#### Genetic codes

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#### 1 Standard genetic code

The standard genetic code given in table 1 was produced with the following @code and inserted with \input{../tables/stdcode.tex} within this LATEX document and referenced as \ref{stdcode} in the text.

```
tablecode( latexfile = "../tables/stdcode.tex",
label = "stdcode", size = "small")
```

## 2 Available genetic code numbers

The genetic code numbers are those from the NCBI¹ (https://www.ncbi.nlm.nih.gov/Taxonomy/Utils/wprintgc.cgi). This compilation from Andrzej (Anjay) Elzanowski, Jim Ostell, Detlef Leipe, and Vladimir Soussov is based primarily on two previous reviews [2, 1].

```
data("SEQINR.UTIL")
codes <- SEQINR.UTIL$CODES.NCBI</pre>
 availablecodes <- which(codes$CODES != "deleted")
codes[availablecodes, "ORGANISMES", drop = FALSE]
                                       ORGANISMES
                                          standard
vertebrate.mitochondrial
        yeast.mitochondrial
protozoan.mitochondrial+mycoplasma
invertebrate.mitochondrial
                         ciliate+dasycladacean
         echinoderm+flatworm.mitochondrial
                        euplotid
bacterial+plantplastid
                        alternativeyeast ascidian.mitochondrial
         alternativeflatworm.mitochondrial
                                       blepharism
                 chlorophycean.mitochondrial
                      trematode.mitochondrial
                    scenedesmus.mitochondrial
             thraustochytrium.mitochondrial
                 Pterobranchia.mitochondrial
    CandidateDivision.SR1+Gracilibacteria
                       Pachysolen.tannophilus
```

<sup>&</sup>lt;sup>1</sup>National Center for Biotechnology Information, Bethesda, Maryland, U.S.A.

TTT	Phe	TCT	Ser	TAT	Tyr	TGT	Cys
TTC	Phe	TCC	Ser	TAC	Tyr	TGC	Cys
TTA	Leu	TCA	Ser	TAA	$\operatorname{Stp}$	TGA	$\operatorname{Stp}$
TTG	Leu	TCG	Ser	TAG	$\operatorname{Stp}$	TGG	Trp
					•		•
CTT	Leu	CCT	Pro	CAT	His	CGT	Arg
CTC	Leu	CCC	Pro	CAC	His	CGC	Arg
CTA	Leu	CCA	Pro	CAA	Gln	CGA	Arg
CTG	Leu	CCG	Pro	CAG	Gln	CGG	Arg
							Ü
ATT	Ile	ACT	$\operatorname{Thr}$	AAT	Asn	AGT	Ser
ATC	Ile	ACC	$\operatorname{Thr}$	AAC	$\operatorname{Asn}$	AGC	Ser
ATA	Ile	ACA	$\operatorname{Thr}$	AAA	Lys	AGA	Arg
ATG	Met	ACG	$\operatorname{Thr}$	AAG	Lys	AGG	Arg
							Ü
GTT	Val	GCT	Ala	GAT	Asp	GGT	Gly
GTC	Val	GCC	Ala	GAC	Asp	GGC	Gly
GTA	Val	GCA	Ala	GAA	$\widehat{\mathrm{Glu}}$	GGA	Gly
GTG	Val	GCG	Ala	GAG	Glu	GGG	Gly
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Table 1: Genetic code number 1: standard.

The tables of variant genetic codes outlining the differences were produced with the following  $\mathbb{Q}$  code:

TTT	Phe	TCT	Ser	TAT	Tyr	TGT	Cys
TTC	Phe	TCC	Ser	TAC	Tyr	TGC	Cys
TTA	Leu	TCA	Ser	TAA	$\operatorname{Stp}$	TGA	Trp
TTG	Leu	TCG	Ser	TAG	$\operatorname{Stp}$	TGG	$\operatorname{Trp}$
					_		_
CTT	Leu	CCT	$\operatorname{Pro}$	CAT	His	CGT	Arg
CTC	Leu	CCC	$\operatorname{Pro}$	CAC	His	CGC	Arg
CTA	Leu	CCA	$\operatorname{Pro}$	CAA	Gln	CGA	Arg
CTG	Leu	CCG	$\operatorname{Pro}$	CAG	Gln	CGG	Arg
ATT	Ile	ACT	$\operatorname{Thr}$	AAT	Asn	AGT	Ser
ATC	Ile	ACC	$\operatorname{Thr}$	AAC	Asn	AGC	Ser
ATA	$\mathbf{Met}$	ACA	$\operatorname{Thr}$	AAA	Lys	$\mathbf{AGA}$	$\mathbf{Stp}$
ATG	Met	ACG	$\operatorname{Thr}$	AAG	Lys	$\mathbf{AGG}$	$\mathbf{Stp}$
GTT	Val	GCT	Ala	GAT	Asp	GGT	Gly
GTC	Val	GCC	Ala	GAC	Asp	GGC	Gly
GTA	Val	GCA	Ala	GAA	$\overline{\mathrm{Glu}}$	GGA	Gly
GTG	Val	GCG	Ala	GAG	Glu	GGG	Gly
							-

Table 2: Genetic code number 2: vertebrate.mitochondrial.

TTT	Phe	TCT	Ser	TAT	Tyr	TGT	Cys
TTC	Phe	TCC	Ser	TAC	$\operatorname{Tyr}$	TGC	Cys
TTA	Leu	TCA	Ser	TAA	$\operatorname{Stp}$	TGA	$\mathbf{Trp}$
TTG	Leu	TCG	Ser	TAG	$\operatorname{Stp}$	TGG	Trp
$\mathbf{CTT}$	$\mathbf{Thr}$	CCT	$\operatorname{Pro}$	CAT	His	CGT	Arg
$\mathbf{CTC}$	${f Thr}$	CCC	$\operatorname{Pro}$	CAC	His	CGC	Arg
CTA	$\mathbf{Thr}$	CCA	$\operatorname{Pro}$	CAA	Gln	CGA	Arg
$\mathbf{CTG}$	$\mathbf{Thr}$	CCG	$\operatorname{Pro}$	CAG	Gln	CGG	Arg
							_
ATT	Ile	ACT	$\operatorname{Thr}$	AAT	Asn	AGT	Ser
ATC	Ile	ACC	$\operatorname{Thr}$	AAC	Asn	AGC	Ser
ATA	$\mathbf{Met}$	ACA	$\operatorname{Thr}$	AAA	Lys	AGA	Arg
ATG	Met	ACG	$\operatorname{Thr}$	AAG	Lys	AGG	Arg
					-		_
GTT	Val	GCT	Ala	GAT	Asp	GGT	Gly
GTC	Val	GCC	Ala	GAC	Asp	GGC	$\operatorname{Gly}$
GTA	Val	GCA	Ala	GAA	Glu	GGA	Gly
GTG	Val	GCG	Ala	GAG	Glu	GGG	$\operatorname{Gly}$
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 ${\bf Table~3:~Genetic~code~number~3:~yeast.mitochondrial.}$ 

TTT	Phe	TCT	Ser	TAT	Tyr	TGT	Cys
TTC	Phe	TCC	Ser	TAC	Tyr	TGC	Cys
TTA	Leu	TCA	Ser	TAA	$\operatorname{Stp}$	TGA	$\mathbf{Trp}$
TTG	Leu	TCG	Ser	TAG	$\operatorname{Stp}$	TGG	$\operatorname{Trp}$
CTT	Leu	CCT	Pro	CAT	His	CGT	Arg
CTC	Leu	CCC	$\operatorname{Pro}$	CAC	His	CGC	Arg
CTA	Leu	CCA	Pro	CAA	Gln	CGA	Arg
CTG	Leu	CCG	Pro	CAG	$\operatorname{Gln}$	CGG	$\operatorname{Arg}$
ATT	Ile	ACT	$\operatorname{Thr}$	AAT	Asn	AGT	Ser
ATC	Ile	ACC	$\operatorname{Thr}$	AAC	Asn	AGC	Ser
ATA	Ile	ACA	$\operatorname{Thr}$	AAA	Lys	AGA	Arg
ATG	3.6 /						
1110	Met	ACG	$\operatorname{Thr}$	AAG	$_{ m Lys}$	AGG	$\operatorname{Arg}$
MIG	Met	ACG	Thr	AAG	Lys	AGG	Arg
GTT	Met Val	ACG GCT	Thr Ala	AAG GAT	Lys Asp	AGG GGT	m Arg $ m Gly$
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GTT	Val	GCT	Ala	GAT	Asp	GGT	Gly
GTT GTC	Val Val	GCT GCC	Ala Ala	GAT GAC	$_{\rm Asp}^{\rm Asp}$	GGT GGC	Gly Gly
GTT GTC GTA	Val Val Val	GCT GCC GCA	Ala Ala Ala	GAT GAC GAA	Asp Asp Glu	GGT GGC GGA	Gly Gly Gly

Table 4: Genetic code number 4: protozoan.mitochondrial+mycoplasma.

TTT	Phe	TCT	$\operatorname{Ser}$	TAT	Tyr	TGT	Cys
TTC	Phe	TCC	$\operatorname{Ser}$	TAC	Tyr	TGC	Cys
TTA	Leu	TCA	$\operatorname{Ser}$	TAA	$\operatorname{Stp}$	TGA	$\mathbf{Trp}$
TTG	Leu	TCG	Ser	TAG	$\operatorname{Stp}$	TGG	Trp
CTT	Leu	CCT	$\operatorname{Pro}$	CAT	His	CGT	Arg
CTC	Leu	CCC	$\operatorname{Pro}$	CAC	His	CGC	Arg
CTA	Leu	CCA	$\operatorname{Pro}$	CAA	Gln	CGA	Arg
CTG	Leu	CCG	$\operatorname{Pro}$	CAG	Gln	CGG	Arg
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ATT	Ile	ACT	$\operatorname{Thr}$	AAT	Asn	AGT	Ser
ATC	Ile	ACC	$\operatorname{Thr}$	AAC	$\operatorname{Asn}$	AGC	Ser
ATA	Met	ACA	$\operatorname{Thr}$	AAA	Lys	$\mathbf{AGA}$	$\mathbf{Ser}$
ATG	Met	ACG	$\operatorname{Thr}$	AAG	Lys	$\mathbf{AGG}$	$\mathbf{Ser}$
GTT	Val	GCT	Ala	GAT	Asp	GGT	Gly
GTC	Val	GCC	Ala	GAC	Asp	GGC	$\operatorname{Gly}$
GTA	Val	GCA	Ala	GAA	Glu	GGA	Gly
GTG	Val	GCG	Ala	GAG	Glu	GGG	$\widetilde{\mathrm{Gly}}$
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Table 5: Genetic code number 5: invertebrate.mitochondrial.

TTT	Phe	TCT	Ser	TAT	Tyr	TGT	Cys
TTC	Phe	TCC	Ser	TAC	Tyr	TGC	Cys
TTA	Leu	TCA	Ser	TAA	$\mathbf{Gln}$	TGA	$\operatorname{Stp}$
TTG	Leu	TCG	Ser	TAG	$\mathbf{Gln}$	TGG	Trp
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CTT	Leu	CCT	Pro	CAT	His	CGT	Arg
CTC	Leu	CCC	$\operatorname{Pro}$	CAC	$_{ m His}$	CGC	Arg
CTA	Leu	CCA	Pro	CAA	$\operatorname{Gln}$	CGA	Arg
CTG	Leu	CCG	Pro	CAG	$\operatorname{Gln}$	CGG	Arg
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ATT	Ile	ACT	$\operatorname{Thr}$	AAT	Asn	AGT	Ser
ATC	Ile	ACC	$\operatorname{Thr}$	AAC	$\operatorname{Asn}$	AGC	$\operatorname{Ser}$
ATA	Ile	ACA	$\operatorname{Thr}$	AAA	Lys	AGA	Arg
ATG	Met	ACG	$\operatorname{Thr}$	AAG	Lys	AGG	Arg
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GTT	Val	GCT	Ala	GAT	Asp	GGT	Gly
GTC	Val	GCC	Ala	GAC	Asp	GGC	Gly
GTA	Val	GCA	Ala	GAA	Glu	GGA	$\operatorname{Gly}$
GTG	Val	GCG	Ala	GAG	Glu	GGG	Gly
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Table 6: Genetic code number 6: ciliate+dasycladacean.

TTT	Phe	TCT	Ser	TAT	Tyr	TGT	Cys
TTC	Phe	TCC	Ser	TAC	Tyr	TGC	Cys
TTA	Leu	TCA	Ser	TAA	$\operatorname{Stp}$	TGA	$\mathbf{Trp}$
TTG	Leu	TCG	Ser	TAG	Stp	TGG	Trp
					•		•
CTT	Leu	CCT	Pro	CAT	His	CGT	Arg
CTC	Leu	CCC	Pro	CAC	His	CGC	Arg
CTA	Leu	CCA	Pro	CAA	$\operatorname{Gln}$	CGA	Arg
CTG	Leu	CCG	Pro	CAG	$\operatorname{Gln}$	CGG	Arg
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ATT	Ile	ACT	$\operatorname{Thr}$	AAT	Asn	AGT	Ser
ATC	Ile	ACC	$\operatorname{Thr}$	AAC	$\operatorname{Asn}$	AGC	Ser
ATA	Ile	ACA	$\operatorname{Thr}$	$\mathbf{A}\mathbf{A}\mathbf{A}$	$\mathbf{Asn}$	$\mathbf{AGA}$	$\mathbf{Ser}$
ATG	Met	ACG	$\operatorname{Thr}$	AAG	Lys	$\mathbf{AGG}$	$\mathbf{Ser}$
					Ü		
GTT	Val	GCT	Ala	GAT	Asp	GGT	Gly
GTC	Val	GCC	Ala	GAC	Asp	GGC	Gly
GTA	Val	GCA	Ala	GAA	Glu	GGA	Gly
GTG	Val	GCG	Ala	GAG	$\operatorname{Glu}$	GGG	Gly
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 ${\it Table 7: Genetic code \ number \ 9: \ echinoderm+flatworm.mitochondrial.}$ 

TTT	Phe	TCT	Ser	TAT	$\operatorname{Tyr}$	TGT	Cys
TTC	Phe	TCC	Ser	TAC	Tyr	TGC	Cys
TTA	Leu	TCA	Ser	TAA	$\operatorname{Stp}$	TGA	$\mathbf{Cys}$
TTG	Leu	TCG	Ser	TAG	$\operatorname{Stp}$	TGG	Trp
CTT	Leu	CCT	Pro	CAT	His	CGT	Arg
CTC	Leu	CCC	Pro	CAC	His	CGC	Arg
CTA	Leu	CCA	Pro	CAA	$\operatorname{Gln}$	CGA	Arg
CTG	Leu	CCG	Pro	CAG	$\operatorname{Gln}$	CGG	Arg
ATT	Ile	ACT	$\operatorname{Thr}$	AAT	Asn	AGT	Ser
ATC	Ile	ACC	$\operatorname{Thr}$	AAC	Asn	AGC	Ser
ATA	Ile	ACA	$\operatorname{Thr}$	AAA	Lys	AGA	Arg
ATG	Met	ACG	$\operatorname{Thr}$	AAG	Lys	AGG	Arg
					-		_
GTT	Val	GCT	Ala	GAT	Asp	GGT	$\operatorname{Gly}$
GTC	Val	GCC	Ala	GAC	Asp	GGC	Gly
GTA	Val	GCA	Ala	GAA	Glu	GGA	Gly
GTG	Val	GCG	Ala	GAG	Glu	GGG	Gly
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Table 8: Genetic code number 10: euplotid.

TTT	Phe	TCT	Ser	TAT	Tyr	TGT	Cys
TTC	Phe	TCC	Ser	TAC	Tyr	TGC	Cys
TTA	Leu	TCA	Ser	TAA	$\operatorname{Stp}$	TGA	$\operatorname{Stp}$
TTG	Leu	TCG	Ser	TAG	$\operatorname{Stp}$	TGG	Trp
CTT	Leu	CCT	Pro	CAT	His	CGT	Arg
CTC	Leu	CCC	$\operatorname{Pro}$	CAC	His	CGC	$\operatorname{Arg}$
CTA	Leu	CCA	Pro	CAA	Gln	CGA	Arg
CTG	Leu	CCG	Pro	CAG	Gln	CGG	Arg
ATT	Ile	ACT	$\operatorname{Thr}$	AAT	Asn	AGT	Ser
ATC	Ile	ACC	$\operatorname{Thr}$	AAC	Asn	AGC	Ser
ATA	Ile	ACA	$\operatorname{Thr}$	AAA	Lys	AGA	$\operatorname{Arg}$
ATG	Met	ACG	$\operatorname{Thr}$	AAG	Lys	AGG	$\operatorname{Arg}$
GTT	Val	GCT	Ala	GAT	Asp	GGT	Gly
GTC	Val	GCC	Ala	GAC	Asp	GGC	Gly
GTA	Val	GCA	Ala	GAA	Glu	GGA	Gly
GTG	Val	GCG	Ala	GAG	Glu	GGG	Gly

Table 9: Genetic code number 11: bacterial+plant plastid.

TTT	Phe	TCT	Ser	TAT	Tyr	TGT	Cys
TTC	Phe	TCC	Ser	TAC	Tyr	TGC	Cys
TTA	Leu	TCA	Ser	TAA	$\operatorname{Stp}$	TGA	$\operatorname{Stp}$
TTG	Leu	TCG	Ser	TAG	$\operatorname{Stp}$	TGG	Trp
					-		-
CTT	Leu	CCT	Pro	CAT	His	CGT	Arg
CTC	Leu	CCC	$\operatorname{Pro}$	CAC	His	CGC	Arg
CTA	Leu	CCA	Pro	CAA	$\operatorname{Gln}$	CGA	Arg
CTG	Ser	CCG	Pro	CAG	$\operatorname{Gln}$	CGG	Arg
							O
ATT	Ile	ACT	$\operatorname{Thr}$	AAT	Asn	AGT	Ser
ATT ATC	Ile Ile	$_{\rm ACC}^{\rm ACC}$	${ m Thr} \ { m Thr}$	$_{\rm AAC}^{\rm AAC}$	$_{\rm Asn}^{\rm Asn}$	$\begin{array}{c} \mathrm{AGT} \\ \mathrm{AGC} \end{array}$	Ser Ser
						_	
ATC	Ile	ACC	$\operatorname{Thr}$	AAC	$\begin{array}{c} \operatorname{Asn} \\ \operatorname{Lys} \end{array}$	AGC	Ser
ATC ATA	Ile Ile	ACC ACA	Thr Thr	AAC AAA	Asn	AGC AGA	Ser Arg
ATC ATA	Ile Ile	ACC ACA	Thr Thr	AAC AAA	$\begin{array}{c} \operatorname{Asn} \\ \operatorname{Lys} \end{array}$	AGC AGA	Ser Arg
ATC ATA ATG	Ile Ile Met	ACC ACA ACG	Thr Thr Thr	AAC AAA AAG	Asn Lys Lys	AGC AGA AGG	Ser Arg Arg
ATC ATA ATG	Ile Ile Met	ACC ACA ACG	Thr Thr Thr	AAC AAA AAG	Asn Lys Lys	AGC AGA AGG GGT	Ser Arg Arg
ATC ATA ATG GTT GTC	Ile Ile Met Val	ACC ACA ACG GCT GCC	Thr Thr Thr Ala Ala	AAC AAA AAG GAT GAC	Asn Lys Lys Asp Asp	AGC AGA AGG GGT GGC	Ser Arg Arg Gly
ATC ATA ATG GTT GTC GTA	Ile Ile Met Val Val Val	ACC ACA ACG GCT GCC GCA	Thr Thr Thr Ala Ala Ala	AAC AAA AAG GAT GAC GAA	Asn Lys Lys Asp Asp Glu	AGC AGA AGG GGT GGC GGA	Ser Arg Arg Gly Gly Gly

Table 10: Genetic code number 12: alternativeyeast.

TTT	Phe	TCT	Ser	TAT	Tyr	TGT	Cys
TTC	Phe	TCC	Ser	TAC	Tyr	TGC	Cys
TTA	Leu	TCA	Ser	TAA	$\operatorname{Stp}$	TGA	$\mathbf{Trp}$
TTG	Leu	TCG	Ser	TAG	$\operatorname{Stp}$	TGG	Trp
CTT	Leu	CCT	Pro	CAT	His	CGT	Arg
CTC	Leu	CCC	Pro	CAC	His	CGC	Arg
CTA	Leu	CCA	Pro	CAA	Gln	CGA	Arg
CTG	Leu	CCG	Pro	CAG	Gln	CGG	Arg
ATT	Ile	ACT	$\operatorname{Thr}$	AAT	$\operatorname{Asn}$	AGT	Ser
ATC	Ile	ACC	$\operatorname{Thr}$	AAC	Asn	AGC	Ser
ATA	$\mathbf{Met}$	ACA	$\operatorname{Thr}$	AAA	Lys	$\mathbf{AGA}$	$\mathbf{Gly}$
ATG	Met	ACG	$\operatorname{Thr}$	AAG	Lys	$\mathbf{AGG}$	$\mathbf{Gly}$
GTT	Val	GCT	Ala	GAT	Asp	GGT	Gly
GTC	Val	GCC	Ala	GAC	Asp	GGC	Gly
GTA	Val	GCA	Ala	GAA	Glu	GGA	Gly
GTG	Val	GCG	Ala	GAG	Glu	GGG	Gly

Table 11: Genetic code number 13: ascidian.mitochondrial.

TTT	Phe	TCT	Ser	TAT	Tyr	TGT	Cys
TTC	Phe	TCC	Ser	TAC	Tyr	TGC	Cys
TTA	Leu	TCA	Ser	TAA	$\mathbf{Tyr}$	TGA	Trp
TTG	Leu	TCG	Ser	TAG	$\operatorname{Stp}$	TGG	Trp
					•		•
CTT	Leu	CCT	Pro	CAT	His	CGT	Arg
CTC	Leu	CCC	$\operatorname{Pro}$	CAC	His	CGC	Arg
CTA	Leu	CCA	Pro	CAA	Gln	CGA	Arg
CTG	Leu	CCG	Pro	CAG	$\operatorname{Gln}$	CGG	Arg
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ATT	Ile	ACT	$\operatorname{Thr}$	AAT	Asn	AGT	Ser
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ATC	Ile	ACC	$\operatorname{Thr}$	AAC	$\operatorname{Asn}$	AGC	$\operatorname{Ser}$
ATC ATA	Ile Ile	ACC ACA	Thr Thr	AAC <b>AAA</b>	Asn <b>Asn</b>	AGC <b>AGA</b>	Ser Ser
_							
ATA	Ile	ACA	Thr	$\mathbf{A}\mathbf{A}\mathbf{A}$	Asn	$\mathbf{AGA}$	Ser
ATA	Ile	ACA	Thr	$\mathbf{A}\mathbf{A}\mathbf{A}$	Asn	$\mathbf{AGA}$	Ser
ATA ATG	Ile Met	ACA ACG	Thr Thr	AAA AAG	Asn Lys	AGA AGG	Ser Ser
ATA ATG	Ile Met Val	ACA ACG	Thr Thr	AAA AAG GAT	Asn Lys	AGA AGG	Ser Ser Gly
ATA ATG GTT GTC	Ile Met Val Val	ACA ACG GCT GCC	Thr Thr Ala	AAA AAG GAT GAC	Asn Lys Asp Asp	AGA AGG GGT GGC	Ser Ser Gly Gly

Table 12: Genetic code number 14: alternativeflatworm.mitochondrial.

TTT	Phe	TCT	Ser	TAT	Tyr	TGT	Cys
TTC	Phe	TCC	Ser	TAC	Tyr	TGC	Cys
TTA	Leu	TCA	Ser	TAA	$\operatorname{Stp}$	TGA	$\operatorname{Stp}$
TTG	Leu	TCG	Ser	TAG	$\mathbf{Gln}$	TGG	Trp
CTT	Leu	CCT	$\operatorname{Pro}$	CAT	His	CGT	Arg
CTC	Leu	CCC	$\operatorname{Pro}$	CAC	His	CGC	Arg
CTA	Leu	CCA	$\operatorname{Pro}$	CAA	$\operatorname{Gln}$	CGA	Arg
CTG	Leu	CCG	$\operatorname{Pro}$	CAG	$\operatorname{Gln}$	CGG	Arg
ATT	Ile	ACT	$\operatorname{Thr}$	AAT	$\operatorname{Asn}$	AGT	Ser
ATC	Ile	ACC	$\operatorname{Thr}$	AAC	$\operatorname{Asn}$	AGC	Ser
ATA	Ile	ACA	$\operatorname{Thr}$	AAA	Lys	AGA	Arg
ATG	Met	ACG	$\operatorname{Thr}$	AAG	Lys	AGG	$\overline{\mathrm{Arg}}$
GTT	Val	GCT	Ala	GAT	Asp	GGT	Gly
GTC	Val	GCC	Ala	GAC	Asp	GGC	Gly
GTA	Val	GCA	Ala	GAA	Glu	GGA	Gly
GTG	Val	GCG	Ala	GAG	$\operatorname{Glu}$	GGG	Gly
							-

Table 13: Genetic code number 15: blepharism.

Cys
Cys
$\operatorname{Stp}$
Trp
Arg
Arg
Arg
Arg
Ser
Ser
Arg
Arg
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Gly
Gly Gly
v
Gly

Table 14: Genetic code number 16: chlorophycean.mitochondrial.

TTT	Phe	TCT	Ser	TAT	Tyr	TGT	Cys
TTC	Phe	TCC	Ser	TAC	Tyr	TGC	Cys
TTA	Leu	TCA	Ser	TAA	$\operatorname{Stp}$	TGA	$\mathbf{Trp}$
TTG	Leu	TCG	Ser	TAG	$\operatorname{Stp}$	TGG	Trp
CTT	Leu	CCT	Pro	CAT	His	CGT	Arg
CTC	Leu	CCC	Pro	CAC	His	CGC	Arg
CTA	Leu	CCA	Pro	CAA	Gln	CGA	Arg
CTG	Leu	CCG	Pro	CAG	Gln	CGG	Arg
ATT	Ile	ACT	$\operatorname{Thr}$	AAT	Asn	AGT	Ser
ATC	Ile	ACC	$\operatorname{Thr}$	AAC	Asn	AGC	Ser
ATA	$\mathbf{Met}$	ACA	$\operatorname{Thr}$	$\mathbf{A}\mathbf{A}\mathbf{A}$	Asn	$\mathbf{AGA}$	$\mathbf{Ser}$
ATG	Met	ACG	$\operatorname{Thr}$	AAG	Lys	$\mathbf{AGG}$	$\mathbf{Ser}$
					-		
GTT	Val	GCT	Ala	GAT	Asp	GGT	Gly
GTC	Val	GCC	Ala	GAC	Asp	GGC	Gly
GTA	Val	GCA	Ala	GAA	Glu	GGA	Gly
GTG	Val	GCG	Ala	GAG	Glu	GGG	Gly
					0.10		- 3

Table 15: Genetic code number 21: trematode.mitochondrial.

TTT	Phe	TCT	Ser	TAT	Tyr	TGT	Cys
TTC	Phe	TCC	Ser	TAC	Tyr	TGC	Cys
TTA	Leu	TCA	$\mathbf{Stp}$	TAA	$\operatorname{Stp}$	TGA	$\operatorname{Stp}$
TTG	Leu	TCG	Ser	TAG	Leu	TGG	Trp
							-
CTT	Leu	CCT	Pro	CAT	His	CGT	Arg
CTC	Leu	CCC	Pro	CAC	His	CGC	Arg
CTA	Leu	CCA	Pro	CAA	$\operatorname{Gln}$	CGA	Arg
CTG	Leu	CCG	Pro	CAG	$\operatorname{Gln}$	CGG	Arg
ATT	Ile	ACT	$\operatorname{Thr}$	AAT	Asn	AGT	Ser
ATC	Ile	ACC	$\operatorname{Thr}$	AAC	$\operatorname{Asn}$	AGC	Ser
ATA	Ile	ACA	$\operatorname{Thr}$	AAA	Lys	AGA	Arg
ATG	Met	ACG	$\operatorname{Thr}$	AAG	Lys	AGG	Arg
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GTT	Val	GCT	Ala	GAT	Asp	GGT	Gly
GTC	Val	GCC	Ala	GAC	Asp	GGC	Gly
GTA	Val	GCA	Ala	GAA	Glu	GGA	Gly
GTG	Val	GCG	Ala	GAG	Glu	GGG	Gly
							-

Table 16: Genetic code number 22: scenedesmus.mitochondrial.

TTT Phe TCT Ser TAT Tyr TGT Cys	
TTC Phe TCC Ser TAC Tyr TGC Cys	
TTA Stp TCA Ser TAA Stp TGA Stp	
TTG Leu TCG Ser TAG Stp TGG Trp	
CTT Leu CCT Pro CAT His CGT Arg	
CTC Leu CCC Pro CAC His CGC Arg	
CTA Leu CCA Pro CAA Gln CGA Arg	
CTG Leu CCG Pro CAG Gln CGG Arg	
ATT Ile ACT Thr AAT Asn AGT Ser	
ATC Ile ACC Thr AAC Asn AGC Ser	
ATA Ile ACA Thr AAA Lys AGA Arg	
ATG Met ACG Thr AAG Lys AGG Arg	
GTT Val GCT Ala GAT Asp GGT Gly	
GTC Val GCC Ala GAC Asp GGC Gly	
GTA Val GCA Ala GAA Glu GGA Gly	
GTG Val GCG Ala GAG Glu GGG Gly	

 ${\it Table~17:~Genetic~code~number~23:~thraustochytrium.mitochondrial.}$ 

TTT	Phe	TCT	Ser	TAT	Tyr	TGT	Cys
TTC	Phe	TCC	Ser	TAC	Tyr	TGC	Cys
TTA	Leu	TCA	Ser	TAA	Stp	<b>TGA</b>	<b>Trp</b>
TTG	Leu	TCG	Ser	TAG	Stp	TGG	Trp
CTT	Leu	CCT	Pro	CAT	His	CGT	Arg
CTC	Leu	CCC	Pro	CAC	His	CGC	Arg
CTA	Leu	CCA	Pro	CAA	Gln	CGA	Arg
CTG	Leu	CCG	Pro	CAG	Gln	CGG	Arg
ATT	Ile	ACT	Thr	AAT	Asn	AGT	Ser
ATC	Ile	ACC	Thr	AAC	Asn	AGC	Ser
ATA	Ile	ACA	Thr	AAA	Lys	<b>AGA</b>	Ser
ATG	Met	ACG	Thr	AAG	Lys	<b>AGG</b>	Lys
GTT	Val	GCT	Ala	GAT	Asp	GGT	Gly
GTC	Val	GCC	Ala	GAC	Asp	GGC	Gly
GTA	Val	GCA	Ala	GAA	Glu	GGA	Gly
GTG	Val	GCG	Ala	GAG	Glu	GGG	Gly

Table 18: Genetic code number 24: Pterobranchia.mitochondrial.

TTT	Phe	TCT	Ser	TAT	Tyr	TGT	Cys
TTC	Phe	TCC	Ser	TAC	Tyr	TGC	Cys
TTA	Leu	TCA	Ser	TAA	$\operatorname{Stp}$	TGA	$\mathbf{Gly}$
TTG	Leu	TCG	Ser	TAG	$\operatorname{Stp}$	TGG	$\operatorname{Trp}$
CTT	Leu	CCT	Pro	CAT	His	CGT	Arg
CTC	Leu	CCC	Pro	CAC	His	CGC	Arg
CTA	Leu	CCA	$\operatorname{Pro}$	CAA	$\operatorname{Gln}$	CGA	Arg
CTG	Leu	CCG	Pro	CAG	$\operatorname{Gln}$	CGG	Arg
ATT	Ile	ACT	$\operatorname{Thr}$	AAT	Asn	AGT	Ser
ATC	Ile	ACC	$\operatorname{Thr}$	AAC	Asn	AGC	Ser
ATA	Ile	ACA	$\operatorname{Thr}$	AAA	Lys	AGA	Arg
ATG	Met	ACG	$\operatorname{Thr}$	AAG	Lys	AGG	Arg
GTT	Val	GCT	Ala	GAT	Asp	GGT	Gly
GTC	Val	GCC	Ala	GAC	Asp	GGC	Gly
GTA	Val	GCA	Ala	GAA	Glu	GGA	Gly
GTG	Val	GCG	Ala	GAG	Glu	GGG	Gly

 ${\bf Table~19:~Genetic~code~number~25:~Candidate Division. SR1+Gracilibacteria.}$ 

TTT TTC TTA TTG	Phe Phe Leu Leu	TCT TCC TCA TCG	Ser Ser Ser	TAT TAC TAA TAG	Tyr Tyr Stp Stp	TGT TGC TGA TGG	Cys Cys Stp Trp
CTT CTC CTA CTG	Leu Leu Leu <b>Ala</b>	CCT CCC CCA CCG	Pro Pro Pro	CAT CAC CAA CAG	His His Gln Gln	CGT CGC CGA CGG	Arg Arg Arg
ATT	Ile	ACT	Thr	AAT	Asn	AGT	Ser
ATC	Ile	ACC	Thr	AAC	Asn	AGC	Ser
ATA	Ile	ACA	Thr	AAA	Lys	AGA	Arg
ATG	Met	ACG	Thr	AAG	Lys	AGG	Arg
GTT	Val	GCT	Ala	GAT	Asp	GGT	Gly
GTC	Val	GCC	Ala	GAC	Asp	GGC	Gly
GTA	Val	GCA	Ala	GAA	Glu	GGA	Gly
GTG	Val	GCG	Ala	GAG	Glu	GGG	Gly

Table 20: Genetic code number 26: Pachysolen.tannophilus.

### **Session Informations**

This part was compiled under the following  $\mathbb{Q}$  environment:

- R version 3.3.1 (2016-06-21), x86\_64-apple-darwin13.4.0
- Locale: fr\_FR.UTF-8/fr\_FR.UTF-8/fr\_FR.UTF-8/C/fr\_FR.UTF-8/fr\_FR.UTF-8
- Base packages: base, datasets, graphics, grDevices, grid, methods, stats, utils
- $\bullet$  Other packages: ade 4 1.7-4, ape 3.5, grImport 0.9-0, MASS 7.3-45, seqin<br/>r 3.3-2, tseries 0.10-35, XML 3.98-1.4, xtable 1.8-2
- $\bullet\,$  Loaded via a name space (and not attached): lattice 0.20-33, nlme 3.1-128, quadprog 1.5-5, tools 3.3.1, zoo 1.7-13

There were two compilation steps:

- $\bullet~\textsc{LAT}_{\mbox{\footnotesize EX}} X$  compilation time was: October 5, 2016

# References

- [1] T. H. Jukes and S. Osawa. Evolutionary changes in the genetic code. *Comp. Biochem. Physiol. B.*, 106:489–494, 1993.
- [2] S. Osawa, T. H. Jukes, K. Watanabe, and A. Muto. Recent evidence for evolution of the genetic code. *Microbiol. Rev.*, 56:229–264, 1992.