	-	U	G	-	U	C	G	-	U	G	A	A	G	A	U	G	U	G	G	U	U	A	A	G	U	C	C	C							

2890 2900 2910 2920 2930 2940

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1 Hs U - - A A C G A A C G A G - - - A - - C U C U - G G C A U G C U A A C U A - G U U A C G G G A C C C - - - - -
7 Oc U - - A A C G A A C G A G - - - A - - C U C U - G G C A U G C U A A C U A - G U U A C G G G A C C C - - - - -
11 Ec U - - A A C G A A C G A G - - - A - - C U C U - A G G C C U A C U A A A U A - G G C G U A C C C G A C C - - - - -
12 Tm U - - A A C G A A C G A G - - - A - - C U C U - A G G C C U A C U A A A U A - G G C G U A C C C G A C C A U C C C A A A
13 Dm U - - A A C G A A C G A G - - - A - - C U C A - A A U A U A U A A A U A - G (A) U A U C U U C A G G A U (U) A U G G U G
16 Le U - - A A C G A A C G A G - - - A - - C C U C - A G C C U G C U A A C U A - G C U A C G G G A G G - - - - -
19 At U - - A A C G A A C G A G - - - A - - C C U C - A G C C U G C U A A C U A - G C U A C G G G A G G - - - - -
20 Zp U - - A A C G A A C G A G - - - A - - C C U C - G G C C U G C U A A C U A - G C U A C G C G G A G G - - - - -
22 Vc U - - A A C G A A C G A G - - - A - - C C U C - A G C C U G C U A A A U A - G U C A C G C G U G - - - - -
23 Cv U - - A A C G A A C G A G - - - A - - C C U C - A G C C U G C U A A A U A - G U C A C G C G U G - - - - -
24 Ne U - - A A C G A A C G A G - - - A - - C C U C - A G C C U G C U A A C U A - G U C A C G C G U G C - - - - -
27 Sc U - - A A C G A A C G A G - - - A - - C C G C - C G C C U G C U A A A U A - G A C C C G C G A U A G - - - - -
30 Pc U - - A A C G A A C G A G - - - A - - C C U U - A A C C U G C U A A A U A - G C C A G A U A G C U - - - - -
33 Pp U - - A A C G A A C G A G - - - A - - C C C C - G A C C U C U A A (U) A - G G C A G G G C A G C C A S A C C (S) G U C
51 Pf U - - A A C G A A C G A G - - - A - - U C U U - A A C C U G C U A A U U A - G C G G G A A G U A C A C A U A U U U U
52 Pf U - - A A C G A A C G A G - - - A - - U C U U - A A C C U G C U A A U U A - G C G G G A A G U A C A C A U A U U U U
53 Pl U - - A A C G A A C G A G - - - A - - U C U A - A A C C U G C U A A U U A - G C G G U A A A A U C C A C A U A U C (A)
56 Ng U - - A A C G A A C G A G - - - A - - C C U A - A G C C U U U A A C U A - G C C S U A G C C U U U C U U (C) G G
59 Ld C - - A A C G A A C G A G - - - A - - U C C A - A G C C U G C C C A G U A - G A A U G C A A A U U - G C C C A U A G
62 Gl C - - A A C G A A C G A G - - - A - - C C C C - G C C C C - - - - - G G C G C - - - - -
    
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37' — 40 — 41

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63 Hc C - - A A C G A G C G A G - - - - - A C C C G C A - - C U C C U A A U U G - C C A G C A G U A C C C U U U - - - - -
68 Ms C - - A A C G A G C G A G - - - - - A C C C C G C G - - C C C A C A G U U (G) - C C A G C G U A C C U C U C U G - - - - -
72 Tc U - - A A C G A G C G A G - - - - - A C C C G C G - - C C C C A G U U G - C C A G U C C - U U - C C C G C U - - - - -
73 Ta U - - A A C G A G C A A G - - - - - A C C C C G A - - U C U C U A A U U G - C C A G A C U G - U C U U U G C - - - - -
75 Po C - - A A C G A G C G A G - - - - - A C C C C A - - C C C C U A G U U G - C U A C C C G G G C C A - - - - -
    
```

1100 1110 1120 1130

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95 Ng C - - A A C G A G C G C A - - - - - A C C C U U G - - U C A U A G U U G - C C A U C A U U C G - - - - -
96 Pa U - - A A C G A G C G C A - - - - - A C C C U U G - - U C C U A G U U (A) - C C A G C A C C U C - - - - -
100 Ap C - - A A C G A G C G C A - - - - - A C C C U U A - - U C C (C) C U G U U G - C C A G C G G U U C - - - - -
101 Ap C - - A A C G A G C G C A - - - - - A C C C U U A - - U C C U U G U U G - C C A G C G A U A A - - - - -
102 Cv U - - A A C G A G C G C A - - - - - A C C C U U G - - U C C C U A G U U G - C C A G C A C U C - - - - -
105 Ec C - - A A C G A G C G C A - - - - - A C C C U U A - - U C C U U G U U G - C C A G C G G U C - - - - -
153 Mg C - - A A C G A G C G C A - - - - - A C C C U U A - - U C G U A G U U A - C U - - - - -
173 Oh C - - A A C G A G C G C A - - - - - A C C C U U A - - U G U U A G U U A - C C A G C A C G U A - - - - -
188 Me C - - A A C G A G C G C A - - - - - A C C C U U A - - U C U U C U U A - C C A G C G G U A - - - - -
189 Mb C - - A A C G A G C G C A - - - - - A C C C U U G - - U C U C A U S U U G - C C A G C A C G U A A - - - - -
201 Sa C - - A A C G A G C G C A - - - - - A C C C U U G - - U C C C G U U G - C C A G C A A G C C C U U C G G G G - - - - -
203 Sl C - - A A C G A G C G C A - - - - - A C C C U U S - - U C C C G U G U U G - C C A G C A A G C C C U U C G G G G - - - - -
207 Tt C - - A A C G A G C G C A - - - - - A C C C C G G - - C C G U A G U U G - C C A G C G G U C - - - - -
208 Dr C - - A A C G A G C G C A - - - - - A C C C U U G - - C U U C A G U U G - C C A G C A U U C - - - - -
    
```

37' — 40 — 41

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222 Zm C - - A A C G A G C G C A - - - - - A C C C U C - - G U G U U A G U U G - C C A C U A U G - - - - -
223 Os C - - A A C G A G C G C A - - - - - A C C C U C - - G U G U U A G U U G - C C A C U A U G - - - - -
225 Gm C - - A A C G A G C G C A - - - - - A C C C U C G - - U S U U U A G U U G - C C A A C A U U - - - - -
228 Cm C - - A A C G A G C G C A - - - - - A C C C U C G - - U C C A C A G U U A - - - - -
229 Ce C - - A A C G A G C G C A - - - - - A C C C U C G - - U C C A C A G U U A - - - - -
230 Ce C - - A A C G A G C G C A - - - - - A C C C U U S - - U U U U A G U U (S) - C U U U A A A U A U A C A U U U A A
231 Cv C - - A A C G A G C G C A - - - - - A C C C U U S - - U U U U G A U U (S) - C C A G U A A U - - - - -
    
```

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234 Hs - - - - - A A G C G C A A G - - U - A C C C A C G U - - - - -
241 Rn - - - - - A A G C C A C A - - - - - A - G A A C A A - - - - -
243 Rc - - - - - A G G C U U A A U C G A U A A C A C G U - - - - -
247 Sp - - - - - G A C U U U A - - - - - A G G - G A G A A C - - - - -
248 Pl - - - - - G G C U C C U - - - - - A G G - G A A A A U - - - - -
253 Gm U - - A A C G A G C G A A - - - - - A C C C U C G - - U U U U S U S U U G - C U G A G A C A U S C G C C U A A G G A G
255 Cr - - - - - C U U U G C C - - - - - A C G U U U C U - - - - -
256 Sc A U A A A C G A G C A A A - - - - - A C U C C - - A U A U A U A A - U U U - - - - - A U - - - - -
258 Sc A U A A A C G A G C A A A - - - - - A C U C C - - A U A U A U A A - U (U) U - A A U A U A U A - - - - -
260 An U - - A A U U A A C G A A - - - - - A C C C U C A - C U U U A U U G C - A U U - - - - -
261 Sp U A A - U U A A C G A A - - - - - A G C C U U - C A A A S A A U - - U U G U U - - - - -
262 Pa G G - A A U U A A C G A A - - - - - A A C C C U U - G C U U A U U U G U - A A A U - - - - -
269 Lt - - - - -
270 Ls - - - - -
    
```

2890 2900 2910 2920 2930 2940

	2950	2960	2970	2980	2990	3000	
-----							Hs 1
-----							Oc 7
-----							Ec 11
-----							Tm 12
-----							Dm 13
-----							Le 16
-----							At 19
-----							Zp 20
-----							Vc 22
-----							Cv 23
-----							Ne 24
-----							Sc 27
-----							Pc 30
-----							Pp 33
-----							Pf 51
-----							Pf 52
-----							P1 53
-----							Ng 56
-----							Ld 59
-----							G1 62

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G C C C G C U G C C C G G G U U C G
(C) U G A A G C U U A (U) G U A G (C) C U U C A U U (C) A U G U (U) G G C A G U A A A A U G C U U A U U
U A U U U G A A - A U U G A A C A U A G G U A A C U A D A C A U U D A U U C A G U A - A U C A A A U U A G G A U A U U
U A U U U G A A - A U U G A A U A D A G G U (U) A C U A D A C G (U) U U A U U C A G U G - U U C A A A U U A G G A U A U U
U G U A C A A A A A G A A U A U A G G C A A A A A A U A C A (U) A G U A A U A (C) A A A A U A U U A G G A U A U U
G G A A (G) G C U U A G U U U G U C G G A A C A
G A U A G C A A A C U C A U C G G (C) G G G U U U

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41

-----							Hc 63
-----							Ms 68
-----							Tc 72
-----							Ta 73
-----							Po 75

-----							Ng 95
-----							Pa 96
-----							Ap 100
-----							Ap 101
-----							Cv 102
-----							Ec 105
-----							Mg 153
-----							Oh 173
-----							Me 188
-----							Mb 189
-----							Sa 201
-----							ST 203
-----							Tt 207
-----							Dr 208

41

-----							Zn 222
-----							Os 223
-----							Gm 225
-----							Cm 228
-----							Ce 229
-----							Ce 230
-----							Cv 231

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A A G G A A U G C C A A G

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P41-1

-----							Hs 234
-----							Rn 241
-----							Rc 243
-----							Sp 247
-----							P1 248
-----							Gm 253
-----							Cr 255
-----							Sc 256
-----							Sc 258
-----							An 260
-----							Sp 261
-----							Pa 262
-----							Lt 269
-----							Ls 270

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A A A G U C U U U G C A A C C G A A G U G A G C C G A G G A G C C G A G U G A C C C G C A G C G C U A C U A

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2950

2960

2970

2980

2990

3000

		3010	3020	3030	3040	3050	3060
1	Hs	-	-	-	-	-	-
7	Oc	-	-	-	-	-	-
11	Ec	-	-	-	-	-	-
12	Tm	-	-	-	-	-	-
13	Dm	-	-	-	-	-	-
16	Le	-	-	-	-	-	-
19	At	-	-	-	-	-	-
20	Zp	-	-	-	-	-	-
22	Vc	-	-	-	-	-	-
23	Cv	-	-	-	-	-	-
24	Ne	-	-	-	-	-	-
27	Sc	-	-	-	-	-	-
30	Pc	-	-	-	-	-	-
33	Pp	-	-	-	-	-	-
51	Pf	U	U	U	-	-	A
52	Pf	U	U	U	U	U	A
53	P1	U	U	A	A	U	A
56	Ng	-	-	-	-	-	-
59	Ld	-	-	-	-	-	-
62	G1	-	-	-	-	-	-

63	Hc	-	-	-	-	-	-
68	Ms	-	-	-	-	-	-
72	Tc	-	-	-	-	-	-
73	Ta	-	-	-	-	-	-
75	Po	-	-	-	-	-	-

95	Ng	-	-	-	-	-	-
96	Pa	-	-	-	-	-	-
100	Ap	-	-	-	-	-	-
101	Ap	-	-	-	-	-	-
102	Cv	U	U	U	U	U	A
105	Ec	-	-	-	-	-	-
153	Mg	-	-	-	-	-	-
173	Oh	-	-	-	-	-	-
188	Me	-	-	-	-	-	-
189	Mb	-	-	-	-	-	-
201	Sa	-	-	-	-	-	-
203	S1	-	-	-	-	-	-
207	Tt	-	-	-	-	-	-
208	Dr	-	-	-	-	-	-

222	Zm	-	-	-	-	-	-
223	Os	-	-	-	-	-	-
225	Gm	-	-	-	-	-	-
228	Cm	-	-	-	-	-	-
229	Ce	-	-	-	-	-	-
230	Ce	-	-	-	-	-	-
231	Cv	-	-	-	-	-	-

P41-1'

P41-2

234	Hs	-	-	-	-	-	-
241	Rn	-	-	-	-	-	-
243	Rc	-	-	-	-	-	-
247	Sp	-	-	-	-	-	-
248	P1	-	-	-	-	-	-
253	Gm	U	U	G	A	G	C
255	Cr	-	-	-	-	-	-
256	Sc	-	-	-	-	-	-
258	Sc	-	-	-	-	-	-
260	An	-	-	-	-	-	-
261	Sp	-	-	-	-	-	-
262	Pa	-	-	-	-	-	-
269	Lt	-	-	-	-	-	-
270	Ls	-	-	-	-	-	-

| 3010 | 3020 | 3030 | 3040 | 3050 | 3060

3070 3080 3090 3100 3110 3120

-----	Hs	1
-----	Oc	7
-----	Ec	11
-----	Tm	12
-----	Dm	13
-----	Le	16
-----	At	19
-----	Zp	20
-----	Vc	22
-----	Cv	23
-----	Ne	24
-----	Sc	27
-----	Pc	30
-----	Pp	33
-----	Pf	51
-----	Pf	52
-----	P1	53
-----	Ng	56
-----	Ld	59
-----	G1	62

-----	Hc	63
-----	Ms	68
-----	Tc	72
-----	Ta	73
-----	Po	75

-----	Ng	95
-----	Pa	96
-----	Ap	100
-----	Ap	101
-----	Cv	102
-----	Ec	105
-----	Mg	153
-----	Oh	173
-----	Me	188
-----	Mb	189
-----	Sa	201
-----	S1	203
-----	Tt	207
-----	Dr	208

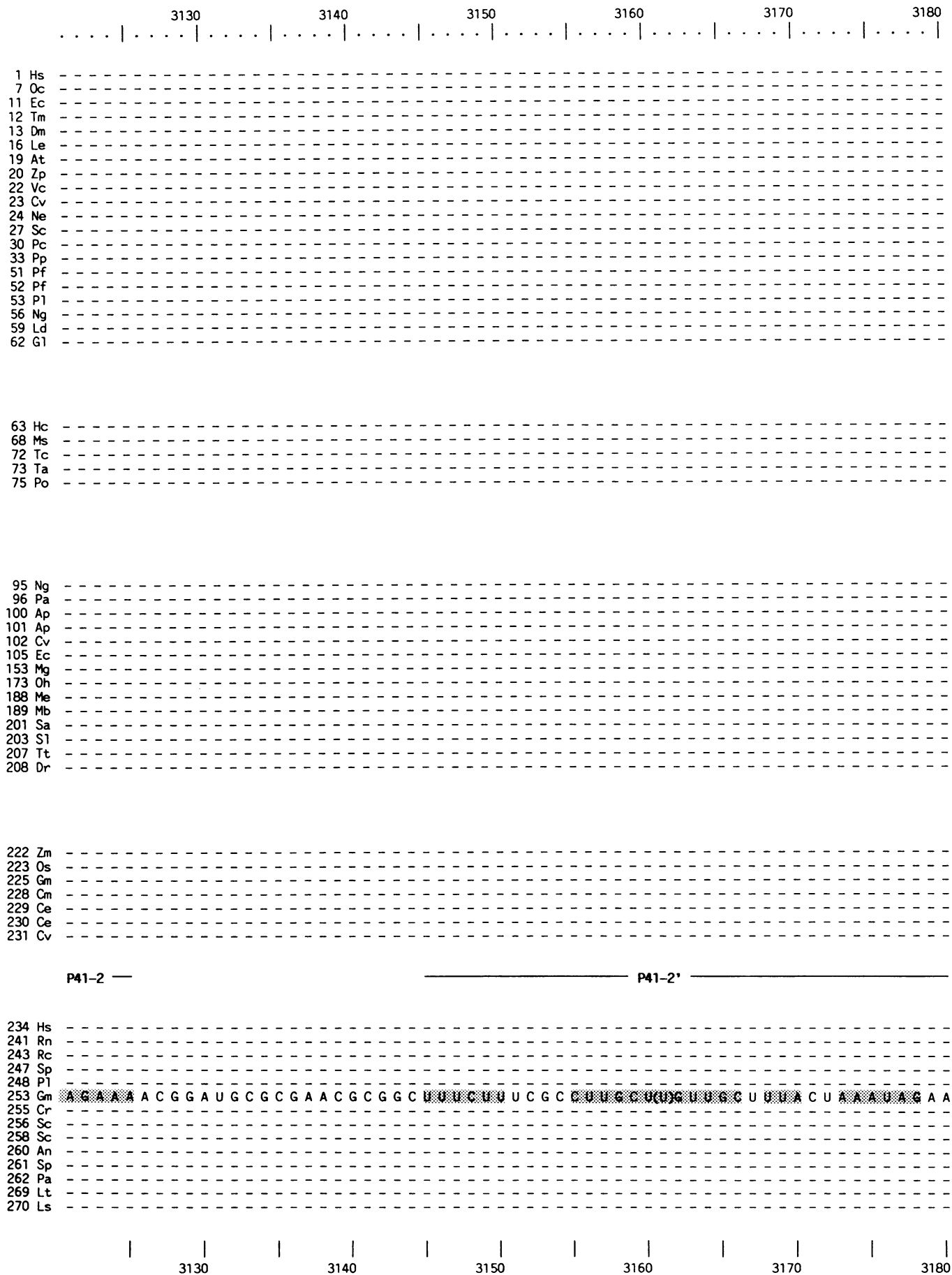
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-----	Os	223
-----	Gm	225
-----	Cm	228
-----	Ce	229
-----	Ce	230
-----	Cv	231

P41-2

-----	Hs	234
-----	Rn	241
-----	Rc	243
-----	Sp	247
-----	P1	248
-----	Gm	253
-----	Cr	255
-----	Sc	256
-----	Sc	258
-----	An	260
-----	Sp	261
-----	Pa	262
-----	Lt	269
-----	Ls	270

G C C U U U C G A A U U C G A A G C A C U U U C U A G U G U G C G C U G U U U U U G A U U G C A G C U A G C C G A G C A

3070 3080 3090 3100 3110 3120



3190 3200 3210 3220 3230 3240

-----	Hs	1
-----	Oc	7
-----	Ec	11
-----	Tm	12
-----	Dm	13
-----	Le	16
-----	At	19
-----	Zp	20
-----	Vc	22
-----	Cv	23
-----	Ne	24
-----	Sc	27
-----	Pc	30
-----	Pp	33
-----	Pf	51
-----	Pf	52
-----	P1	53
-----	Ng	56
-----	Ld	59
-----	G1	62

-----	Hc	63
-----	Ms	68
-----	Tc	72
-----	Ta	73
-----	Po	75

-----	Ng	95
-----	Pa	96
-----	Ap	100
-----	Ap	101
-----	Cv	102
-----	Ec	105
-----	Mg	153
-----	Oh	173
-----	Me	188
-----	Mb	189
-----	Sa	201
-----	S1	203
-----	Tt	207
-----	Dr	208

-----	Zn	222
-----	Os	223
-----	Gm	225
-----	Cm	228
-----	Ce	229
-----	Ce	230
-----	Cv	231

P41-2'

P41-3

-----	Hs	234
-----	Rn	241
-----	Rc	243
-----	Sp	247
-----	P1	248
-----	Gm	253
-----	Cr	255
-----	Sc	256
-----	Sc	258
-----	An	260
-----	Sp	261
-----	Pa	262
-----	Lt	269
-----	Ls	270

AGAAAGGGCUUUUCUC C C U G U H A G U A A A G C C C A G U H H H G G C C U U A U C U U G C A C C U G A

3190 3200 3210 3220 3230 3240

	3490	3500	3510	3520	3530	3540
1 Hs	G G C U G G C A C G G G G C G C U A C A C U G G G A C U G G C U C A G C G U G					
7 Oc	G G C U G G C A C G G G G C G C U A C A C U G G G A C U G G C U C A G C G U G					
11 Ec	G G C C G G C A C G G G G C G C U A C A C U G G G A A G G A A U C A G C G U G					
12 Tm	G G C C G G C A C G G G G C G C U A C A C U G G G A A G G A A U C A G C G U G					
13 Dm	G G C C G G C A C G G G G C G C U A C A C U G G G A A G G A A U C A G C G U G					
16 Le	G G C C G G C A C G G G G C G C U A C A C U G G G A A G G A A U C A G C G U G					
19 At	G G C C G G C A C G G G G C G C U A C A C U G G G A A G G A A U C A G C G U G					
20 Zp	G G C C G G C A C G G G G C G C U A C A C U G G G A A G G A A U C A G C G U G					
22 Vc	G G C C G G C A C G G G G C G C U A C A C U G G G A A G G A A U C A G C G U G					
23 Cv	G G C C G G C A C G G G G C G C U A C A C U G G G A A G G A A U C A G C G U G					
24 Ne	G G C C G G C A C G G G G C G C U A C A C U G G G A A G G A A U C A G C G U G					
27 Sc	G G C C G G C A C G G G G C G C U A C A C U G G G A A G G A A U C A G C G U G					
30 Pp	G G C C G G C A C G G G G C G C U A C A C U G G G A A G G A A U C A G C G U G					
33 Pp	G G C C G G C A C G G G G C G C U A C A C U G G G A A G G A A U C A G C G U G					
51 Pf	G G C U G G C A C G G G G C G C U A C A C U G G G A A G G A A U C A G C G U G					
52 Pf	G G C U G G C A C G G G G C G C U A C A C U G G G A A G G A A U C A G C G U G					
53 P1	G G C U G G C A C G G G G C G C U A C A C U G G G A A G G A A U C A G C G U G					
56 Ng	G G C U G G C A C G G G G C G C U A C A C U G G G A A G G A A U C A G C G U G					
59 Ld	G G C U G G C A C G G G G C G C U A C A C U G G G A A G G A A U C A G C G U G					
62 G1	G G C U G G C A C G G G G C G C U A C A C U G G G A A G G A A U C A G C G U G					

34' ----- 32' ----- 43 ----- E43-1 -----

63 Hc	G G C A A C A C G G G G C U A C A A U G G G U C G G A G A C A A U				
68 Ms	G G C U A C A C G G G G C U A C A A U G G G U C G G A G A C A A U				
72 Tc	G G C U A C A C G G G G C U A C A A U G G G U C G G A G A C A A U				
73 Ta	G G C U A C A C G G G G C U A C A A U G G G U C G G A G A C A A U				
75 Po	G G C U G G C A C G G G G C U A C A A U G G G U C G G A G A C A G C				

	1230	1240	1250
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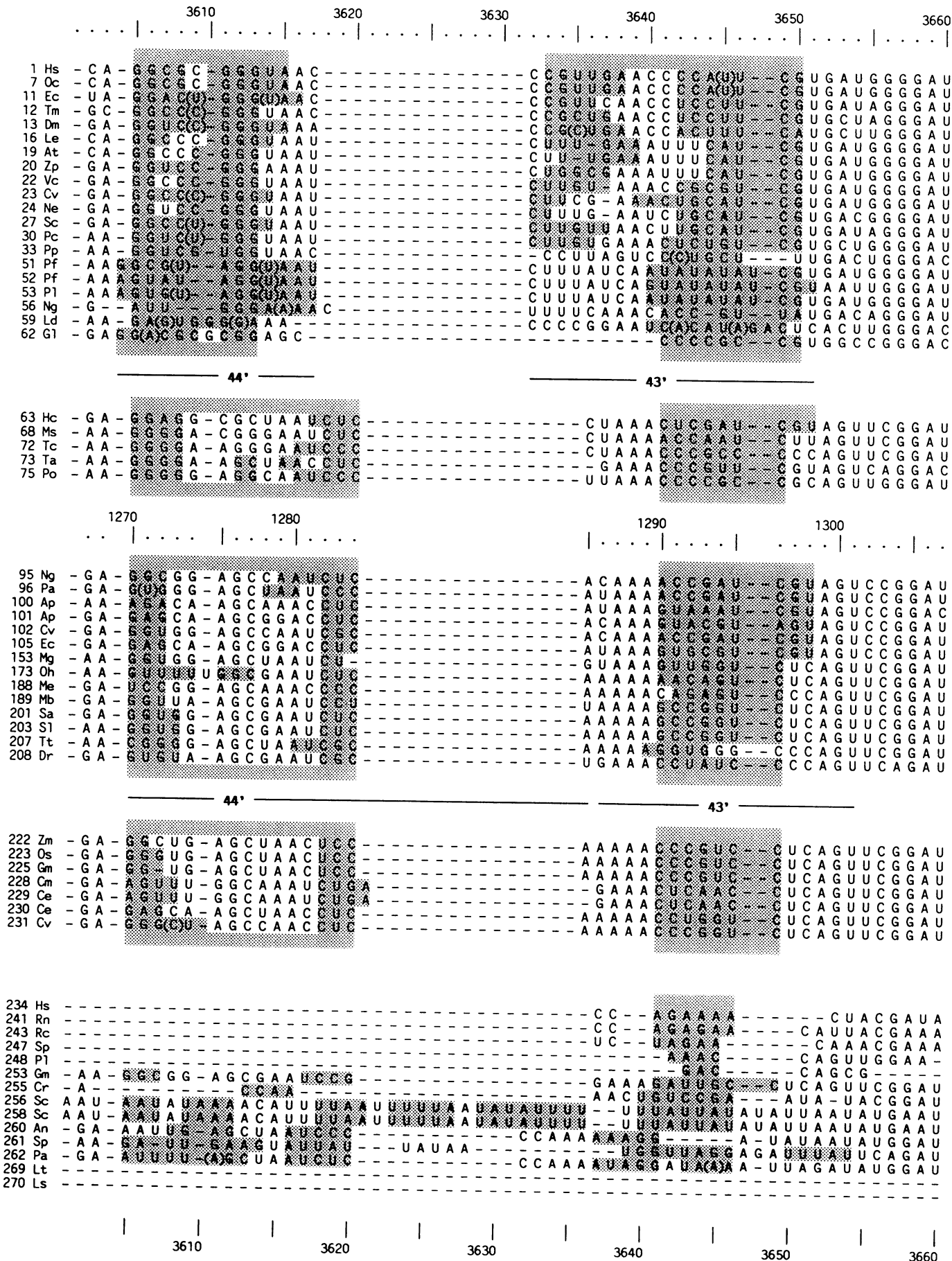
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96 Pa	G G C U A C A C A C G G G G C U A C A A U G G G U C G G G U A C A A A		
100 Ap	G G C U A C A C A C G G G G C U A C A A U G G G U C G G G U A C A A A		
101 Ap	G G C U A C A C A C G G G G C U A C A A U G G G U C G G G U A C A A A		
102 Cv	G G C U A C A C A C G G G G C U A C A A U G G G U C G G G U A C A G A		
105 Ec	G G C U A C A C A C G G G G C U A C A A U G G G U C G G G U A C A A A		
153 Mg	G G C U G G C A C A C G G G G C U A C A A U G G G U C G G G U A C A A A		
173 Oh	G G C U A C A C A C G G G G C U A C A A U G G G U C G G G U A C A A A		
188 Me	G G C U A C A C A C G G G G C U A C A A U G G G U C G G G U A C A A G		
189 Mb	G G C U A C A C A C G G G G C U A C A A U G G G U C G G G U A C A A A		
201 Sa	G G C U G G C A C A C G G G G C U A C A A U G G G U C G G G U A C A A U		
203 S1	G G C U G G C A C A C G G G G C U A C A A U G G G U C G G G U A C A A U		
207 Tt	G G C G A C A C A C G G G G C U A C A A U G G G U C G G G U A C A A A		
208 Dr	G G C U A C A C A C G G G G C U A C A A U G G G U C G G G U A C A A C		

34' ----- 32' ----- 43 -----

222 Zn	G G C G A C A C A C G G G G C U A C A A U G G G G C G G G A C A A A		
223 Os	G G C G A C A C A C G G G G C U A C A A U G G G G C G G G A C A A A		
225 Gm	G G C G A C A C A C G G G G C U A C A A U G G G G C G G G A C A A A		
228 Cn	G G C G A C A C A C G G G G C U A C A A U G G G G C G G G A C A A A		
229 Ce	G G C G A C A C A C G G G G C U A C A A U G G G G C G G G A C A A A		
230 Ce	G G C G A C A C A C G G G G C U A C A A U G G G G C G G G A C A A U		
231 Cv	G G C G A C A C A C G G G G C U A C A A U G G G G C G G G A C A A A		

234 Hs	G - C A A G A A A U G G G C U A C - A U U - - - U U C U A C C - - -		
241 Rn	G - A A A G A A A U G G G C U A C - A U U - - - U U C U U U C - - -		
243 Rc	G - G A A G U A A U G G G C U A C - A A U - - - U U C U A A - - -		
247 Sp	G - G A A G U A A U G G G C U A C - A A U - - - G U U U G - A A C - - -		
248 P1	G - G A A G U A A U G G G C U A C - A A U - - - G U U U U U A A C - - -		
253 Gm	G G C C A C A C A C G G G G C U A C A A U G G G G C A A U U - A C A A -		
255 Cr	G G C U A C A C A C G G G G C U A C A A U G G G G A C A C C C A C A A G		
256 Sc	G G U A A U A A G A C C G G G C U A U A A U A - - - A A A U G A U A A U -		
258 Sc	G G U A A U A A G A C C G G G C U A U A A U A - - - A A A U G A U A A U -		
260 An	G G C U A A U A G A C C G G G C U A C A A U A U - - - G C A U U U - A C A A A		
261 Sp	G G C U A A U A G A C C G G G C U A U A A A A - - - U C A A U C C A - - -		
262 Pa	G G C U A A U A G A C C G G G C A C A U (G) U - - - A C C U A A - A C A A A		
269 Lt	- -		
270 Ls	- -		

3490 3500 3510 3520 3530 3540



	3670	3680	3690	3700	3710	3720	
C G G G G - A U	-	-	-	-	-	-	U G C A A U Hs 1
C G G G G - A U	-	-	-	-	-	-	U G C A A U Oc 7
A G G G G - C U	-	-	-	-	-	-	U G U A A U Ec 11
U G G G G - C U	-	-	-	-	-	-	U G C A A U Tm 12
U G U G A - A C	-	-	-	-	-	-	U G A A A C Dm 13
A G A U C - A U	-	-	-	-	-	-	U G C A A U Le 16
A G A U C - A U	-	-	-	-	-	-	U G C A A U At 19
A G A U C - A U	-	-	-	-	-	-	U G C A A U Zp 20
A G A U U - A U	-	-	-	-	-	-	U G C A A U Vc 22
A G A U U - A U	-	-	-	-	-	-	U G C A A U Cv 23
A G A U U - A U	-	-	-	-	-	-	U G C A A U Ne 24
A C A U U - A U	-	-	-	-	-	-	U G C A A U Sc 27
A G A G C - A U	-	-	-	-	-	-	U G C A A U Pc 30
A G A U C - U U	-	-	-	-	-	-	U G C A A U Pp 33
A G A U U - A U	-	-	-	-	-	-	U G C A A U Pf 51
A G A U U - A U	-	-	-	-	-	-	U G C A A U Pf 52
A G A U U - A U	-	-	-	-	-	-	U G C A A U P1 53
C G A G G - A U	-	-	-	-	-	-	U G C A A C Ng 56
C G A G G - A U	-	-	-	-	-	-	U G C A A U Ld 59
C G C G G - G C	-	-	-	-	-	-	U G - A A C Gt 62

— 45 —

U G A G G - G C	-	-	-	-	-	-	U G A A A C Hc 63
U G A G G - G C	-	-	-	-	-	-	U G C A A C Ms 68
C G C G G - G C	-	-	-	-	-	-	U G C A A C Tc 72
U G A G G - G C	-	-	-	-	-	-	U G U A A C Ta 73
C G A G G - G C	-	-	-	-	-	-	U G C A A C Po 75

1310

1320

U G C A C - U C	-	-	-	-	-	-	U G C A A C Ng 95
C G C A G - U C	-	-	-	-	-	-	U G C A A C Pa 96
U G G A G - U C	-	-	-	-	-	-	U G C A A C Ap 100
U G G A G - U C	-	-	-	-	-	-	U G C A A C Ap 101
C G C A G - U C	-	-	-	-	-	-	U G C A A C Cv 102
U G G A G - U C	-	-	-	-	-	-	U G C A A C Ec 105
U G A G G - G C	-	-	-	-	-	-	U G C A A U Mg 153
U G A A G - U C	-	-	-	-	-	-	U G C A A C Oh 173
U G C A G - G C	-	-	-	-	-	-	U G C A A C Me 188
C G G G G - U C	-	-	-	-	-	-	U G C A A C Mb 189
U G G G G - U C	-	-	-	-	-	-	U G C A A C Sa 201
U G G G G - U C	-	-	-	-	-	-	U G C A A C S1 203
U G G G G - U C	-	-	-	-	-	-	U G C A A C Tt 207
C G G A G - U C	-	-	-	-	-	-	U G C A A C Dr 208

— 45 —

P45-1 P45-1' P45-2 P45-2'

U G C A G - G C	-	-	-	-	-	-	U G C A A C Zm 222
U G C A G - G C	-	-	-	-	-	-	U G C A A C Os 223
U G U A G - G C	-	-	-	-	-	-	U G C A A C Gm 225
U G C A G - G C	-	-	-	-	-	-	U G C A A C Cm 228
U G C A G - G C	-	-	-	-	-	-	U G C A A C Ce 229
U G C A G - G C	-	-	-	-	-	-	U G C A A C Ce 230
U G C A G - G C	-	-	-	-	-	-	U G C A A C Cv 231

G C C C U - U A	-	-	-	-	-	-	U G A A A C Hs 234
C C U - U A	-	-	-	-	-	-	U G A A A C Rn 241
G A C U A - U A	-	-	-	-	-	-	U G A A A U Rc 243
G G A G G - G A	-	-	-	-	-	-	U G A A A U Sp 247
A A A A U A G A	-	-	-	-	-	-	A A U G A A A C P1 248
U G U U C - U C	-	-	-	-	-	-	U G C A A C Gm 253
U G C A G - U A	G C A A A C G A G A G A A C U A U A C A G U U C C U U U G C A U C G U U A U G C C U U G C	-	-	-	-	-	U G A A A C Cr 255
U A D A A - U C	-	-	-	-	-	-	U G A A A U Sc 256
U A U A A - U C	-	-	-	-	-	-	U G A A A U Sc 258
U G U A G - U C	-	-	-	-	-	-	U G U A A C An 260
U U A A A - U C	-	-	-	-	-	-	U G U A A U Sp 261
U G U A G - U C	-	-	-	-	-	-	U G A A A C Pa 262
	-	-	-	-	-	-	Lt 269
	-	-	-	-	-	-	Ls 270

3670 3680 3690 3700 3710 3720

	3730	3740	3750	3760	3770	3780
1 Hs	U A U U C C C C C	- A U G A A C G A G G A A U U C C C C A G U A A G U G C G G G U C A U A A - A G C U U G C G G U U G A U U A A				
7 Oc	U A U U C C C C C	- A U G A A C G A G G A A U U C C C C A G U A A G U G C G G G U C A U A A - A G C U U G C G G U U G A U U A A				
11 Ec	U G U U C C C C C	- U U G A A C G A G G A A U U C C C C A G U A A G C C G A G U C A U A A - A G C U U C G C G U U G A U U A C				
12 Tm	U G U U C C C C C	- A U G A A C G A G G A A U U C C C C A G U A A G C C G A G U C A U A A - A G C U U C G C G U U G A U U A C				
13 Dm	U G U U C C C C C	- A U G A A C G A G G A A U U C C C C A G U A A G C C G A G U C A U A A - A G C U U C G C G U U G A U U A C				
16 Le	U G U U G G G U C	- U U C A A C G A G G A A U U C C C C A G U A A G C C G A G U C A U U - A G C U U C G C G U U G A U U A C				
19 At	U G U U G G G U C	- U U C A A C G A G G A A U U C C C C A G U A A G C C G A G U C A U U - A G C U U C G C G U U G A C U A C				
20 Zp	U A U U G A U C	- U U C A A C G A G G A A U U C C C C A G U A A G C C G A G U C A U U - A G C U U C G C G U U G A C U A C				
22 Vc	U A U U A G U C	- U U C A A C G A G G A A U U C C C C A G U A A G C C G A G U C A U U - A G C U U C G C G U U G A C U A C				
23 Cv	U A U U A A U C	- U U C A A C G A G G A A U U C C C C A G U A A G C C G A G U C A U U - A G C U U C G C G U U G A U U A C				
24 Ne	U A U U A A U C	- U U C A A C G A G G A A U U C C C C A G U A A G C C G A G U C A U U - A G C U U C G C G U U G A U U A C				
27 Sc	U A U U A A U C	- U U C A A C G A G G A A U U C C C C A G U A A G C C G A G U U C A U C - A G C U U C G C G U U G A U U A C				
30 Pc	U A U U G C U C	- U U C A A C G A G G A A U U U U U U A G U A A G C C G C A G U C A U C - A G C U U G C G U U G A U U A U				
33 Pp	U A U U G C U C	- U U C A A C G A G G A A U U U U U U A G U A A G C C G C A G U C A U C - A G C U U G C G U U G A U U A U				
51 Pf	U A U U A A U C	- U U G A A C G A G G A A U U G C C C U A G U A A G C C A U G A U U C A U U - A G A U U G U C C U G A C U A C				
52 Pf	U A U U A A U C	- U U G A A C G A G G A A U U G C C C U A G U A A G C C A U G A U U C A U U - A G A U U G U C C U G A C U A C				
53 Pl	U A U U A A U C	- U U G A A C G A G G A A U U G C C C U A G U A A G C C A U G A U U C A U U - A G A U U G U C C U G A C U A C				
56 Ng	- A U C C - U C G	- U G A A C G A G G A A U U G C C U A G U A A G C C U G G U U C A U C - A U A C C A C A U U G A U U A C				
59 Ld	U A U U G G U C	- G C A C G A G G A A U U G C C U A G U A A G C C U G G U U C A U C - A U A C C A C A U U G A U U A C				
62 G1	- - G C C C C C	- G C A C G A G G A A U U G C C U A G U A A G C C U G G U U C A U C - A U A C C A C C C U G G A U U A C				
	45'	31'	46	46'		
63 Hc	U C G C C C U C	- A U G A A G C U G G A A U U C G G U A G U A A U C G C G U G U C A G C - A G C G C G C G G U U G A A U A C				
68 Ms	U C G C C C U C	- A U G A A G C U G G A A U U C C C U A G U A A U C G C G U G U C A A C - A G C A C G C G C G U U G A A U A C				
72 Tc	U C G C C C G C	- U U G A A A G C U G G A A U U C C C U A G U A A C C C G C G U G U C A A C - A U C G C G C G G U U G A A U A C				
73 Ta	U C G C C C U C	- A C G A A U G U G G A A U U C C G U A G U A A U C G U A G G U U C A A C - A G C C U A C G G U U G A A U A U				
75 Po	U C G C C C U C	- G U G A A C G C G G A A U U C C C U A G U A A C C G C G C G U U A G C - A U C G C G C G G U U G A A U A C				
	1330	1340	1350	1360	1370	
95 Ng	U C G A G U G C	- A U G A A G U C G G A A U U C G C U A G U A A U C G C A G G U C A G C - A U A C U G C G G U U G A A U A C				
96 Pa	U C G A C U G C	- A U G A A G U C G G A A U U C G C U A G U A A U C G G U G G A U C A G A - A U G C C A C C G G U U G A A U A C				
100 Ap	U C G A C U G C	- A U G A A G U C G G A A U U C G C U A G U A A U C G G U G G A U C A G A - A U G C C A C C G G U U G A A U A C				
101 Ap	U C G A C U G C	- A U G A A G U C G G A A U U C G C U A G U A A U C G G U G G A U C A G A - A U G C C A C C G G U U G A A U A C				
102 Cv	U C G A C U G C	- A U G A A G U C G G A A U U C G C U A G U A A U C G G U G G A U C A G A - A U G C C A C C G G U U G A A U A C				
105 Ec	U C G A C U G C	- A U G A A G U C G G A A U U C G C U A G U A A U C G G U G G A U C A G A - A U G C C A C C G G U U G A A U A C				
153 Mg	U C G A C U G C	- A U G A A G U C G G A A U U C C C U A G U A A U C G C G A A U C A G C - A U G U C G C G G U U G A A U A C				
173 Oh	U C G A C U G C	- A U G A A G U C G G A A U U C C C U A G U A A U C G C G A A U C A G C - A U G U C G C G G U U G A A U A C				
188 Me	U C G A C U G C	- A U G A A G U C G G A A U U C C C U A G U A A U C G C G A A U C A G C - A U G U C G C G G U U G A A U A C				
189 Mb	U C G A C U G C	- A U G A A G U C G G A A U U C C C U A G U A A U C G C G A A U C A G C - A U G U C G C G G U U G A A U A C				
201 Sa	U C G A C C C C	- A U G A A G U C G G A A U U C G C U A G U A A U C G C C A G A U C A G C - A A C G C U G C G G U U G A A U A C				
203 Sl	U C G A C C C C	- A U G A A G U C G G A A U U C G C U A G U A A U C G C C A G A U C A G C - A U U G C U G C G G U U G A A U A C				
207 Tt	C C G A C C C C	- A U G A A G U C G G A A U U C G C U A G U A A U C G C C A G A U C A G C - A U U G C U G C G G U U G A A U A C				
208 Dr	U C G A C U G C	- A U G A A G U C G G A A U U C G C U A G U A A U C G C G G U U C A G C - A U A C C C G C G G U U G A A U A C				
	45'	31'	46	46'		
222 Zn	U C G C C U G C	- A U G A A G C A G G A A U U C G C U A G U A A U C G C C G G U C A G C C A U A C G G C G G U U G A A U C C				
223 Os	U C G C C U G C	- A U G A A G C A G G A A U U C G C U A G U A A U C G C C G G U C A G C C C A U A C G G C G G U U G A A U C C				
225 Gm	U C G C C U G C	- A U G A A G C A G G A A U U C G C U A G U A A U C G C C G G U C A G C C C A U A C G G C G G U U G A A U C C				
228 Cm	U C G C C U G C	- A U G A A G U C G G A A U U C G A U A G U A A U C G C C A A U C A G C C A U G C G G C G G U U G A A U A C				
229 Ce	U C G C C U G C	- A U G A A G U C G G A A U U C G A U A G U A A U C G C C A A U C A G C C A U G C G G C G G U U G A A U A C				
230 Ce	U C G C C S A C	- A U G A A G U C G G A A U U C G C U A G U A A U C G C C A G A U C A G C C A U A C A S C G G U U G A A U A C				
231 Cv	U C G C C U G C	- A U G A A G U C G G A A U U C G C U A G U A A U C G C C A G A U C A G C C A U A C A C U G C G G U U G A A U A C				
	45'	31'	46	46'		
234 Hs	U - U A A G G G	- U C G A A G G U G G A U U U A G C A G U A A A U A A G A A G U A G A - G U G C U U A G U U G A A A C A G				
241 Rn	- - U A A A G G	- A C G A A G G U G G A U U U A G C A G U A A A U A A G A A G U A G A - G U G C U U A G U U G A A A C A G				
243 Rc	- - U A A A G G	- A C G A A G G U G G A U U U A G C A G U A A A U A A G A A G U A G A - G U G C U U A G U U G A A A C A G				
247 Sp	A - - U A C C C C	- A G G A A U U G G A U U U C A G C A G U A A A G C C C C A A U A A G A - G A A U G G U U G G C U U C U U G A A A A G				
248 Pl	A - - A U U C U U	- A G G A A U U G G A U U U C A G C A G U A A A G C C C C A A U A A G A - G A A U G G U U G G C U U C U U G A A A A G				
253 Gm	U C G C C A C C	- A U G A A G U U G G A A U U C G C U A G U A A U C C G G A A U C A G C - A G C A G C C U G G C G G U U G A A U A				
255 Cr	U A G C C C U C	- A U G A A G U U G G A A U U C G C U A G U A A U C C G G A A U C A G C - A G C A G C C U G G C G G U U G A A U A				
256 Sc	U C G A U U A U	- A U G A A A A A G A A U U G C U A G U A A U A C G U A A A U U A G U A U G U U A C C G G U U G A A U - A				
258 Sc	U C G A U U A U	- A U G A A A A A G A A U U G C U A G U A A U A C G U A A A U U A G U A U G U U A C C G G U U G A A U - A				
260 An	U C G A U U A U	- A U G A A A A A G A A U U G C U A G U A A U A C C U A A U C A C C A U C A U C G U A C C G G U U G A A U - U				
261 Sp	U C G A U U A U	- A U G A A A A A G A A U U G C U A G U A A U A C C U A A U C A C C A U C A U C G U A C C G G U U G A A U - U				
262 Pa	U C G A U U A U	- A U G A A A A A G A A U U G C U A G U A A U A C C U A A U C A C C A U C A U C G U A C C G G U U G A A U - U				
269 Lt	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -
270 Ls	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -	- - - - -
	3730	3740	3750	3760	3770	3780

3790 3800 3810 3820 3830 3840

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GUC - CCUGGCCCUUGUAACAACACCCGCCCGUCGCUACU(A)C CGAUU -- GGAUGGUU(U)AG -- U Hs 1
GUC - CCUGGCCCUUGUAACAACACCCGCCCGUCGCUACU(A)C CGAUU -- GGAUGGUU(U)AG -- U Oc 7
GUC - CCUGGCCCUUGUAACAACACCCGCCCGUCGCUACU(A)C CGAUU -- GGAUGGAU(U)AG -- U Ec 11
GUC - CCUGGCCCUUGUAACAACACCCGCCCGUCGCUACU(A)C CGAUU -- GGAUGAU(U)AG -- U Tm 12
GUC - CCUGGCCCUUGUAACAACACCCGCCCGUCGCUACU(A)C CGAUU -- GGAU(U)AU(U)AG -- U Dm 13
GUC - CCUGGCCCUUGUAACAACACCCGCCCGUCGCUACU(A)C CGAUU -- GGAUGAU(C)CG -- U Le 16
GUC - CCUGGCCCUUGUAACAACACCCGCCCGUCGCUACU(A)C CGAUU -- GGAUGAU(C)CG -- U At 19
GUC - CCUGGCCCUUGUAACAACACCCGCCCGUCGCUACU(A)C CGAUU -- GGAUGAU(C)CG -- U Zp 20
GUC - CCUGGCCCUUGUAACAACACCCGCCCGUCGCUACU(A)C CGAUU -- GGGU(U)GUGG -- U Vc 22
GUC - CCUGGCCCUUGUAACAACACCCGCCCGUCGCUACU(A)C CGAUU -- GGGU(U)GUGG -- U Cv 23
GUC - CCUGGCCCUUGUAACAACACCCGCCCGUCGCUACU(A)C CGAUU -- GGGU(U)GUGG -- U Ne 24
GUC - CCUGGCCCUUGUAACAACACCCGCCCGUCGCUACU(A)C CGAUU -- GGAUGAU(C)CG -- U Sc 27
GUC - CCUGGCCCUUGUAACAACACCCGCCCGUCGCUACU(A)C CGAUU -- GGAUGGC(U)A -- U Pc 30
GUC - CCUGGCCCUUGUAACAACACCCGCCCGUCGCUACU(A)C CGAUU -- GGGU(U)UACA -- U Pp 33
GUC - CCUGGCCCUUGUAACAACACCCGCCCGUCGCUACU(A)C CGAUU -- GGAUGAU(U)AG -- U Pf 51
GUC - CCUGGCCCUUGUAACAACACCCGCCCGUCGCUACU(A)C CGAUU -- GAAAGAU(U)AG -- U P1 52
GUC - CCUGGCCCUUGUAACAACACCCGCCCGUCGCUACU(A)C CGAUU -- GAAAGAU(U)AG -- U P1 53
GUC - CCUGGCCCUUGUAACAACACCCGCCCGUCGCUACU(A)C CGAUU -- GGAAGAU(U)AG -- U Ng 56
GUC - CCUGGCCCUUGUAACAACACCCGCCCGUCGCUACU(A)C CGAUU -- G(A)UGGU(G)CA -- U Ld 59
GUC - CCUGGCCCUUGUAACAACACCCGCCCGUCGCUACU(A)C CGAUU -- GGGCGGG(C)GG -- U G1 62
    
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30' 47'

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GUC - CCUGGCCCUUGUAACAACACCCGCCCGUCGCUACU(A)C CGAUU -- GGGGUGUUGGA -- U Hc 63
GUC - CCUGGCCCUUGUAACAACACCCGCCCGUCGCUACU(A)C CGAUU -- GUAUGGUUGCA -- U Ms 68
GUC - CCUGGCCCUUGUAACAACACCCGCCCGUCGCUACU(A)C CGAUU -- GCGGGUGUGCA -- U Tc 72
GCC - CCUGGCCCUUGUAACAACACCCGCCCGUCGCUACU(A)C CGAUU -- GUGGUGUGGA -- U Ta 73
GUC - CCUGGCCCUUGUAACAACACCCGCCCGUCGCUACU(A)C CGAUU -- GCGGGGGAGGG -- U Po 75
    
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1380 1390 1400 1410 1420 1430

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GUU - CCGGGGCUUGUAACAACACCCGCCCGUCACAC(C)UUGGGA -- GU - GGGGGAUACC -- A Ng 95
GUU - CCGGGGCUUGUAACAACACCCGCCCGUCACAC(C)UUGGGA -- GU - GGGGUGCUC -- A Pa 96
GUU - CCGGGGCUUGUAACAACACCCGCCCGUCACAC(C)UUGGGA -- GU - GGGUUGCAAA -- A Ap 100
GUU - CCGGGGCUUGUAACAACACCCGCCCGUCACAC(C)UUGGGA -- GU - GGGUUGCAAA -- A Ap 101
GUU - CCGGGGCUUGUAACAACACCCGCCCGUCACAC(C)UUGGGA -- GU - GGGUUGCAAA -- A Cv 102
GUU - CCGGGGCUUGUAACAACACCCGCCCGUCACAC(C)UUGGGA -- GU - GGGUUGCAAA -- A Ec 105
GUU - CCGGGGCUUGUAACAACACCCGCCCGUCACAC(C)UUGGGA -- GC - UGGUAABUAC -- U Mg 153
GUU - CCGGGGCUUGUAACAACACCCGCCCGUCACAC(C)UUGGGA -- GU - UGGUAABUAC -- C Oh 173
GUU - CCGGGGCUUGUAACAACACCCGCCCGUCACAC(C)UUGGGA -- GU - (A)UUGCAACC -- C Mb 188
GUU - CCGGGGCUUGUAACAACACCCGCCCGUCACAC(C)UUGGGA -- GU - GGGUAACACC -- C Mb 189
GUU - CCGGGGCUUGUAACAACACCCGCCCGUCACAC(C)UUGGGA -- GU - CGGUAACACC -- C Sa 201
GUU - CCGGGGCUUGUAACAACACCCGCCCGUCACAC(C)UUGGGA -- GU - CGGUAACACC -- C S1 203
GUU - CCGGGGCUUGUAACAACACCCGCCCGUCACAC(C)UUGGGA -- GC - GGGCUCUACC -- G Tt 207
GUU - CCGGGGCUUGUAACAACACCCGCCCGUCACAC(C)UUGGGA -- GU - AGAUUGCAGU -- U Dr 208
    
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30' 47'

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GUU - CCGGGGCUUGUAACAACACCCGCCCGUCACACU(A)UAGGA -- GC - (U)GGCC(A)GGUU -- U Zm 222
GUU - CCGGGGCUUGUAACAACACCCGCCCGUCACACU(A)UAGGA -- GC - (U)GGCC(A)GGUU -- U Os 223
GUU - CCGGGGCUUGUAACAACACCCGCCCGUCACACU(A)UAGGA -- GC - UGGCC(A)U -- C Cr 225
GUU - CCGGGGCUUGUAACAACACCCGCCCGUCACACU(A)UAGGA -- GA - U(U)GUAAGU(C)G -- C Cm 228
GUU - CCGGGGCUUGUAACAACACCCGCCCGUCACACU(A)UAGGA -- GA - U(U)GUAAGU(C)G -- C Ce 229
GUU - CCGGGGCUUGUAACAACACCCGCCCGUCACACU(A)UAGGA -- GU - CCGUUG(C)C -- C Ce 230
GUU - CCGGGGCUUGUAACAACACCCGCCCGUCACACU(A)UAGGA -- GC - UGGCU(A)UGCC -- C Cv 231
    
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GGC - CUGAAGCGCGUAACAACACCCGCCCGUCACCCUCUGAA -- GU - AUACUUCAAA -- G Hs 234
AGC - AUAUGGACCGUAACAACACCCGCCCGUCACCCUCUGAA -- AU - UAGAUUGA(C)A -- U Rn 241
AGC - UCUGGGA(U)GCGUAACAACACCCGCCCGUCACCCUCUGAA -- (U) - AGU(A)U -- Rc 243
AGC - UCUGGGA(U)GCGUAACAACACCCGCCCGUCACCCUCUGAA -- GU - U -- Sp 247
AGC - UCUGGGA(U)GCGUAACAACACCCGCCCGUCACCCUCUGAA -- GCUUA -- P1 248
GUA - CCUGGGA(U)GCGUAACAACACCCGCCCGUCACCCUCUGAA -- AU - UGGUUGCGC -- G Gm 253
UUA - CCUGGGA(U)GCGUAACAACACCCGCCCGUCACCCUCUGAA -- UA - GUABUGUA(C)A -- G Cr 255
UUC - UAACUGGUAACAACACCCGCCCGUCACCCUCUGAA -- CA - UAUUAUUAUC -- U Sc 256
UUC - UAACUGGUAACAACACCCGCCCGUCACCCUCUGAA -- CA - UAUUAUUAUC -- U Sc 258
AAA - AAUCAGUUGGUAACAACACCCGCCCGUCACCCUCUGAA -- GA - AGUAUGUGCA -- A An 260
UUA - UCUGGGA(U)GCGUAACAACACCCGCCCGUCACCCUCUGAA -- GU - AUUAUUAUC -- U Sp 261
AAC - U - UCUGGGA(U)GCGUAACAACACCCGCCCGUCACCCUCUGAA -- GG - AGUAUGUGCA -- A Pa 262
AAA - AAUCAGUUGGUAACAACACCCGCCCGUCACCCUCUGAA -- -- -- -- -- -- -- -- -- -- -- Lt 269
AUA - AAUCAGUUGGUAACAACACCCGCCCGUCACCCUCUGAA -- -- -- -- -- -- -- -- -- -- -- Ls 270
    
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3790 3800 3810 3820 3830 3840

	3850	3860	3870	3880	3890	3900
1 Hs	G A G G C C	- C U C G G A U C G G G C C C G C C G G G G U C G				- - - - G
7 Oc	G A G G C C	- C U C G G A U C G G G C C C G C C G G G G U C G				- - - - G
11 Ec	G A G G U C	- U U C G G A U U G G G C C U C G G A G C G G G C C				- - - - G
12 Tm	G A G G U C	- U U C G G A C C G G U A C G G U G G C - G U				- - - - U U
13 Dm	G A G G U C	- U U C G G A C C G G (U) G A U (C) A C U G U G A C G C				- - - - C U
16 Le	G A A A U G	- U U C G G A U C G G G C G (A) C G U G G G C G G				- - - - U U
19 At	G A A A U G	- U U C G G A U C G G G C G (A) C G U G G G U G G				- - - - U U
20 Zp	G A A G U G	- U U C G G A U C G U G G (C) - C G - - (A) C G A C G G C G				- - - - G U U
22 Vc	G A A G U G	- U U C G G A U U G - A C U (U) U S A C U G G G				- - - - G
23 Cv	G A A G U G	- U U C G G A U U G - C C G (A) C C (U) G G G C G G				- - - - U C
24 Ne	G A A A U G	- C U C G G A U U G - G C G G C U U U G G C C G G				- - - - U U
27 Sc	G A G G A G	- U C G A G A U U G U G G A U (U) A G C U C C				- - - - U U
30 Pc	G A G G U C	- U U C G G A C U G G U G A U G G G U U A U U G				- - - - G
33 Pp	U A C G C G	- U U C G G A G G (A) C G A U G U U U (C) G G U C U				- - - - U
51 Pf	G A A U (U) G	- U U U G G A C A A G A A - - A A A U - U G A A - U				- - - - U
52 Pf	A A A U (U) G	- U U U G G A U A U G A A U U A A A A U A A U G A A A U				- - - - U U U
53 P1	G A A U (U) G	- U U U G G A C A A G A A - - A A A A - U A A A U				- - - - U U
56 Ng	G A A C C U	- G G C G G A C C G A A C C - - - - -				- - - - G
59 Ld	A C A G G - - U G A U C G G A C C A G G C G G U G U					- - - - U U
62 G1	G A G C G (C) - C C G G A - - C C A G G C G G U G U					- - - - C G

47

63 Hc	G A G G C C G G C	- - - - -				- - - - A
68 Ms	G A G A G C C C U U U C					- - - - U
72 Tc	G A G G C C U G A U C U C C C					- - - - U
73 Ta	G A G G G U C C G U C C					- - - - U
75 Po	G A G G C C C G U C C					- - - - C

1440

1450

95 Ng	G A A G U A G G U A G G G U	- A A C C				- - - - G
96 Pa	G A A G U A G C U A G G U C U	- A A C C				- - - - G
100 Ap	G A A G (C) A G G U A U C C U	- A A C C				- - - - C U U U A
101 Ap	G A A G U A G G U A G C C U U	- A A C C				- - - - U
102 Cv	G A A G U A G A U A G C C U U	- A A C C				- - - - U
105 Ec	G A A G U A G G U A G C C U U	- A A C C				- - - - U
153 Mg	A (A) A A C C G U G U G C U	- A A C C				- - - - G
173 Oh	A A A G (C) C G G U G G C C U	- A A C C U C				- - - - G
188 Me	G A A G C C G G U G A G G U	- A A C C				- - - - U
189 Mb	G A A G (C) A G U G G C C U	- A A C C				- - - - C
201 Sa	G A A G C C G G U G G C (C) C	- A A C C C				- - - - C U
203 S1	G A A G C C G G U G G C (C) C	- A A C C C				- - - - C U
207 Tt	G A A G (U) C G C G G G A	- - - - G C C				- - - - U
208 Dr	(G) A (A) A C C G G G A	- - - - G C C				- - - - U

47

222 Zn	G A (A) G U C A U U A C C C U U	- A A C C				- - - - G
223 Os	G A (A) G U C A U U A C C C U U	- A A C C				- - - - G
225 Gm	G A A G (U) C G U U A C C U U					- - - - A A C C G
228 Cm	A A A A U C C U U A G C C U U	- A A C C				- - - - G
229 Ce	A A A A U C C U U A G C C U U	- A A C C				- - - - G
230 Ce	A A A G (U) C G U A C C U U	- A A C C				- - - - U
231 Cv	A A A G (U) C G U U A C C C	- A A C C U				- - - - U

234 Hs	G A C A U U U	- - - - -				- - - - A A
241 Rn	U					- - - - C A C A
243 Rc						- - - - C U C A C C C G U U
247 Sp						- - - - A G A
248 P1						- - - - A C
253 Gm	G A A G C A U C G G A C C A A U S A U C A C C C A U G (A) C U U C U G U G A C					- - - - C A C
255 Cr	G A A G A A C U A U G G C U					- - - - A C A C U
256 Sc	U A U U A U U A U A U A U A U U U - U U U A A U A A U A U A U A U					- - - - A A
258 Sc	U A U U A U U U A U A U A U A U U U - U U U A A U A A U A U A U A U					- - - - A A
260 An	G A A G U U U G A U U U A C U U A U - A U U U A U A A U A U A U A U A					- - - - U
261 Sp	G A A G A A G A C A					- - - - U U C A
262 Pa	U A (A) G U U U G C U G U U - C U G U A - U U A A A (C) A A (G) A A (U) A G A U G (A) C					- - - - G G U G
269 Lt						- - - - G G U G
270 Ls						- - - - G G U G

3850

3860

3870

3880

3890

3900

	3970	3980	3990	4000	4010	4020
1 Hs	- A A C U(U)G	- A C U A U C U A G	- A G G(A)G U A A A G U C G U A A C	- - - -	- A A G G U U U C C G U	- - - - A G
7 Oc	- A A C U(U)G	- A C U A U C U A G	- A G G(A)G U A A A A G U C G U A A C	- - - -	- A A G G U U U C C G U	- - - - A G
11 Ec	- A A C U(U)G	- A U C A U U U A G	- A G G(A)G U A A A A G U C G U A A C	- - - -	- A A G G U U U C C G U	- - - - A G
12 Tm	- A A C U(U)G	- A U C A U U U A G	- A G G(A)G U A A A A G U C G U A A C	- - - -	- A A G G U U U C C G U	- - - - A G
13 Dm	- A A C U(U)G	- A U(U)A U U U A G	- A G G(A)G U A A A A G U C G U A A C	- - - -	- A A G G U U U C C G U	- - - - A G
16 Le	- A A C C U U	- A U C A U U U A G	- A G G(A)G G G A A A G U C G U A A C	- - - -	- A A G G U U U C C G U	- - - - A G
19 At	- A A C C U U	- A U C A U U U A G	- A G G(A)G G G A A A G U C G U A A C	- - - -	- A A G G U U U C C G U	- - - - A G
20 Zp	- A A C C U U	- A U C A U U U A G	- A G G(A)G G G A A A G U C G U A A C	- - - -	- A A G G U U U C C G U	- - - - A G
22 Vc	- A A C C U U	- C(C)C A C C U A G	- A G G(A)G G G A A A G U C G U A A C	- - - -	- A A G G U U(A)C C G U	- - - - A G
23 Cv	- A A C C C U	- C(C)C A C C U A G	- A G G(A)G G G A A A G U C G U A A C	- - - -	- A A G G U U U C C G U	- - - - A G
24 Ne	- A A C C C U	- C(C)C A C C U A G	- A G G(A)G G G A A A G U C G U A A C	- - - -	- A A G G U U U C C G U	- - - - A G
27 Sc	- A A C C U U	- A U C A U U U A G	- A G G(A)G G G A A A G U C G U A A C	- - - -	- A A G G U U U C C G U	- - - - A G
30 Pc	- A A U U(U)G	- G U C A U U U A G	- A G G(A)G U A A A A G U C G U A A C	- - - -	- A A G G U U U C C G U	- - - - A G
33 Pp	- C U A C U G	- A C G G C C(U)A G	- A G G(A)G G G A A A G U C G U A A C	- - - -	- A A G G U A A(U)C C G U	- - - - A G
51 Pf	- A A U C(C)U	- A U C U U U U A A	- A G G(A)G G G A A A G U C G U A A C	- - - -	- A A G G U U U C C G U	- - - - A G
52 Pf	- A A U C(C)U	- A U C U U U U A A	- A G G(A)G G G A A A G U C G U A A C	- - - -	- A A G G U U U C C G U	- - - - A G
53 P1	- A A U C(C)U	- A U C U U U U A A	- A G G(A)G G G A A A G U C G U A A C	- - - -	- A A G G U U U C C G U	- - - - A G
56 Ng	- A A U C U G	- U U C G U C U G U	- (A)G G(A)G G G A A A G U C G U A A C	- - - -	- A A G G U C U(U)C G U	- - - - A G
59 Ld	- A U A U U U	- C U U C A(A)U A G	- A G G A A G C A A A A G U C G U A A C	- - - -	- A A G G U A G C U G U	- - - - A G
62 G1	- A G C C(C)C	- C G C C C U G	- (A)G G(A)G G G A A A G U C G U A A C	- - - -	- A A G G U A U C C G U	- - - - A G

47'

48

63 Hc	- A A A U C U	- G G C U C C G C A	- A G G G(G)G A U U A A A G U C G U A A C	- - - -	- A A G G U A G C C G U	- - - - A G
68 Ms	- G A A U U U G	- G G C U U U G C A	- A G G G(G)G S U U A A A G U C G U A A C	- - - -	- A A G G U A G C C G U	- - - - A G
72 Ta	- G A G U C U G	- G G C U C C G U G	- A G G G(G)G G A U A A A G U C G U A A C	- - - -	- A A G G U A G C C G U	- - - - A G
73 Tc	- G A A U C U G	- A U G U C A G U G	- A G G A(G)G G U U A A A G U C G U A A C	- - - -	- A A G G U A U C C G U	- - - - A G
75 Po	- G A A C C U C	- U C C C C G C G	- A G G G(G)G G A G A A A G U C G U A A C	- - - -	- A A G G U A G C C G U	- - - - A G

1470

1480

1490

1500

1510

95 Ng	- A C G G U A	- U G C U U C A U G	- A C U C(G)G S U G A A A G U C G U A A C	- - - -	- A A G G U A G C C G U	- - - - A G
96 Pa	- A C G G A G	- U G A U U C A U G	- A C U G(G)G G U G A A A G U C G U A A C	- - - -	- A A G G U A G C C G U	- - - - A G
100 Ap	- A C U U U G	- U G A U U C A U G	- A C U G(G)G G U G A A A G U C G U A A C	- - - -	- A A G G U A A C C G U	- - - - A G
101 Ap	- A C U U U G	- U G A U U C A U G	- A C U G(G)G G U G A A A G U C G U A A C	- - - -	- A A G G U A A C C G U	- - - - A G
102 Cv	- A C G G U G	- U G G U C A A U G	- A C X X(G)G S X X X X X X G U A A C	- - - -	- A A G X X X X X X X X	- - - - X X
105 Ec	- A C U U U G	- U G A U U C A U G	- A C U G(G)G S U G A A A G U C G U A A C	- - - -	- A A G G U A A C C G U	- - - - A G
153 Mg	- A G G G U A	- G G G C C G U G	- A U U G(G)G S U U A A A G U C G U A A C	- - - -	- A A G G U A C C C G U	- - - - A C
173 Oh	- A A G G U A	- G G G C C G A U G	- A U U G(G)G S U X X X X X X G U A A C	- - - -	- A A G G U A U C C G U	- - - - A C
188 Me	- A A G G U X	- (G)G G C(G)G A U G	- A U U A G G S X X X X X X G U A A C	- - - -	- A A G X X X X X X X X	- - - - X X
189 Mb	- A A G G U G	- G G A U C G G C G	- A U U G(G)G A C G A A A G U C G U A A C	- - - -	- A A G G U A G C C G U	- - - - A C
201 Sa	- A A G G U G	- G G A C U G G C G	- A U U G(G)G A C G A A A G U C G U A A C	- - - -	- A A G G U A G C C G U	- - - - A C
203 S1	- A A G G U G	- G G A C U G G C G	- A U U G(G)G A C G A A A G U C G U A A C	- - - -	- A A G G U A G C C G U	- - - - A C
207 Tt	- A G G G U A	- G G G C C C G U G	- A C U G(G)G C C G A A A G U C G U A A C	- - - -	- A A G G U A G C U G U	- - - - A C
208 Dr	- (A)G A C U G	- U G G U U U A U G	- A C U G(G)G S U G A A A G U C G U A A C	- - - -	- A A G G U A A C U G U	- - - - A C

47'

48

222 Zm	- A A G G C U	- (A)G G C U(U)G C G	- A C U G(G)A G U G A A A G U C G U A A C	- - - -	- A A G G U A G C C G U	- - - - A C
223 Os	- A A G G C U	- (A)G G C U(U)G C G	- A C U G(G)A G U G A A A G U C G U A A C	- - - -	- A A G G U A G C C G U	- - - - A C
225 Gm	- A A - G C G	- (G)G C U A G U G	- A C U G(G)A G U G A A A G U C G U A A C	- - - -	- A A G G U A G C C G U	- - - - A C
228 Cm	- A C C C(U)A	- U U A C(C)A U U G	- A U C C(A)U G G U G A A A G U C G U A A C	- - - -	- A A G G U A G G G G U	- - - - U C
229 Ce	- A C C C(U)A	- U U A C(C)A U U G	- A U C C(A)U G G U G A A A G U C G U A A C	- - - -	- A A G G U A G G G G U	- - - - U C
230 Ce	- A A G(G)C A	- G G C U G G U A	- A U G A G A G U G A A A G U C G U A A C	- - - -	- A A G G U A G C C G U	- - - - A C
231 Cv	- A A G G C A	- (G)A G C U A G U	- A C U A(G)G G U G A A A G U C G U A A C	- - - -	- A A G G U A G C C G U	- - - - A C

234 Hs	- - - U A C G	- C A U U U A U A U	- A G A G G A G A C A A A G U C G U A A C	- - - -	- A U G G U A A G U G U	- - - - A C
241 Rn	- C U A A C	- A A A U U U A U G	- A G A G G A G A U A A A G U C G U A A C	- - - -	- A A G G U A A G C A U	- - - - A C
243 Rc	- - - - -	- A(C)A U U(U)A -	- G A A C A G G - C A A A G U C G U A A C	- - - -	- A U G G U A A G U G U	- - - - A C
247 Sp	- - - - -	- - - U A C A C(A) -	- A G G(G)G A G A - C A A A G U C G U A A C	- - - -	- - - A C A A U	- - - - (A)G
248 P1	- - - - -	- - - U A A G U(A) -	- A G G(G)G A G A - C A A A G U C G U A A C	- - - -	- - - A C A A U	- - - - (A)G
253 Gm	- A G G G U G	- G G G U C U U C G	- A C U G G G S U S A A A G U C G U A A C	- - - -	- A A G G U A G C C G U	- - - - A G
255 Cr	- U A U G C G	- U G A U A U U A G	- A U U G G G G A G A A A G U C G U A A C	- - - -	- A G G U U A G C C G U	- - - - A G
256 Sc	- U C A G A A	- A U A A U A U G A	- A U U A A D G C G A A A G U C G A A A U	- - - -	- A C A G U U A C C G U	- - - - A G
258 Sc	- U C A G A A	- A U A A U A U G A	- A U U A A D G C G A A A G U C G A A A U	- - - -	- A C A G U U A C C G U	- - - - A G
260 An	- G C A U G C	- A U G A C U U G A	- A U U G G G U S U A A A G U C G A A A U	- - - -	- A U G G U U A C C G U	- - - - A G
261 Sp	- C C A A G	- G(U)G U U G U G C A	- A U U A G U S U A A A G U C G A A A U	- - - -	- A A G G U A C C C G U	- - - - A G
262 Pa	- (G)U A U G U	- G U G A C U C U G	- A U U A G U G U A A A G U C G A A A U	- - - -	- A C G G U U C C G U	- - - - A G
269 Lt	- - - - -	- - - - -	- - - U A A A G A C A A C G U C A G U	- - - -	- A A U U - A A U A U A	- - - - U U
270 Ls	- - - - -	- - - - -	- - - U A A A A U A A C G U G C A G U	- - - -	- A A U U - A A U G(A)A	- - - - C U

3970

3980

3990

4000

4010

4020

