

South Dakota State University

Open PRAIRIE: Open Public Research Access Institutional Repository and Information Exchange

Electronic Theses and Dissertations

2016

Analysis of Starch Branching Enzyme 1 (SBE1) Gene in Maize

Abiskar Gyawali

South Dakota State University

Follow this and additional works at: <https://openprairie.sdstate.edu/etd>



Part of the Biology Commons

Recommended Citation

Gyawali, Abiskar, "Analysis of Starch Branching Enzyme 1 (SBE1) Gene in Maize" (2016). *Electronic Theses and Dissertations*. 1037.

<https://openprairie.sdstate.edu/etd/1037>

This Thesis - Open Access is brought to you for free and open access by Open PRAIRIE: Open Public Research Access Institutional Repository and Information Exchange. It has been accepted for inclusion in Electronic Theses and Dissertations by an authorized administrator of Open PRAIRIE: Open Public Research Access Institutional Repository and Information Exchange. For more information, please contact michael.biondo@sdstate.edu.

ANALYSIS OF STARCH BRANCHING ENZYME 1 (SBE1) GENE IN MAIZE

BY

ABISKAR GYAWALI

A thesis submitted in partial fulfillment of the requirements for the

Master of Science

Major in Biological Sciences

Specialization in Biology

South Dakota State University

2016

ANALYSIS OF STARCH BRANCHING ENZYME 1 (*SBE1*) GENE IN MAIZE

This dissertation is approved as a creditable and independent investigation by a candidate for the Master of Science in Biological Science degree and is acceptable for meeting the dissertation requirements for this degree. Acceptance of this dissertation does not imply that the conclusions reached by the candidate are necessarily the conclusions of the major department.

Donald Auger, PhD
Thesis Advisor

Volker Brozel, PhD Date
Head, Department of Biology and
Microbiology

Dean, Graduate School Date

ACKNOWLEDGEMENTS

I would like to extend my gratitude to my advisor Dr. Donald Auger for helping and supporting me for my Master's study and research. I would also like to thank my wife, my parents and all those encouraged and supported me.

Abiskar Gyawali

Brookings, SD

July, 2016

TABLE OF CONTENTS

LIST OF TABLES	vi
LIST OF FIGURES	vii
ABSTRACT	viii
CHAPTER 1 INTRODUCTION	1
1. PURPOSE.....	1
2. MAIZE KERNEL STRUCTURE AND COMPOSITION	1
2.1. MOLECULAR AND GRANULAR COMPOSITION OF MAIZE STARCH.....	2
2.2. STARCH BIOSYNTHESIS	3
3. ENZYMES INVOLVED IN AMYLOSE AND AMYLOPECTIN SYNTHESIS	3
3.1 STARCH SYNTHASE.....	3
3.2 GRANULE BOUND STARCH SYNTHASE (GBSS).....	4
3.3 BRANCHING ENZYME.....	4
4 GENETIC APPROACH TO ALTERING AMYLOSE CONTENT	5
4.1 HIGH AMYLOSE AND AMYLOPECTIN IN MUTANT MAIZE	5
4.2 BREEDING FOR HIGH AMYLOSE CORN.....	6
CHAPTER 2 CONFIRMATION THAT <i>STARCH BRANCHING ENZYME 1 (SBE1)</i> IS THE SOURCE OF A HIGH ENDOSPERM AMYLOSE CONTENT QTL IN MAIZE	8
INTRODUCTION	8
MATERIALS AND METHODS	9
RESULTS.....	11
DISCUSSION	12
CHAPTER 3 PHYLOGENETIC ANALYSIS OF <i>SBE1</i> IN MAIZE	20
INTRODUCTION	20
METHODS	21

RESULTS.....	22
DISCUSSION	24
CHAPTER 4 SUMMARY AND FUTURE WORK.....	35
REFERENCES.....	37
APPENDIX.....	42
APPENDIX 1. ABSORBANCE AT 550 HM AND 620 HM.....	42
APPENDIX 2. DNA SEQUENCE FROM SEVENTEEN VARIETIES.....	43
APPENDIX 3. ORF FROM SEVENTEEN VARIETIES.....	100

LIST OF TABLES

Table 2.1 Primers for genotyping sbe1 alleles	14
Table 3.1. Name and source of all the seventeen genotypes used in our study	26
Table 3.2 Shows the sequence of the primers used and their amplicon size	27
Table 3.3 Substitution polymorphism (SNP) of <i>Sbe1</i> ORF.....	28
Table 3.4 Amino acid polymorphism of SBEI	31

LIST OF FIGURES

Figure 1.1 A pathway of starch synthesis in maize	7
Figure 2.1 Generation of segregating population.....	15
Figure 2.2 Diagram showing how kernels were separated for phenotyping and genotyping.	16
Figure 2.3 PCR genotyping of maize kernels for <i>sbe1-Mu</i> versus the wild-type.....	17
Figure 2.4 Distinguishing <i>sbe1</i> alleles originating from H99ae and GEMS-0067.....	18
Figure 2.5 Absorbance ratios of 620 nm/550 nm per genotype.....	19
Figure 3.1 Neighbor joining tree based <i>sbe1</i> DNA sequence	32
Figure 3.2 Neighbor joining tree based <i>sbe1</i> reading frame	33
Figure 3.3 Neighbor joining tree based <i>sbe1</i> amino acid sequence	34

ABSTRACT

ANALYSIS OF STARCH BRANCHING ENZYME 1 (*SBE1*) GENE IN MAIZE

ABISKAR GYAWALI

2016

A previous study revealed a quantitative trait locus (QTL) in maize on the short arm of chromosome 5 (5S) for endosperm amylose content. In that original study, both low and high amylose parental lines, H99ae and GEMS-0067 respectively, were homozygous recessive for *amylose extender 1* (*ae1*) and the polymorphism responsible for this QTL was additive (semi-dominant). Located within the QTL interval is *starch branching enzyme 1* (*sbe1*), which makes it a candidate gene. In order to test whether a polymorphism in *sbe1* is the source of this QTL, we crossed a plant homozygous for *ae1* and *sbe1-Mu* onto a GEMS-0067/H99ae hybrid to test whether this allele would eliminate additivity in the progeny. The *sbe1-Mu* allele is null and acts as a simple recessive against a functional *Sbe1* allele. PCR markers were used to distinguish homozygous wild (*Sbe1-G/Sbe1-G* or *Sbe1-H/Sbe1-H*), heterozygous (*Sbe1-G/sbe1-Mu* or *Sbe1-H/sbe1-Mu*) and homozygous mutant (*sbe1-Mu/sbe1-Mu*). Furthermore *Alu1* restriction digestion was done to distinguish GEMS-0067 from H99ae. A dual wavelength iodine-binding assay was used to determine relative amylose/amylopectin content from these segregated populations. The amylose assay showed that the presence of *sbe1-Mu* eliminated additivity and dominance relationship was revealed. This establishes that allelic differences of *sbe1* between H99ae and GEMS-0067 as the source of the QTL. The

gene for *starch branching enzyme 1 (sbe1)* in a high amylose line, GEMS-007, would translate into a protein with six amino acid polymorphisms relative to a lower amylose line, H99ae. A review of the published *sbe1* sequence data indicates that most varieties of maize are remarkably uniform, i.e., they have the same amino acid usage as found in H99ae. In *Zea mays* L., we studied the phylogenetic and selection analysis of *starch branching enzyme 1 (sbe1)*, a candidate gene for high amylose QTL. The main objective of this study was to know whether or not *sbe1* was subjected to selection. We compared 2797 bp of the *sbe1* coding region of 17 accessions of maize and teosinte. Very low proportion of single nucleotide polymorphisms were observed relative to other genes in maize. Comparison of synonymous and nonsynonymous polymorphism revealed the effect of purifying selection in the whole species. Phylogenetic analysis of *sbe1* revealed that *sbe1* in a high amylose line, GEMS-007, is ancestral as it lies together in group with teosintes.

Chapter 1 Introduction

1. Purpose

The project is focused in confirming two hypotheses, which are described in chapters two and three. Those chapters in this thesis are written in manuscript format. Chapter one is a general introduction of *sbe1* and its effects upon endosperm amylose content. Chapter two describes confirmation that *starch branching enzyme 1 (sbe1)* is the source of a high endosperm amylose content QTL in maize. Chapter three elaborates about the phylogenetic analysis of *sbe1*. The last chapter is about the summary and future work on both projects.

2. Maize kernel structure and composition

The maize grain is composed of the same basic structures that are found in major cereals: endosperm (82-83 %), germ (10-11 %), pericarp (5-6 %) and tip cap (0.8-1 %) (SINGH, *et al.*, 2014). Pericarp is the outermost layer consisting most of the cellulose, hemicellulose and lignin with a lesser proportion of lipids. Endosperm is the major portion of the maize kernel with large number of cells and each cell is composed of densely packed starch granules (MIAO, *et al.*, 2014). Germ contains the living part of the maize kernel and stores the genetic information along with vitamins, enzymes and other nutrients that helps the kernel to grow into whole plant. Tip cap is the point of attachment of kernel to maize ear and it is the only structure that is not covered with pericarp.

2.1. Molecular and granular composition of maize starch

The major component of endosperm dry matter is starch and starch is present in two forms: amylose, the linear form, and the amylopectin which is highly branched. The normal amylose content in maize is 20-25% which are glucose polymers linked by α -D-1, 4-glucosidic bonds. Maize amylose is composed of not only the straight chains of glucose but they also have few branching points (TAKEDA, *et al.*, 1988). The majority of maize endosperm is composed of amylopectin, which is about 75% of total starch. Straight chains of glucose in amylopectin, joined with α -D-1, 4-glucosidic bonds, are branched with α -D-1, 6-glucosidic bonds.

Three levels of starch structure have been observed. At first, many unbranched glucose monomers are linked together to form an A chain. One or more glucose molecules connect to each other to make branch linkage known as a B chain. In the second level, A chains and B chains link together to form crystalline and amorphous layer. The major difference between crystalline and amorphous layer is based on their subjection to acid hydrolysis. The crystalline layer is resistant to acid hydrolysis whereas amorphous layer is more susceptible to acid hydrolysis. The third level is mainly about the blocklet structure made of crystalline and amorphous layer and the starch granules are made of these blocklets, which are organized to form different rings.

2.2. Starch Biosynthesis

Starch biosynthesis in the endosperm of cereal is a coordinated activity of several enzymes, including adenosine 5' diphosphate-glucose (ADP-Glc) pyrophosphorylase (AGPase), granule-bound starch synthase (GBSS), soluble starch synthase (SS), and starch branching enzyme (SBE) and starch debranching enzyme (DBE). Seven genes are specifically involved in the starch synthesis pathway (Figure 1.1): *shrunken1* (*sh1*), *shrunken2* (*sh2*), *brittle2* (*bt2*), *waxy1* (*wx1*), *ae1 amylose extender* (*ae1*), *starch branching enzyme1* (*sbe1*), *starch branching enzyme3* (*sbe3*), *sugary1* (*su1*) (MYERS, *et al.*, 2000). Several steps are involved in this pathway. The first step involves the synthesis of UDP-glucose which is catalyzed by sucrose synthase that is encoded by *sh1*. Two genes; *sh2* and *bt2* encode ADP-glucose pyrophosphorylase (AGPase) which assists in conversion of UDP-glucose to ADP-glucose. The enzymes of starch synthesis are encoded by *wx1*, *ae1*, *sbe1*, *sbe3* and *su1* to produce amylose and amylopectin. single mutants of *wx1* and *ae1* decrease and increase the amylose content in the starch respectively (TSAI, 1974). In case of homozygous *wx1* mutant, the endosperm starch granule produces 100% amylopectin. The *wx1* gene has a epistatic gene interaction that cause the mutants to resist amylose accumulation (YEH, *et al.*, 1981).

3. Enzymes involved in amylose and amylopectin synthesis

3.1 Starch Synthase

Starch synthase catalyzes the elongation of linear glucose chain by transferring the glucosyl unit of ADP-glucose to the non-reducing end of glucose

chain. Various forms of starch synthase identified so far are GBSS, SSI, SSII, SIII, SSIV (JAMES, *et al.*, 2003)

3.2 Granule bound starch synthase (GBSS)

Two isoforms of GBSS has been identified; GBSS I and GBSS II. In cereal endosperm, GBSSI is found in endosperm and is encoded by *waxy* locus (*wx*) whereas GBSSII is predominant in non-storage plant tissue. Maize *wx1* mutants in maize have either low or no amylose starch content, however these mutants do not show difference in starch content (TSAI, 1974). Single *waxy* mutant in barley contains between 0.4% and 9% amylose (1:3 ratio of amylose and amylopectin present in wild barley) in starch (PATRON, *et al.*, 2002).

3.3 Branching Enzyme

Branching enzyme (BE) is the class of enzyme that catalyzes the formation of branch point by cleaving α -1, 4-glucosidic bonds and attaching it again through α -1, 6-glucosidic bonds. Based on biochemical and physiochemical properties, two isoforms of BE are known; BEI and BEII. BEI differs from BEII in terms of amino acid composition, enzyme kinetic properties, immunological reactivities, peptide maps, optimal reaction conditions and substrate specificity (FISHER, *et al.*, 1983, STINARD, *et al.*, 1993). In addition, BEII also possess two isoforms; BEIIa and BEIIb (HAN, *et al.*, 2007). BEIIa and BEIIb are not distinct in biochemical and immunological properties (BOYER, *et al.*, 1978, FISHER, *et al.*, 1983). However they showed difference in the branching linkage assay (STINARD, *et al.*, 1993) and optimum temperature.

4 Genetic approach to altering amylose content

There are specific genes that are known to regulate the amylose content. However there are also some unknown factors. Amylose content in rice is predominantly controlled by *wx* gene on chromosome 6 (TSAI, 1974). In wheat, there are three waxy loci located on the short arm of chromosome 7A (CHAO, *et al.*, 1989). Wheat lines lacking one or two GBSS isoforms produce low amylo-starch. Although increasing the *waxy* protein can lead to higher amylose but this cannot exceed 40% (FASAHAT, *et al.*, 2014). Altering the branching enzyme activity can also increase the amylose proportion in starch. Three isoforms of starch-branching enzymes, SBEI, SBEIIa and SBEIIb, have been identified in maize (DANG, *et al.*, 1989). These enzymes are responsible for formation of amylopectin. Amylose is a linear chain consisting α -1, 4 glycosidic linkage and amylopectin also had the branched form of α -1,6 linkages. The properties of SBEI differ significantly from SBEIIa and SBEIIb. SBE I is active in branching amylose, whereas SBE II is active in branching amylopectin (GUAN, *et al.*, 1993). BLAUTH, *et al.* (2002) found that single mutant of *sbe1* does not affect the endosperm starch structure, whereas a deficiency of SBEIIb in *amylose extender1 (ae1)* mutants increases the amylose content.

4.1 High amylose and amylopectin in mutant maize

Normal amylose content in maize is around 25% and the rest is amylopectin. The proportion of amylose in maize endosperm can be increased if the kernels are homozygous for the recessive allele of *ae1* (VINEYARD AND BEAR, 1952) which encodes SBEIIb. One maize inbred line GEMS-0067, (Reg. no GP-550, PI 643420),

derived from the pedigree of [GUAT209:-S13 × (OH43ae × H99ae)], is the only publicly available source of high amylose maize in the US (CAMPBELL, *et al.*, 2007). H99ae is a Midwestern dent that was converted to being homozygous *ae1*; it yields about 50% amylose

4.2 Breeding for high amylose corn

High amylose starch has been previously used to make gums, candies and adhesive for cardboard (Ferguson, 1994). However in recent times amylose has been used for the manufacturing the biodegradable plastic and has been found to be good source of ‘resistant starch’ that lowers the glycemic index when added in the food (BEHALL, *et al.*, 2002). Isolating amylose from normal maize is quite costly. Therefore high amylo-maize breeding can be economically significant and also can be useful in expanding the application of maize starch and starch based maize industry (SLATTERY, *et al.*, 2000). Previously little was known about the inheritance of *ae1* and its complementary interaction with other regulating genes. Subsequent work on the interaction of *ae1* with other endosperm mutants revealed much variation in amylose content (BEAR, *et al.*, 1958, KRAMER, *et al.*, 1958, ZUBER, *et al.*, 1958). Amylose content ranging from 36.5 to 64.9 was reported from cross between 135 inbreds in *ae1* background (VINEYARD, *et al.*, 1958). This variation in the amylose content is the result of different modifier genes that interacted with the *ae1* (VINEYARD, *et al.*, 1958, ZUBER, *et al.*, 1958). Different breeding procedures have been proposed to develop agronomically adapted amylo-maize hybrids (BEAR, *et al.*,

1958, HELM, *et al.*, 1967). Some of these include three cycles of alternate backcrossing and selfing sequence for development of high amylose inbred lines.

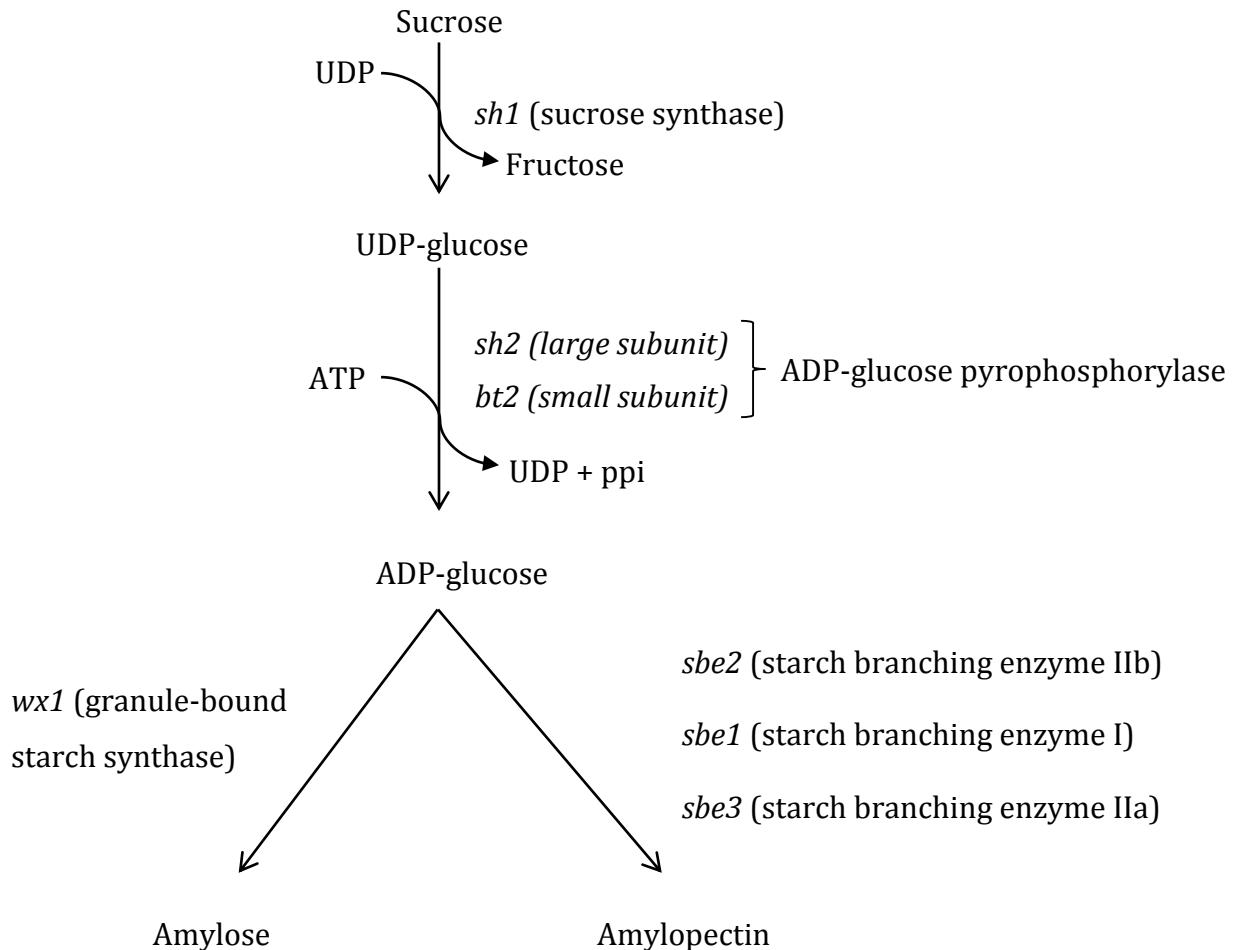


Figure 1.1 A pathway of starch synthesis in maize

Chapter 2 Confirmation that *starch branching enzyme 1 (sbe1)* is the source of a high endosperm amylose content QTL in maize

Introduction

Starch is composed of two forms; straight chained amylose and highly branched amylopectin (BANKS, 1975). Generally, maize endosperm starch is composed of about 25% amylose and 75% amylopectin (NELSON, *et al.*, 1995). High amylose starch has been of great benefit in making gums candies and adhesive (FERGASON, 2000). High amylose foods is also found as a source of resistant starch which helps in lowering the risk of colon cancer (BEHALL, *et al.*, 2002).

The ratio of amylose increases to over 50% in maize kernels homozygous for the null allele of the *amylose extender1 (ae1)* gene, which encodes starch branching enzyme 2b (SBE2b) (VINEYARD, *et al.*, 1958). In the GEMS-0067 maize line, which is homozygous for *ae1*, the proportion of amylose is over 70% (CAMPBELL, *et al.*, 2007). A strong quantitative trait locus (QTL) on the short arm of chromosome 5 (5S) was identified using an F2 population from a cross of GEMS-0067 and H99ae, a lower amylose line (WU, *et al.*, 2009).

Even though *starch branching enzyme1 (sbe1)* is located within this QTL, there is no direct evidence that allelic segregation of *sbe1* contributes to this QTL. To test if an allelic difference of *sbe1* is the cause of this QTL we contrasted two known facts: the QTL is additive (WU, *et al.*, 2009), and a null allele of *sbe1 (sbe1-Mu)* acts as

a simple recessive (BLAUTH, *et al.*, 2002). If the amylose trait continues to demonstrate additivity in endosperm that is heterozygous for *sbe1-Mu*, it would indicate that some other closely linked locus, is responsible for the QTL. If the amylose trait demonstrates simple dominance when heterozygous for *sbe1-Mu*, it would indicate that *sbe1* is responsible for this QTL.

Materials and methods

In order to examine dominance relationship, plant homozygous for *sbe1-Mu* was crossed with a GEMS-0067/H99ae. The *sbe1-Mu* plant was in a W64A background and homozygous for *ae1*; it was obtained from Mark Campbell, Truman State University. The GEMS-0067 and H99ae stocks were the same as were used by Wu et al., (2009). Several progeny of this cross were selfed, which produced kernels of five different genotypes (Figure 2.1).

Sample kernels were randomly selected from five selfed ears. These sample kernels were sliced horizontally to separate the endosperm distal to the scutellum (Figure 2.2). The distal portions were used to assay for relative amylose content; the proximal portions were germinated to produce leaf tissue that was used to obtain DNA for genotyping. DNA extraction was done with a Genomic DNA Mini Kit (IBI Scientific, Peosta, IA) using their protocol. Genotyping of each kernel was done in two-steps. Primer pairs 1A4/1A5 and 1A4/*MuTIR* (Table 2.1) were used to distinguish the null *Mutator* allele from the alleles found in GEMS-0067 and H99ae (BLAUTH, *et al.*, 2002). Although both primer sets yield 500 bp products, 1A4/1A5 amplifies only wild-type alleles of *sbe1* while 1A4/*MuTIR* amplifies only the null

allele (Figure 2.3). In the second step, the *sbe1* alleles from GEMS-0067 (*Sbe1-G*) and H99ae (*Sbe1-H*) are distinguished by restriction digest of a 906 bp PCR product that is produced with a different primer pair (sixth SNP forward and reverse, Table 2.1). The *Sbe1-H* product has an *Alu*I restriction site, whereas the *Sbe1-G* product does not. Figure 2.4 shows the PCR products from *Sbe1-H* are cut into two smaller fragment of 617 and 289-bp by *Alu*I digestion, but the *Sbe1-G* products are not. We tested a total of 71 individual kernels of which 10 were *Sbe1:G/Sbe1:G*, 16 were *Sbe1:G/sbe1:Mu*; 10 were *Sbe1:H/Sbe1:H*, 12 were *Sbe1:H/sbe1:Mu* and 23 were *sbe1:Mu/sbe1:Mu*.

The amylose assay was performed by the dual wavelength iodine-binding method (KNUTSON, *et al.*, 1994). The isolated endosperm from each individual kernel was crushed using a mortar and pestle. Approximately 10 mg of the endosperm sample was placed in a 1.5 mL centrifuge tube and mixed with 100 uL of 3M CaCl₂ and vortexed for 60 s. After standing for 10 min, 900 uL of 6.7 x 10⁻³ M iodine diluted in dimethyl sulfoxide (DMSO) was added. The iodine-starch samples were heated to 70°C for 15 min and a 100 uL aliquot of the heated starch suspension was combined with 900 uL of DMSO 6.7 x 10⁻³ M iodine in a 15 mL tube. A volume of 8 mL of deionized water was added to the starch-DMSO-iodine solution to form an amylose-iodine complex. One milliliter of the amylose-iodine complex was placed in the cuvette and absorbance was measured at 550 nm and 620 nm using Thermo Scientific Genesys-20 spectrophotometer (Thermo Fisher Scientific, Waltham, MA). In the presence of iodine, the peak absorbance of amylose and amylopectin occurs at 620 nm and 550 nm respectively (FAJARDO, *et al.*, 2013). Three technical replicates

were measured for each sample. The A₆₂₀/A₅₅₀ ratios for each kernel was recorded and assigned to its corresponding genotype. Because the samples were from non-inbreds, care was made to insure that kernels of similar genotypes came from multiple ears. Duncan's multiple range test was done using R version 3.2.3 (R Core Team 2013).

Results

It was previously demonstrated that the null *sbe1:Mu* allele acts as a simple recessive as a heterozygote and results in a lower amylose ratio when homozygous in an *ae1* background (Blauth et al., 2002) This is in contrast to the QTL affecting amylose content, which is additive (WU, et al., 2009). If the amylose trait continues to demonstrate additivity in endosperm that are heterozygous for *sbe1-Mu*, it would indicate that some other locus, not *sbe1*, is responsible for the QTL. If the amylose trait demonstrates simple dominance when heterozygous for *sbe1-Mu*, this would indicate that *sbe1* is responsible for this QTL.

The mean A₆₂₀/A₅₅₀ ratios for each genotype are portrayed in Figure 2.5. The mean A₆₂₀/A₅₅₀ ratios of *Sbe1:G/Sbe1: G* and *Sbe1:G/sbe1:Mu* are equal to each other and are significantly higher ($P \leq 0.01$) than the other genotypes. The mean A₆₂₀/A₅₅₀ ratios of *Sbe1:H/Sbe1:H* and *Sbe1:H/sbe1:Mu* are lower than those involving *Sbe1:G* ($P \leq 0.01$) but are equal to each other. The mean A₆₂₀/A₅₅₀ ratios of *sbe1:Mu/sbe1:Mu* are significantly lower ($P \leq 0.01$) than the other four genotypes. Heterozygosity of *sbe1:Mu* with either the GEMS-0067 or H99ae *sbe1* alleles resulted in a dominance relationship relative to this trait rather than additivity.

Discussion

WU, *et al.* (2009) used the triploid model of inheritance to show that the variation in amylose content in endosperm starch between H99ae and GEMS-0067 was highly heritable. Furthermore, their models suggested a strong additive with lesser dominant component. However they were unable to explain the cause of high amylose QTL. Therefore we tried to explain whether or not *Sbe1* is the source of 5S QTL. Statistical analysis of our result shows that both *Sbe1:H* (allele associated with lower amylose) and *Sbe1:G* (allele associated with higher amylose) acts as simple dominants to the null *Sbe1:Mu* allele.

Two main pathways are involved in the production of amylose and amylopectin (JAMES, *et al.*, 2003, TETLOW, *et al.*, 2004). Granule-bound starch synthase helps in synthesis of amylose (DENYER, *et al.*, 2001, NELSON, *et al.*, 1962) and different isoforms of starch synthase, branching and debranching enzymes synthesize amylopectin. Three isoforms of starch branching enzymes have been recorded in maize: *Sbe1a*, *Sbe2a* and *Sbe2b* (DANG, *et al.*, 1989). These are encoded by *Sbe1*, *Sbe3* and *ae1* respectively. *Sbe2b*, predominates in maize endosperm and *Sbe2a* is inhibited by functional *Sbe1a* (YAO, *et al.*, 2004). During endosperm development, *Sbe1* mRNA expression peaks later than the other two isoforms of *Sbe2* (both *Sbe2a* and *Sbe2b*) mRNA (GAO, *et al.*, 1996). This differential expression suggests that *Sbe1* plays more important role in the later stage of endosperm starch synthesis. Synthesis of starch in endosperm is the result of protein-protein

interaction between starch synthesizing enzyme (JAMES, *et al.*, 2003). Zymogram analyses of maize *ae1* suggest that the interdependence of branching enzyme is a result of protein-protein interaction (COLLEONI, *et al.*, 2003). A similar result was shown in the endosperm amyloplasts of *T. aestivum*, which explains that Sbe1 and Sbe2 form phosphorylation-dependent protein complexes (TETLOW, *et al.*, 2004). However there were studies that showed that no any protein complexes were formed between Sbe1a and Sbe2b. HENNEN-BIERWAGEN, *et al.* (2009) explained that Sbe1a functioned independently and no other interaction was observed in either wildtype or mutant *ae1*.

In maize, the homozygous null allele of *sbe1* results in reduced amylose in the endosperm starch (BLAUTH, *et al.*, 2002), however the branching pattern has been changed comparison to wild type (XIA, *et al.*, 2011). It was consistent with another study done in rice where an *sbe1* null allele resulted in increased proportion of amylopectin (SATOH, *et al.*, 2003). Paradoxically a double mutant of *sbe1a* and *ae1* results in decreased amylose content in the endosperm starch (YAO, *et al.*, 2004). If this proposition holds true, then the Sbe1 protein either solely or interacting with Sbe2 should have some effect in increasing amylose in *ae1* background.

Table 2.1 Primers for genotyping sbe1 alleles.

Name of Primers	Sequence
1A4	5'-TGGGATGCGATTGCCGGGAAATACAG-3'
1A5	5'-CTCTGGAAGCTTGACGTCGATGCTC-3'
<i>MuTIR</i>	5'-AGAGAACCCAACGCCA(AT)CGCCTC(CT)ATTCGTC-3'
Sixth SNP Forward	5'-GTACACATTAAAGCATCCTCGGC-3'
Sixth SNP Reverse	5'-CTGATCATGGCTCTCAGCATATG-3'

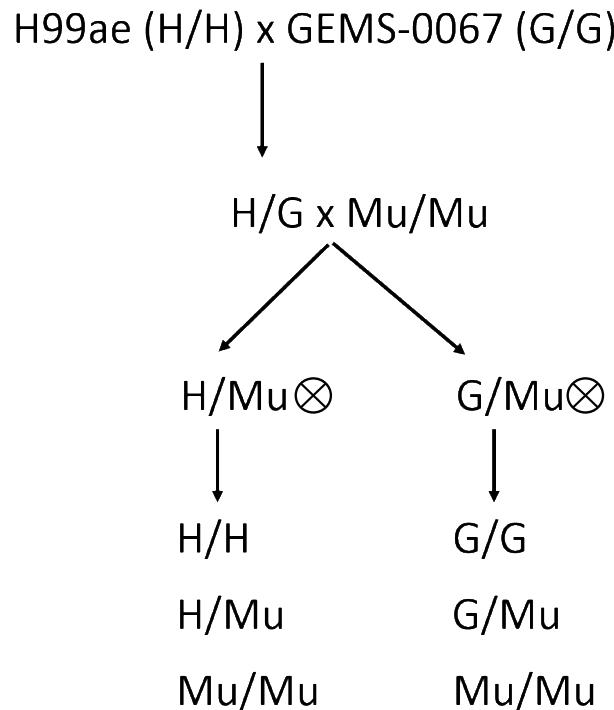


Figure 2.1 Generation of segregating population.

H/H: Plants homozygous for H99ae allele of *sbe1*; G/G: Plants homozygous for GEMS-0067 allele of *sbe1*; H/G: Plants heterozygous for H99ae and GEMS-0067 alleles of *sbe1*; H/Mu: Plants heterozygous for H99ae and null allele of *sbe1*; G/Mu: Plants heterozygous for GEMS-0067 and null alleles of *sbe1*; Mu/Mu: Plants homozygous for null allele of *sbe1*.

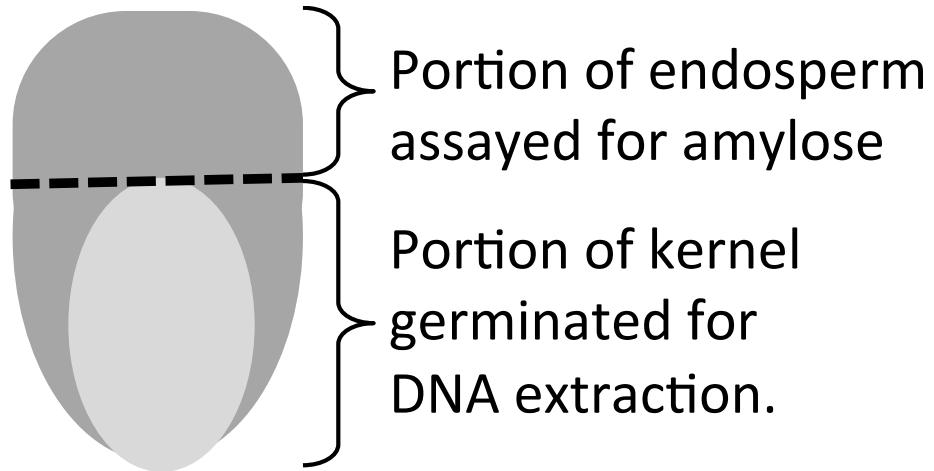


Figure 2.2 Diagram showing how kernels were separated for phenotyping and genotyping.

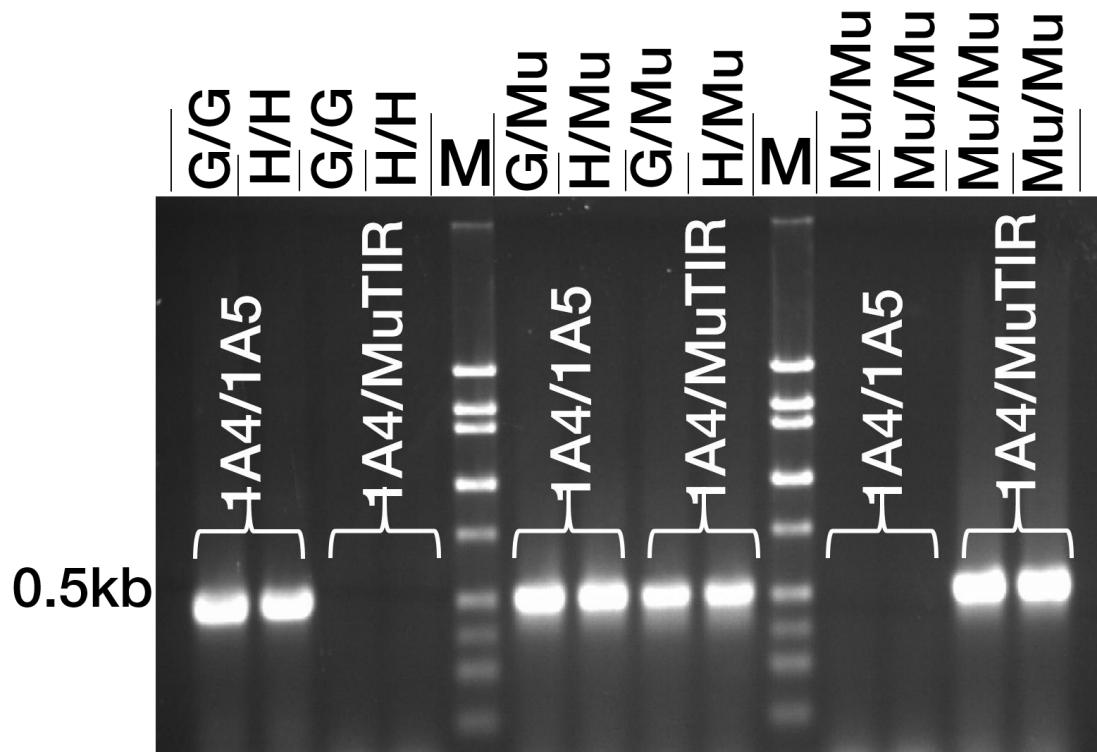


Figure 2.3 PCR genotyping of maize kernels for *sbe1-Mu* versus the wild-type alleles.

First two lanes of each group of four show the products of primer set 1A4 and 1A5, which produces a 0.5 kb band only from wild-type alleles of *sbe1*. The latter two lanes of four show products from primer set 1A4 and MuTIR, which also amplifies a 0.5 kb product, but only from the *sbe1-Mu* allele. The genotypes are indicated above each lane. G/G: homozygous for GEMS-0067 alleles (*Sbe1:G/Sbe1:G*); H/H: homozygous for H99ae alleles (*Sbe1:H/Sbe1:H*); G/Mu; heterozygous *Sbe1-G/sbe1:Mu*; H/Mu heterozygous *Sbe1:H/sbe1:Mu*; and Mu/Mu homozygous *sbe1:Mu/sbe1:Mu*. MW = 100-bp low scale DNA ladder (Thermo Fisher Scientific, Waltham, MA).

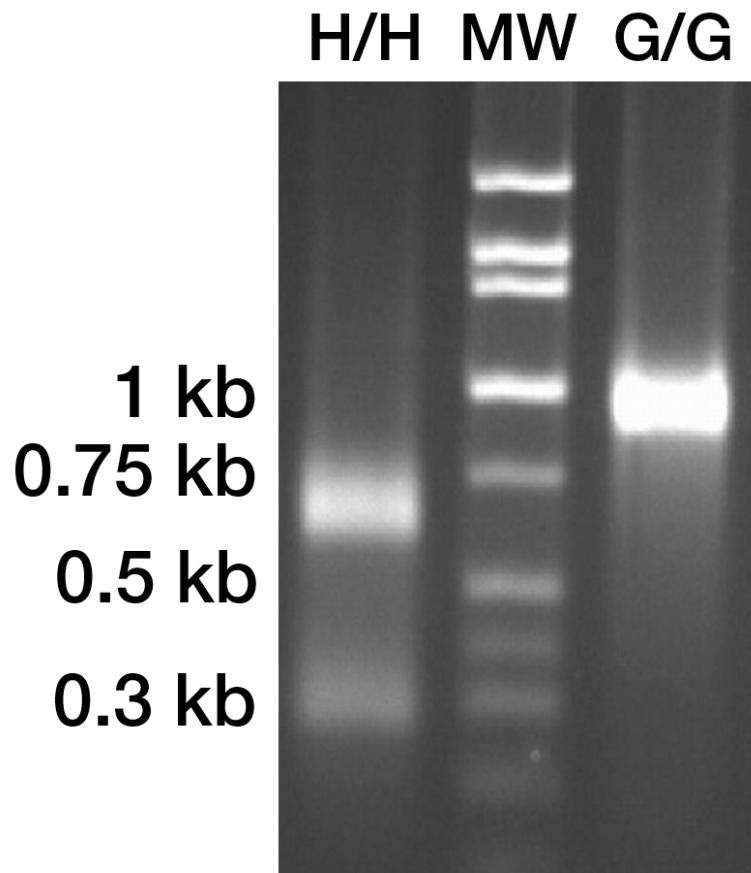


Figure 2.4 Distinguishing sbe1 alleles originating from H99ae and GEMS-0067. Lanes under H/H and G/G show PCR products using “Sixth SNP” primers (Table 2.1) that amplify an internal segment of sbe1. The left lane (H/H) was from a kernel that was homozygous for the H99ae sbe1 allele and the right lane (G/G) was from a kernel that was homozygous for the GEMS-0067 sbe1 allele. Both PCR products were digested with AluI restriction endonuclease. The 906-bp products from G/G were not cut, whereas the H/H products were cut into two smaller fragments of 617 bp and 289-bp. MW = 100-bp low scale DNA ladder (Thermo Fisher Scientific, Waltham, MA);

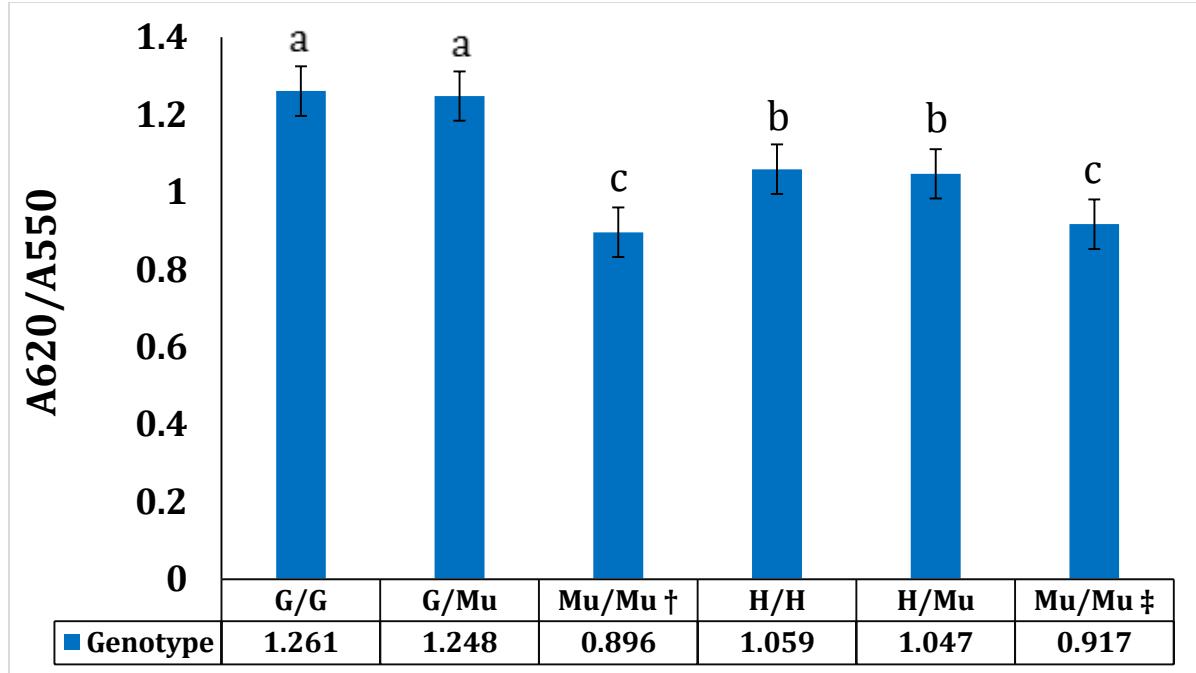


Figure 2.5 Absorbance ratios of 620 nm/550 nm per genotype. The means with the same letter are not significantly different, otherwise they are significantly different ($P<0.01$).

†: Mu/Mu plants from G/Mu self progeny. ‡: Mu/Mu plants from H/Mu self progeny.

Chapter 3 Phylogenetic analysis of *sbe1* in maize

Introduction

Maize (*Zea mays mays*) was domesticated from Mexican teosinte (*Zea mays parviglumis*) about 5000 to 10,000 year ago (MATSUOKA, *et al.*, 2002). Molecular diversity in maize is around two to five fold higher compared with other grass crops (BUCKLER, *et al.*, 2001). During domestication, much of the transformation took place in the ear (DOEBLEY, 1992). This observation was consistent with BEADLE (1939) who suggested that differences between maize and teosinte is controlled by five key traits.

Among all the traits that differ between modern maize and teosinte, kernel weight shows significant variation and it directly depends on the amount of starch that accumulates in the endosperm. Starch is composed of two forms; straight chained amylose and highly branched amylopectin (BANKS, 1975). Generally, maize endosperm starch is composed of about 25% amylose and 75% amylopectin (NELSON, *et al.*, 1995). More than 20 genes have been identified that are involved in starch synthesis (MYERS, *et al.*, 2000, NELSON, *et al.*, 1995). Enzymes encoded by *sbe1*, *ae1*, *su1* and *wx1* collectively participate in starch synthesis (FISHER, *et al.*, 1983, JAMES, *et al.*, 1995). Strong selection has been reported in *ae1* and *su1* but no evidence of selection has been demonstrated for *wx1* (WHITT, *et al.*, 2002), which may indicate that high amylopectin was the target of selection.

The published *sbe1* sequence data indicate that commercial dents are remarkably uniform (HUANG, 2012). We studied the phylogenetics and selection of *sbe1* using synonymous and nonsynonymous changes in the sequence from 17 different samples.

Methods

Sequencing of alleles

For this study we sequenced 17 varieties (Table 3.1), including two teosinte genotype; *Zea diploperennis*, *Zea mays ssp. parviflora*. The seventeen varieties were chosen to represent modern commercial variety belonging to different heterotic group. Sorghum was used as an out group for analysis (GenBank accession: EF089838). Seeds were germinated and around 1 g of leaf tissue was taken from each seedling. DNA extraction was done with a Genomic DNA Mini Kit (IBI Scientific, Peosta, IA) using their protocol.

Polymerase chain reaction (PCR) was carried out using genomic DNA as the template. Thirteen primer sets were used to sequence the transcribed region of the *sbe1* gene (Table 3.2). B73 was used as the reference genome for the design of these primers

(http://popcorn.maizegdb.org/search/project_search/project_search.php?record=1232999). Each reaction mixture contained 10 μl of GoTaq Green Master Mix (Promega, Madison, WI), 0.5 μM each of forward and reverse primer, 50 ng of DNA sample and sufficient water to make a final volume of 20 μl. All the amplification were conducted with initial denaturation at 95 °C for 5 min., followed by denaturation at 94 °C for 30 sec., annealing at 60 °C for 30 sec., extension at 72 °C for

1 min. and a final extension at 72 °C for 7 min. Denaturation, annealing and extension were repeated for 35 cycles. The PCR product was loaded onto a 0.6% general purpose agarose (MIDSCI, St. Louis, MO) gel with TAE buffer with a 100bp Low Scale DNA Ladder (Fisher BioReagents, Pittsburgh, PA). After running, the gels were stained with ethidium bromide. The amplicon of expected size was excised with razor under UV light and the gel fragment was cleaned following the protocol of the Gel/PCR DNA fragment extraction kit (IBI Scientific, Peosta, IA). The extracted DNA was then sent to Nevada Genomics Center (University of Nevada, Reno) for Sanger sequencing.

Data Analysis

The sequences were analyzed visually using Chromas v 2.0.0 software and whenever required, edited using chromatogram. Nucleotide and derived amino acid polymorphisms were detected by aligning sequences with CLUSTALW using MEGA version 7 (KUMAR S, 2016). We tested for neutrality of polymorphism using Tajima's D test (TAJIMA, 1989) and (FU, *et al.*, 1993) *F* tests as applied in DNA-SP (LIBRADO, 2009) with *S. bicolor* as outgroup. The neighbor joining (NJ) was used for tree construction and Z test of selection analyses were conducted using MEGA version 7 using bootstrap method with 1000 bootstrap replications.

Results

Nucleotide and amino acid polymorphisms

Out of a total 8550 bp DNA sequence (not shown), 174 single nucleotide polymorphisms (SNPs) (2.03 %) are observed. Most of these (79.31%) are found in

the noncoding region including 5' untranslated region (UTR) and introns. Excluding sorghum, 36 SNPs were observed in the open reading frame (ORF) (Table 3.3). Of these 36, 15 translated into amino acid polymorphism (Table 3.4).

Phylogenetic Analysis

Three phylogenetic trees of *sbe1* in genus *Zea* are constructed using *Sorghum bicolor* as the outgroup. Neighbor joining trees with 1000 bootstrap replications were made using DNA sequences (Fig 3.1), the open reading frames (Fig 3.2) and the amino acid sequences (Fig 3.3). Based upon analysis of protein domains (not shown) and SNPs in those domain, each tree can be divided into five clades. Clade I (Nueta Sweet, Mandan Black, M162W, CML 247, NC 358 and B73) share same amino acid at position 211 which is the Carbohydrate Binding Module (CBM). Mo18W and CML 277 at clade II share same amino acid at 213 (CBM), Ree Flint and Mandan Yellow Flint at clade III have same amino acid at position 70 and 490 (catalytic domain). Clade IV (*Parviglumis*, *Diploperennis*, NC 350 and GEMS-0067) share same amino acid at position 30 and 444 (catalytic domain) and the remaining (Mandan Yellow Flour, Mandan Red Clay and Bear Island) are assigned to clade V as no such significant SNPs were discovered.

Test for Selection

We used Tajima's *D* test to evaluate the role of selective process. Both coding and non-coding regions were used for this test. *D* (-1.63) was not found significant ($P > 0.05$) for whole DNA sequence meaning that the hypothesis of neutrality cannot be rejected. A similar result was found in Fu and Li's test (-2.02) with *S. bicolor* as

the outgroup. However, statistically it is very hard to detect a deviation from neutrality from these tests with the size of the sample used in this study.

We compared the synonymous and nonsynonymous polymorphism in the ORF of *sbe1* having 2474 nucleotides and 824 codons. Codon based Z test of selection indicated that the null hypothesis of strict neutrality ($d_N = d_S$) was rejected ($P = 0.00055$) in favor of the alternate hypothesis of purifying selection.

Discussion

We are interested in whether *sbe1* has been subjected to selection. For this study we used sequences of *sbe1* from 17 different genotype and SNPs detected among these seventeen genotypes are similar to the ones seen in CHEN, *et al.* (2013) and WU, *et al.* (2015).

Phylogenetic analysis reveals that clades are consistent in all three neighbor joining tree constructed using transcribed DNA, ORF and amino acid sequences (Fig 3.1, 3.2 and 3.3). Analysis of the clades, suggests that the *sbe1* alleles present in the maize lines GEMS-0067 and NC 350 are more ancestral because they occur in clade IV with teosintes. If we compare the amino acid (AA) polymorphism among the 17 varieties, we observed five polymorphic sites in the α -amylase catalytic domain of SBEI protein. Among those five AA polymorphism, a polymorphism at position 444; aspartic acid (D) is observed in all four varieties in clade IV; GEMS-0067, *Diploperennis*, *Parviglumis*, NC 350. A similar result was observed by (HUANG, 2012), when comparing *sbe1* transcripts from GEMS-0067, H99ae and B73. CHAW,

et al. (2004) and GAO, *et al.* (1996) reported that SBEI evolved prior to the divergence of monocots and dicots and is highly conserved for 140 million years.

Codon based Z test, which compares the polymorphisms that result in synonymous and non-synonymous changes in the coding sequence, indicates purifying selection in whole coding sequence of *sbe1*. A similar result has been observed with another gene involved in starch biosynthesis: *sh2*, which is indicated to be involved in a purifying selection in both cultivated and wild forms of maize (MANICACCI, *et al.*, 2007). Analyzing the maize subgenomes, (SCHNABLE, *et al.*, 2011, SCHNABLE, *et al.*, 2011) predicted that genes of subgenome 1 are subjected more to purifying selection than subgenome 2. WHITT, *et al.* (2002) proposed that because of the positions of *bt2*, *su1* and *ae1*, the selection process for these genes is still continuing for increased yield and increasing amylopectin content. Maize farmers and breeders in the past bred for high yield and increased starch content. However grain quality is also an important feature while breeding for high yield. We can see the evidence from gluten level in wheat and stickiness in rice. In maize, high amylopectin in starch influenced the pasting and gelatinization properties that could affect tortilla and porridge texture (CHEN, 1992, JANE, *et al.*, 1999, KLUCINEC, *et al.*, 2002). Therefore the selection for amylopectin would have been favored over amylose. This may be the reason why the modern maize varieties have low amylose level in the starch. Therefore we can propose that purifying selection evident in *sbe1* is turning into stabilizing selection. However this still needs to be confirmed.

Table 3.1. Name and source of all the seventeen genotypes used in our study

Name	Source
Ree Flint	PI 213764
<i>Z. m. parviflumis</i>	Ames 21894
Neuta Sweet	PI 213796
NC 358	Ames 27175
NC 350	Ames 27171
Mo 18W	PI 550441
M 162W	Ames 27134
Mandane Yellow Flour	PI 213794
Mandane Yellow Flint	PI 213800
Mandane Red Clay	PI 213807
Mandane Black	PI 213806
GEMS-0067	PI 643420
<i>Z. diploperennis</i>	PI 462368
CML 277	PI 595550
CML 247	PI 595541
Bear Island	PI 213801
B73	Transcript ID: GRMZM2G088753_T01

Table 3.2 Primers sets used for PCR amplification and their amplicon size

Primer Name	Sequence	Size
1A1 F	CCCGATGAAGTCAAGGATAGTG	572
1A1R	CCTAGCTGTCACTCCCTAGTAA	
1A2F	ATTGATGATCCGCTCCTGAAC	688
1A2R	GCTTTCTCAAGGAACTCTCGAA	
1A3F	TGCCGTGCCACTCTATT	992
1A3R	GATTGGCCTTGCGCTTG	
1B3F	TGTTCATCTAAGGCCGTTGTC	708
1B3R	CTCTCACTGTCCACCTCACTAA	
1C3F	CCGCATGTTCATTCATCACTTT	844
1C3R	TATATCGGGTGCCTGGACT	
1A4F	AACCTATAAGCAGGACACATGAA	615
1A4R	CACTGGACAGACAACACACT	
1A5F	TCTTCTGTACTGATGGTTCATAGTT	786
1A5R	CGGAAATGTTGATGATGCAGATAA	
1A6F	GCAGAAAGGATCAATTGAAGAA	945
1A6R	CTTAAATGTGTACCTGCAAACC	
1B6F	AAATGAGGGAAAGTCTTGAATCT	623
1B6R	CGACCAAACAACCAAATTATCC	
1C6F	GTCATGTCTTAGCTGAGGAG	684
1C6R	GCTCCATAACTGCCATCAA	
1A7F	AGCAATAGACCTTAGCAGACAAA	687
1A7R	ACAGCTGTGTCCAAACTGAA	
1A8F	GGCTTCGATTGATGGAGTTA	802
1A8R	CCAGGTTCAACCAAGAACATTGA	
1A9F	ACTATTGCATTCTCCTGATGGA	909
1A9R	CCTAGAATGGTGCCAGAACAA	
1A10F	CACTGATCACTTGCAGTACA	739
1A10R	AAGAAAGAACGTCGCAACAC	
1A11F	CGTTGACCAAGCGATGAATG	751
1A11R	CGGAGAAAGGACTTGAAACGA	
1A12F	ATCATATCAGGCTGTCGTGTTT	856
1A12R	GCTGAACAGCTGGAATCAAATG	
1B13F	CGAAAGCAGAGACAGGAAAGA	877
1B13R	TGACATTAGGCCACACACA	

Table 3.3 Single nucleotide polymorphism (SNP) of *Sbe1* ORF among 17 alleles from different *Zea mays*. Numbers on the top of each column shows the position of SNPs.

	88*	117	208*	413*	443*	450	504	597	627	632*	638*	692*
Ree Flint	C	C	C	G	C	G	G	A	A	G	G	G
Parviglumis	A	T	G	G	T	A	G	A	T	G	G	G
Neuta Sweet	C	C	G	G	C	G	G	A	A	T	G	G
NC 358	C	C	G	G	C	G	G	A	A	T	G	G
NC 350	A	T	G	G	C	A	G	A	T	G	G	T
Mo 18W	C	C	G	G	C	G	G	A	A	G	A	G
M 162W	C	C	G	G	C	G	G	A	A	T	G	G
M Y Flour	C	C	G	G	C	G	G	A	A	G	G	G
M Y Flint	C	C	C	G	C	G	G	A	A	G	G	G
M R Clay	C	C	G	G	C	G	G	A	A	G	G	G
M Black	C	C	G	G	C	G	G	A	A	T	G	G
GEMS-0067	A	T	G	A	T	A	G	A	T	G	G	T
Diploperennis	A	T	G	G	T	G	G	G	T	G	G	G
CML 277	C	C	G	G	C	G	A	A	A	G	A	G
CML 247	C	C	G	G	C	G	G	A	A	T	G	G
Bear Island	C	C	G	G	C	G	G	A	A	G	G	G
B73	C	C	G	G	C	G	G	A	A	T	G	G

	897	912	1210	1220*	1287	1290	1331*	1438*	1470*	1476	1542	1626
Ree Flint	G	C	T	T	G	G	C	C	A	C	G	T
Parviglumis	G	C	T	T	G	G	A	C	C	T	A	T
Neuta Sweet	G	C	T	T	G	G	C	T	C	C	G	T
NC 358	G	C	T	T	G	G	C	C	C	C	G	T
NC 350	G	C	C	T	G	A	A	C	C	T	A	T
Mo 18W	G	C	T	T	G	G	C	C	C	C	G	C
M 162W	G	C	T	T	G	G	C	C	C	C	G	T
M Y Flour	G	C	T	T	G	G	C	C	C	C	G	T
M Y Flint	G	C	T	T	G	G	C	C	A	C	G	T
M R Clay	A	T	C	T	G	G	C	C	C	C	G	T
M Black	G	C	T	T	G	G	C	C	C	C	G	T
GEMS-0067	G	C	T	C	G	A	A	C	C	T	A	T
Diploperennis	G	C	C	T	A	G	A	A	C	C	G	T
CML 277	G	C	T	T	G	G	C	C	C	C	G	T
CML 247	G	C	T	T	G	G	C	C	C	C	G	T
Bear Island	G	C	T	T	G	G	C	C	C	C	G	T
B73	G	C	T	T	G	G	C	C	C	C	G	T

	1716	1945*	1971	1980	1983	1986	1998	2186*	2238	2314*	2325	2450*
Ree Flint	T	G	G	G	C	C	C	C	G	C	G	C
Parviglumis	C	G	G	G	C	A	C	C	G	C	G	C
Neuta Sweet	T	G	G	G	C	C	C	C	G	C	G	C
NC 358	T	G	G	A	C	C	C	C	G	C	G	C
NC 350	C	G	G	G	C	A	C	C	G	C	G	A
Mo 18W	T	G	G	G	C	C	C	T	G	C	G	C
M 162W	T	A	G	G	C	C	C	C	A	C	G	C
M Y Flour	T	G	G	G	C	C	C	C	G	C	G	C
M Y Flint	T	G	G	G	C	C	C	C	G	C	G	C
M R Clay	T	G	G	G	C	C	C	C	G	C	G	C
M Black	T	G	G	G	C	C	C	C	G	C	G	C
GEMS-0067	C	G	G	G	C	A	C	C	G	C	G	C
Diploperennis	T	G	A	G	A	A	T	C	G	G	C	C
CML 277	T	G	G	G	C	C	C	C	G	C	G	C
CML 247	T	G	G	G	C	C	C	C	G	C	G	C
Bear Island	T	G	G	G	C	C	C	C	G	C	G	C
B73	T	G	G	G	C	C	C	C	G	C	G	C

* Nonsynonymous substitution

Table 3.4 Amino acid polymorphism of SBEI among 17 genotypes from different *Zea mays*. Numbers on the top of each column shows the position of AA polymorphism.

	30	70	138	148	211	213	231	407	444	480	490	649	729	772	817
Ree Flint	P	H	G	A	W	R	W	F	A	R	E	D	T	R	P
Parviglumis	T	D	G	V	W	R	W	F	D	R	D	D	T	R	P
Neuta Sweet	P	D	G	A	L	R	W	F	A	W	D	D	T	R	P
NC 358	P	D	G	A	L	R	W	F	A	R	D	D	T	R	P
NC 350	T	D	G	A	W	R	L	F	D	R	D	D	T	R	Q
Mo 18W	P	D	G	A	W	H	W	F	A	R	D	D	M	R	P
M 162W	P	D	G	A	L	R	W	F	A	R	D	N	T	R	P
M Y Flour	P	D	G	A	W	R	W	F	A	R	D	D	T	R	P
M Y Flint	P	H	G	A	W	R	W	F	A	R	E	D	T	R	P
M R Clay	P	D	G	A	W	R	W	F	A	R	D	D	T	R	P
M Black	P	D	G	A	L	R	W	F	A	R	D	D	T	R	P
GEMS-0067	T	D	E	V	W	R	L	S	D	R	D	D	T	R	P
Diploperennis	T	D	G	V	W	R	W	F	D	R	D	D	T	G	P
CML 277	P	D	G	A	W	H	W	F	A	R	D	D	T	R	P
CML 247	P	D	G	A	L	R	W	F	A	R	D	D	T	R	P
Bear Island	P	D	G	A	W	R	W	F	A	R	D	D	T	R	P
B73	P	D	G	A	L	R	W	F	A	R	D	D	T	R	P

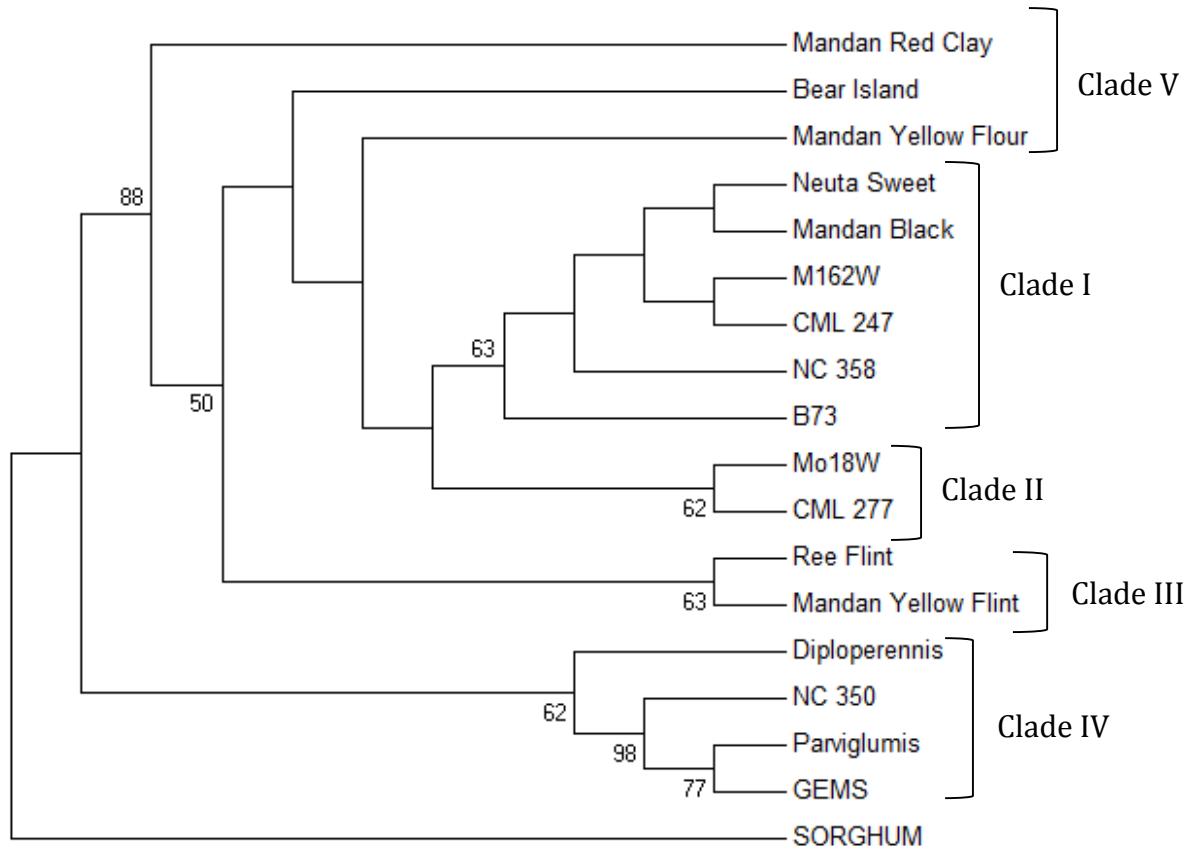


Figure 3.1 Neighbor joining tree based *sbe1* DNA sequence from 17 *Zea* accessions with *S. bicolor* as outgroup. The values above the branches are the bootstrap support of 1000 replications.

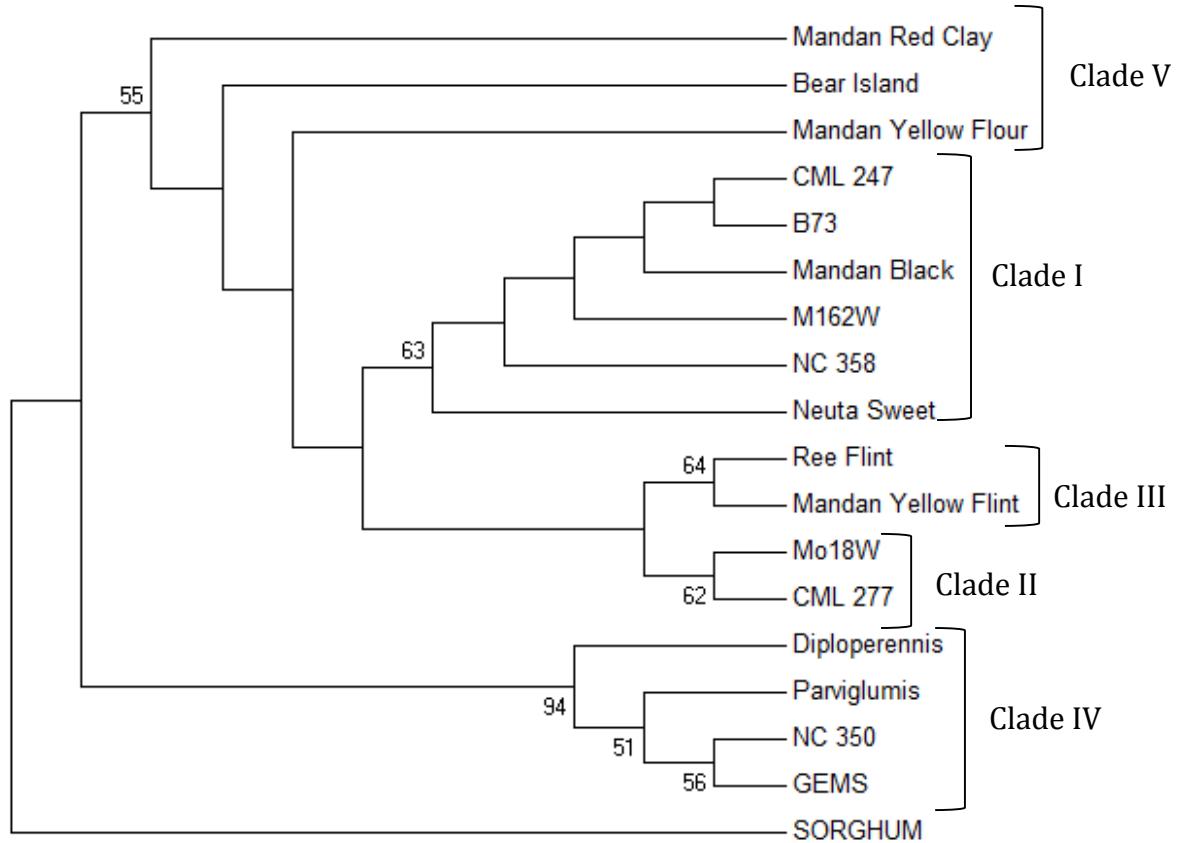


Figure 3.2 Neighbor joining tree based *sbe1* reading frame from 17 *Zea* accessions with *S. bicolor* as outgroup. The values above the branches are the bootstrap support of 1000 replications.

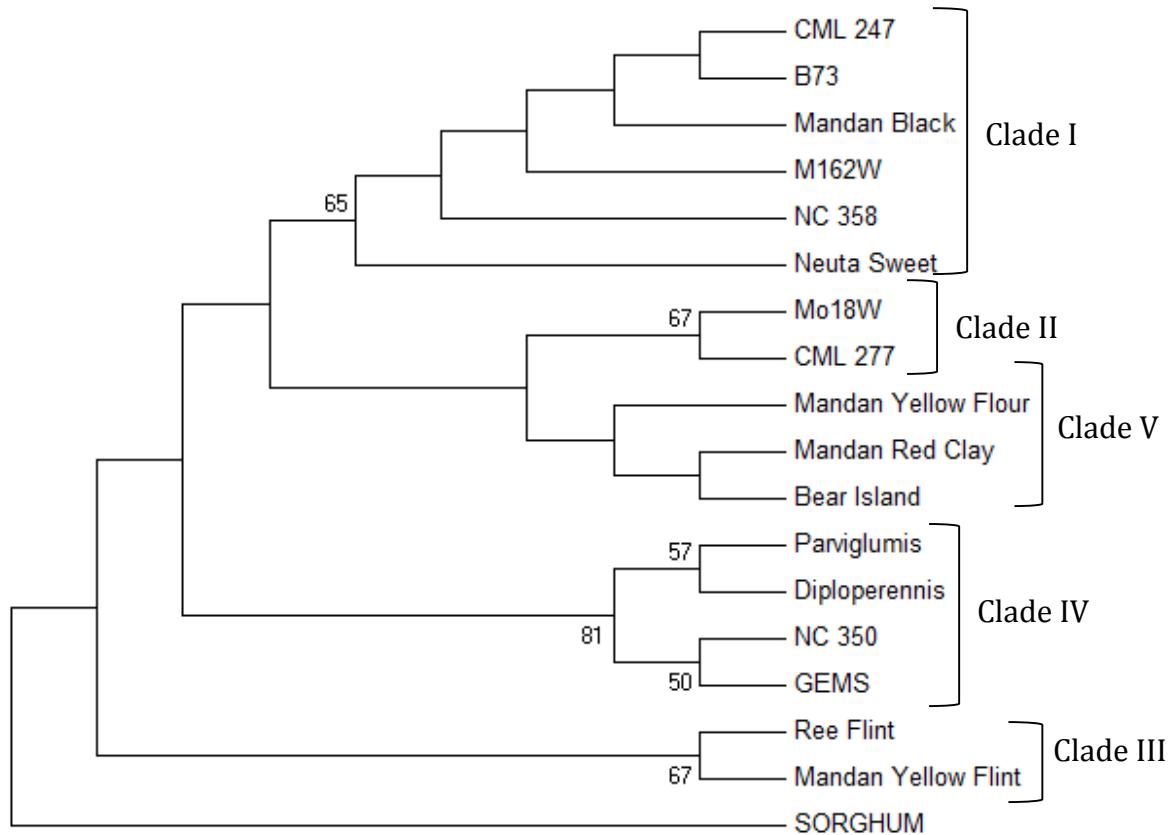


Figure 3.3 Neighbor joining tree based *sbe1* amino acid sequence from 17 *Zea* accessions with *S. bicolor* as outgroup. The values above the branches are the bootstrap support of 1000 replications.

Chapter 4 Summary and future work

Previously our lab proposed *starch branching enzyme 1 (sbe1)* as a candidate gene for high amylose endosperm starch QTL. So we were interested in knowing whether this particular enzyme is actually the source of high amylose or not. For this we introduced null allele of *sbe1* against the two wild type alleles of *sbe1* that are found in GEMS-0067 and H99ae, ultimately to produce five segregated population; G/G, G/mu, H/H, H/mu and mu/mu. Estimating the amylose content revealed that G/G and G/mu; H/H and H/mu had similar amylose content and higher than mu/mu. This was the result of dominance relationship between the wild and the mutant which led us to conclude that allelic segregation of *sbe1* is the basis for the QTL.

In most maize, amylopectin content is much higher than amylose, but GEMS-0067 is the only publicly available inbred having higher amylose than amylopectin. A previous study suggested that *sbe1* in GEMS-0067 may be more ancestral and proposed that *sbe1* in modern maize may have been selected during the improvement of maize. To validate this proposition we used *sbe1* sequence from seventeen varieties including two teosinte; *parviflumis* and *diploperennis* in our study. Phylogenetic analysis of these 17 genotypes validated that *sbe1* in GEMS-0067 along with NC 350 is ancestral as it is grouped together with *parviflumis* and *diploperennis*. We compared the synonymous and nonsynonymous polymorphism *sbe1* ORFs having 2474 nucleotides and 824 codons. Codon based Z test of selection

indicated that the null hypothesis of strict neutrality ($d_N = d_S$) was rejected ($P = 0.00055$) in favor of the alternate hypothesis of purifying selection.

Since we have now established that *sbe1* is the source of amylose QTL, future direction of this project can be focused in determining which amino acid polymorphism or combination of polymorphism is responsible for the trait. One strategy for achieving the goals would be comparing the amino acid sequence in maize varieties of high and low amylose content. Having larger sample for comparing the polymorphisms and amylose contents, we gain confidence as to what polymorphisms are important for increasing amylose content.

Another question that we could address is the relationship between amylose content and yield. During the field trial, we have observed that high amylose corn have small size kernel, which may affect the overall productivity of crop. Therefore unveiling the correlation between yield and amylose would encourage breeder to work on increasing amylose content without reduction in the yield.

References

- BANKS, W., AND C. T. GREENWOOD. 1975. Fractionation of the starch granule, and the fine structures of its components. In: Banks, W. and C.T. Greenwood, Starch and its Components. 27: 5-66. doi:10.1002/star.19750270912.
- BEADLE, G.W. 1939. Teosinte and the Origin of Maize. Journal of Heredity 30: 245-247.
- BEAR, R.P., M.L. VINEYARD, M.M. MACMASTERS and W.L. DEATHERAGE. 1958. Development of "Amylomaize"—Corn Hybrids With High Amylose Starch: II. Results of Breeding Efforts. Agronomy Journal 50: 598-602. doi:10.2134/agronj1958.00021962005000100010x.
- BEHALL, K.M. and J. HALLFRISCH. 2002. Plasma glucose and insulin reduction after consumption of breads varying in amylose content. Eur J Clin Nutr 56: 913-920. doi:10.1038/sj.ejcn.1601411.
- BLAUTH, S.L., K. KIM, J.D. KLUCINEC, J.C. SHANNON, D.B. THOMPSON and M.J. GUILTINAN. 2002. Identification of *Mutator* insertional mutants of *starch branching enzyme 1 (sbe1)* in *Zea mays* L. Plan Mol Bio 48. doi:10.1023/A:1013335217744.
- BLAUTH, S.L., K.N. KIM, J. KLUCINEC, J.C. SHANNON, D. THOMPSON and M. GUILTINAN. 2002. Identification of *Mutator* insertional mutants of *starch-branched enzyme 1 (sbe1)* in *Zea mays* L. Plant Mol Biol 48: 287-297. doi:10.1023/a:1013335217744.
- BOYER, C.D. and J. PREISS. 1978. Multiple forms of (1,4)- α -D-glucan-6-glucosyl transferase from developing *Zea Mays* L. kernels. Carbohydr Res 61. doi:10.1016/S0008-6215(00)84492-4.
- BUCKLER, E.S., J.M. THORNSBERRY and S. KRESOVICH. 2001. Molecular Diversity, Structure and Domestication of Grasses. Genet. Res. 77: 213-218.
- CAMPBELL, M.R., J.-L. JANE, L. POLLAK, M. BLANCO and A. O'BRIEN. 2007. Registration of Maize Germplasm Line GEMS-0067 All rights reserved. . J. Plant Reg. 1: 60-61. doi:10.3198/jpr2006.10.0640crg.
- CHAO, S., P.J. SHARP, A.J. WORLAND, E.J. WARHAM, R.M. KOEBNER and M.D. GALE. 1989. RFLP-based genetic maps of wheat homoeologous group 7 chromosomes. TAG. Theoretical and applied genetics. Theoretische und angewandte Genetik 78: 495-504. doi:10.1007/bf00290833.
- CHAW, S.M., C.C. CHANG, H.L. CHEN and W.H. LI. 2004. Dating the monocot-dicot divergence and the origin of core eudicots using whole chloroplast genomes. J Mol Evol 58. doi:10.1007/s00239-003-2564-9.
- CHEN, J.-L.J.A.J.-F. 1992. Effect of Amylose Molecular Size and Amylopectin Branch Chain Length on Paste Properties of Starch. Cereal Chem 69: 60-65.

- CHEN, T., L. NING, X. LIU, D. CUI, H. ZHANG, D. LI et al., 2013. Development of Functional Molecular Markers of I and IIb for the High Amylose Maize Germplasm Line GEMS-0067. *Crop Science* 53: 482-490. doi:10.2135/cropsci2012.06.0386.
- COLLEONI, C., A.M. MYERS and M.G. JAMES. 2003. One- and two-dimensional native PAGE activity gel analyses of maize endosperm proteins reveal functional interactions between specific starch metabolizing enzymes. *Journal of Applied Glycoscience* 50: 207-212. doi:<http://doi.org/10.5458/jag.50.207>.
- DANG, P.L. and C.D. BOYER. 1989. Comparison of soluble starch synthases and branching enzymes from leaves and kernels of normal and amylose-extender maize. *Biochem Genet* 27: 521-532.
- DENYER, K.A.Y., P. JOHNSON, S. ZEEMAN and A.M. SMITH. 2001. The control of amylose synthesis. *Journal of Plant Physiology* 158: 479-487. doi:<http://dx.doi.org/10.1078/0176-1617-00360>.
- DOEBLEY, J. 1992. Mapping the genes that made maize.. *Trends in genetics* 8: 302-307.
- FAJARDO, D., S.S. JAYANTY and S.H. JANSKY. 2013. Rapid high throughput amylose determination in freeze dried potato tuber samples. *J Vis Exp*. doi:10.3791/50407.
- FASAHAT, P., S. RAHMAN and W. RATNAM. 2014. Genetic controls on starch amylose content in wheat and rice grains. *J Genet* 93: 279-292. doi:10.1007/s12041-014-0325-8.
- FERGASON, V. 2000. High Amylose and Waxy Corns. *Specialty Corns*, Second Editioin. CRC Press, Boca Raton, FL. p. 63-84.
- FISHER, M.B. and C.D. BOYER. 1983. Immunological Characterization of Maize Starch Branching Enzymes. *Plant Physiology* 72: 813-816.
- FU, Y.A. and W. LI. 1993. Statistical tests of neutrality of mutations. *Genetics* 133: 693-709.
- GAO, M., D.K. FISHER, K.N. KIM, J.C. SHANNON and M.J. GUILTINAN. 1996. Evolutionary conservation and expression patterns of maize starch branching enzyme I and IIb genes suggests isoform specialization. *Plant Mol Biol* 30. doi:10.1007/BF00019554.
- GUAN, H.P. and J. PREISS. 1993. Differentiation of the Properties of the Branching Isozymes from Maize (*Zea mays*). *Plant Physiology* 102: 1269-1273. doi:10.1104/pp.102.4.1269.
- HAN, Y., F.-J. SUN, S. ROSALES-MENDOZA and S.S. KORBAN. 2007. Three orthologs in rice, *Arabidopsis*, and *Populus* encoding starch branching enzymes (SBEs) are different from other SBE gene families in plants. *Gene* 401: 123-130. doi:<http://dx.doi.org/10.1016/j.gene.2007.06.026>.
- HELM, J.L., V.L. FERGASON and M.S. ZUBER. 1967. Development of High-Amylose Corn (*Zea mays* L.) by the Backcross Method. *Crop Science* 7: 659-662. doi:10.2135/cropsci1967.0011183X000700060030x.

- HENNEN-BIERWAGEN, T.A., Q. LIN, F. GRIMAUD, V. PLANCHOT, P.L. KEELING, M.G. JAMES et al.. 2009. Proteins from multiple metabolic pathways associate with starch biosynthetic enzymes in high molecular weight complexes: a model for regulation of carbon allocation in maize amyloplasts. *Plant Physiol* 149: 1541-1559. doi:10.1104/pp.109.135293.
- HUANG, R. 2012. The functional genomics of maize gametophyte mutants and analysis of *sbe1* gene. Thesis (M.S.) Biology and Microbiology Dep., South Dakota State University.
- JAMES, M.G., K. DENYER and A.M. MYERS. 2003. Starch synthesis in the cereal endosperm. *Current Opinion in Plant Biology* 6: 215-222. doi:[http://dx.doi.org/10.1016/S1369-5266\(03\)00042-6](http://dx.doi.org/10.1016/S1369-5266(03)00042-6).
- JAMES, M.G., D.S. ROBERTSON and A.M. MYERS. 1995. Characterization of the maize gene *sugary1*, a determinant of starch composition in kernels. *The Plant Cell* 7: 417-429. doi:10.1105/tpc.7.4.417.
- JANE, J., Y.Y. CHEN, L.F. LEE, A.E. MCPHERSON, K.S. WONG, M. RADOSAVLJEVIC et al.,. 1999. Effects of Amylopectin Branch Chain Length and Amylose Content on the Gelatinization and Pasting Properties of Starch. *Cereal Chemistry Journal* 76: 629-637. doi:10.1094/CCHEM.1999.76.5.629.
- KLUCINEC, J.D. and D.B. THOMPSON. 2002. Amylopectin Nature and Amylose-to-Amylopectin Ratio as Influences on the Behavior of Gels of Dispersed Starch. *Cereal Chemistry Journal* 79: 24-35. doi:10.1094/CCHEM.2002.79.1.24.
- KNUTSON, C.A. and M.J. GROVE. 1994. Rapid method for estimation of amylose in maize starches. *Cereal Chemistry* 71: 469-471.
- KRAMER, H.H., P.L. PFAHLER and R.L. WHISTLER. 1958. Gene Interactions in Maize Affecting Endosperm Properties. *Agronomy Journal* 50: 207-210. doi:10.2134/agronj1958.00021962005000040011x.
- KUMAR S, S.G., AND TAMURA K. 2016. MEGA7: Molecular Evolutionary Genetics Analysis version7.0 for bigger datasets. *Molecular Biology and Evolution*.
- LIBRADO, P.A.R., J. 2009. DnaSP v5: A software for comprehensive analysis of DNA polymorphism data. *Bioinformatics* 25: 1451-1452.
- MANICACCI, D., M. FALQUE, S. LE GUILLOU, B. PIÉGU, A.M. HENRY, M. LE GUILLOUX et al.,. 2007. Maize *Sh2* gene is constrained by natural selection but escaped domestication. *Journal of Evolutionary Biology* 20: 503-516. doi:10.1111/j.1420-9101.2006.01264.x.
- MATSUOKA, Y., Y. VIGOUROUX, M.M. GOODMAN, G.J. SANCHEZ, E.S. BUCKLER and J. DOEBLEY. 2002. A single domestication for maize shown by multilocus microsatellite genotyping. *Proc Natl Acad Sci* 99: 6080-6084.
- MIAO, M., R. LI, B. JIANG, S.W. CUI, K. LU and T. ZHANG. 2014. Structure and digestibility of endosperm water-soluble α -glucans from different sugary maize

- mutants. *Food Chemistry* 143: 156-162.
doi:<http://dx.doi.org/10.1016/j.foodchem.2013.07.109>.
- MYERS, A.M., M.K. MORELL, M.G. JAMES and S.G. BALL. 2000. Recent Progress toward Understanding Biosynthesis of the Amylopectin Crystal. *Plant Physiology* 122: 989-998. doi:10.1104/pp.122.4.989.
- NELSON, O. and D. PAN. 1995. Starch Synthesis in Maize Endosperms. Annual Review of Plant Physiology and Plant Molecular Biology 46: 475-496. doi:10.1146/annurev.pp.46.060195.002355.
- NELSON, O.E. and H.W. RINES. 1962. The enzymatic deficiency in the waxy mutant of maize. *Biochemical and biophysical research communications* 9: 297-300.
- PATRON, N.J., A.M. SMITH, B.F. FAHY, C.M. HYLTON, M.J. NALDRETT, B.G. ROSSNAGEL et al.,. 2002. The Altered Pattern of Amylose Accumulation in the Endosperm of Low-Amylose Barley Cultivars Is Attributable to a Single Mutant Allele of Granule-Bound Starch Synthase I with a Deletion in the 5' -Non-Coding Region. *Plant Physiology* 130: 190-198. doi:10.1104/pp.005454.
- SATOH, H., A. NISHI, K. YAMASHITA, Y. TAKEMOTO, Y. TANAKA, Y. HOSAKA et al.,. 2003. Starch-Branching Enzyme I-Deficient Mutation Specifically Affects the Structure and Properties of Starch in Rice Endosperm. *Plant Physiology* 133: 1111-1121. doi:10.1104/pp.103.021527.
- SCHNABLE, J.C. and M. FREELING. 2011. Genes Identified by Visible Mutant Phenotypes Show Increased Bias toward One of Two Subgenomes of Maize. *PLoS ONE* 6: e17855. doi:10.1371/journal.pone.0017855.
- SCHNABLE, J.C., N.M. SPRINGER and M. FREELING. 2011. Differentiation of the maize subgenomes by genome dominance and both ancient and ongoing gene loss. *Proceedings of the National Academy of Sciences* 108: 4069-4074. doi:10.1073/pnas.1101368108.
- SINGH, N., A. KAUR and K. SHEVKANI. 2014. Maize: Grain Structure, Composition, Milling, and Starch Characteristics. In: D. P. Chaudhary, S. Kumar and S. Langyan, editors, *Maize: Nutrition Dynamics and Novel Uses*. Springer India. p. 65-76.
- SLATTERY, C.J., I.H. KAVAKLI and T.W. OKITA. 2000. Engineering starch for increased quantity and quality. *Trends in Plant Science* 5: 291-298. doi:[http://dx.doi.org/10.1016/S1360-1385\(00\)01657-5](http://dx.doi.org/10.1016/S1360-1385(00)01657-5).
- STINARD, P.S., D.S. ROBERTSON and P.S. SCHNABLE. 1993. Genetic Isolation, Cloning, and Analysis of a Mutator-Induced, Dominant Antimorph of the Maize amylose extender1 Locus. *The Plant Cell* 5: 1555-1566.
- TAJIMA, F. 1989. Statistical method for testing the neutral mutation hypothesis by DNA polymorphism. *Genetics* 123: 585-595.
- TAKEDA, Y., T. SHITAOZONO and S. HIZUKURI. 1988. Molecular Structure of Corn Starch. *Starch - Stärke* 40: 51-54. doi:10.1002/star.19880400204.

- TETLOW, I.J., M.K. MORELL and M.J. EMES. 2004. Recent developments in understanding the regulation of starch metabolism in higher plants. *Journal of Experimental Botany* 55: 2131-2145.
- TETLOW, I.J., R. WAIT, Z. LU, R. AKKASAENG, C.G. BOWSHER, S. ESPOSITO et al., 2004. Protein phosphorylation in amyloplasts regulates starch branching enzyme activity and protein-protein interactions. *Plant Cell* 16: 694-708. doi:10.1105/tpc.017400.
- TSAI, C.-Y. 1974. The function of the Waxy locus in starch synthesis in maize endosperm. *Biochemical Genetics* 11: 83-96. doi:10.1007/BF00485766.
- VINEYARD, M.L., R.P. BEAR, M.M. MACMASTERS and W.L. DEATHERAGE. 1958. Development of "Amylomaize"—Corn Hybrids With High Amylose Starch: I. Genetic Considerations. *Agronomy Journal* 50: 595-598. doi:10.2134/agronj1958.00021962005000100009x.
- WHITT, S.R., L.M. WILSON, M.I. TENAILLON, B.S. GAUT and E.S. BUCKLER. 2002. Genetic Diversity and Selection in the Maize Starch Pathway. *Proceedings of the National Academy of Sciences of the United States of America* 99: 12959-12962.
- WU, Y., M. CAMPBELL, Y. YEN, Z. WICKS, III and A.H. IBRAHIM. 2009. Genetic analysis of high amylose content in maize (*Zea mays L.*) using a triploid endosperm model. *Euphytica* 166: 155-164. doi:10.1007/s10681-008-9798-y.
- WU, Y., R. HUANG, D. AUGER, M. CAMPBELL and Y. YEN. 2015. A High-amylase Modifier Locus Revealed by Analysis of a Homozygous Amylose-extender Mapping Population. *Crop Science* 55: 1163-1169. doi:10.2135/cropsci2014.10.0676.
- XIA, H., M. YANDEAU-NELSON, D.B. THOMPSON and M.J. GUILTINAN. 2011. Deficiency of maize starch-branched enzyme i results in altered starch fine structure, decreased digestibility and reduced coleoptile growth during germination. *BMC Plant Biology* 11: 1-13. doi:10.1186/1471-2229-11-95.
- YAO, Y., D.B. THOMPSON and M.J. GUILTINAN. 2004. Maize Starch-Branching Enzyme Isoforms and Amylopectin Structure. In the Absence of Starch-Branching Enzyme IIb, the Further Absence of Starch-Branching Enzyme Ia Leads to Increased Branching. *Plant Physiology* 136: 3515-3523. doi:10.1104/pp.104.043315.
- YEH, J.Y., D.L. GARWOOD and J.C. SHANNON. 1981. Characterization of Starch from Maize Endosperm Mutants. *Starch - Stärke* 33: 222-230. doi:10.1002/star.19810330703.
- ZUBER, M.S., C.O. GROGAN, W.L. DEATHERAGE, J.E. HUBBARD, W.E. SCHULZE and M.M. MACMASTERS. 1958. Breeding High Amylose Corn. *Agronomy Journal* 50: 9-12. doi:10.2134/agronj1958.00021962005000010003x.

Appendix

Appendix 1. Absorbance at 550 nm and 620 nm

Genotype	Source	620/550	Genotype	Source	620/550
G/G	G/Mu x G/Mu	1.265051	H/H	H/Mu x H/Mu	1.045089
G/G	G/Mu x G/Mu	1.28621	H/H	H/Mu x H/Mu	1.019286
G/G	G/Mu x G/Mu	1.253089	H/H	H/Mu x H/Mu	1.030357
G/G	G/Mu x G/Mu	1.231185	H/H	H/Mu x H/Mu	1.087193
G/G	G/Mu x G/Mu	1.28391	H/H	H/Mu x H/Mu	1.079758
G/G	G/Mu x G/Mu	1.267436	H/H	H/Mu x H/Mu	1.064552
G/G	G/Mu x G/Mu	1.252882	H/H	H/Mu x H/Mu	1.061153
G/G	G/Mu x G/Mu	1.261297	H/H	H/Mu x H/Mu	1.067246
G/G	G/Mu x G/Mu	1.272921	H/H	H/Mu x H/Mu	1.073904
G/G	G/Mu x G/Mu	1.236246	H/H	H/Mu x H/Mu	1.065122
G/Mu	G/Mu x G/Mu	1.257426	H/mu	H/Mu x H/Mu	1.039941
G/Mu	G/Mu x G/Mu	1.242699	H/mu	H/Mu x H/Mu	1.02637
G/Mu	G/Mu x G/Mu	1.264357	H/mu	H/Mu x H/Mu	1.012863
G/Mu	G/Mu x G/Mu	1.264706	H/mu	H/Mu x H/Mu	1.081569
G/Mu	G/Mu x G/Mu	1.23945	H/mu	H/Mu x H/Mu	1.029377
G/Mu	G/Mu x G/Mu	1.244009	H/mu	H/Mu x H/Mu	1.019777
G/Mu	G/Mu x G/Mu	1.249462	H/mu	H/Mu x H/Mu	1.060144
G/Mu	G/Mu x G/Mu	1.238901	H/mu	H/Mu x H/Mu	1.096954
G/Mu	G/Mu x G/Mu	1.230723	H/mu	H/Mu x H/Mu	1.059343
G/Mu	G/Mu x G/Mu	1.266304	H/mu	H/Mu x H/Mu	1.034157
G/Mu	G/Mu x G/Mu	1.256987	H/mu	H/Mu x H/Mu	1.044248
G/Mu	G/Mu x G/Mu	1.242849	H/mu	H/Mu x H/Mu	1.059524
G/Mu	G/Mu x G/Mu	1.274676	mu/mu	H/Mu x H/Mu	0.927031
G/Mu	G/Mu x G/Mu	1.212166	mu/mu	H/Mu x H/Mu	0.898392
G/Mu	G/Mu x G/Mu	1.253968	mu/mu	H/Mu x H/Mu	0.870982
G/Mu	G/Mu x G/Mu	1.238271	mu/mu	H/Mu x H/Mu	0.939048
Mu/Mu	G/Mu x G/Mu	0.903191	mu/mu	H/Mu x H/Mu	0.933836
Mu/Mu	G/Mu x G/Mu	0.917277	mu/mu	H/Mu x H/Mu	0.927176
Mu/Mu	G/Mu x G/Mu	0.867851	mu/mu	H/Mu x H/Mu	0.938621
Mu/Mu	G/Mu x G/Mu	0.923111	mu/mu	H/Mu x H/Mu	0.93626
Mu/Mu	G/Mu x G/Mu	0.899613	mu/mu	H/Mu x H/Mu	0.922838
Mu/Mu	G/Mu x G/Mu	0.912054	mu/mu	H/Mu x H/Mu	0.902868
Mu/Mu	G/Mu x G/Mu	0.898408	mu/mu	H/Mu x H/Mu	0.908517
Mu/Mu	G/Mu x G/Mu	0.862646	mu/mu	H/Mu x H/Mu	0.912213
Mu/Mu	G/Mu x G/Mu	0.869996	mu/mu	H/Mu x H/Mu	0.905512
Mu/Mu	G/Mu x G/Mu	0.913892			

Appendix 2. DNA sequence from seventeen varieties

>B73

GTCGACTGCCCTAGACCCGATGAAGTCAAGGATAGTGAGCGCCAACCAAGTTAGGCTCCCCAGCCAGATGATCATGTTA
GGTGTTCACGCCATAAAAGAAAGCGTCCGTGATGTCGTACTTGGGGCGGTGAATACGTAAGGGACAGATGCTCATATACC
TTCATCTGTTTACTCGAAATTACTAATGTTTCCCTATGTCAGCTAAAGTCAAATCTCACCCGACCAATCTGCAGATTGTGAA
TGACTTGAAGTTACCGTAACCATGCTGTGGAACCCATCAATGAAAAGCTGCACATGATATCCGAGAACATCAAAAGCGTGA
GAAGGGAAAGAGGAAAACGAATGATGATAGCTGCATCAGTCACCAACATCCTGACCAGGGTCATCAGTGGGATTGATGATCC
GCTCCTGAACGGAAGCTTGAGTGACAACACAGCGTCCAAAGAAAGCACGGAGGCAGCCAGGAAATCAGGCTATGCAAGCCAGA
GAGCGGTGGGGAGAGCAGCGACCATGCCCTAGCGGGTTGAGATCCGAGGGAACAGATGGATTACTAGGGAGTGACAGCTAGG
AGCAATCTGAGGAGATACTATGTAATGTCACAGGAGTTGCCCTGTTGATGTGCGATAACCAGGGCAGTGGGTTCTGAGCGT
AAGACGAGGTCTAGCAATGATATGTTGAGCGTACTAAATCGAGATGAGCAATCAGGTTGTTGCTGTTGATTCTTCGGC
TGACCATTGCGCTGCTGAGGCCCTGATCCTGTATTGAGATGTCAGGCCTACTTAGAGCAAATGCTGGAAGGAAGCAATGTGCC
TGTTCTGAGGTCCCTCCAGCATCACTGTAATTGTAAGTACTCAAGTACAGACTAGAACTAGTCATGCATACCAGAAGAACAG
ATAGATGTTTCAAGAAGTTGAGGCCCTGAGATGCCGTGCCACTCTATTGCTCTGTTCATGCTTGCCATTATATACACTATT
TCACTGTTCAATTCTAAGGCCCTGTCACACGGTACCAAGAGCAGAACACCTTTACGTTCTTGTGCTATGGATGGAC
TTCGAGAGTTCCCTGAGAAAGCACTCTCATCTATCTTCAATTCTGTTGATCCTGATCACTGAAGATGCCATT
TGATTTCACTTCAAGTTATATAAGTAAGACGGTTGTCACGCCAATATGTAAGTCAAGATGAGCTACACTGCA
AGGAACCCAAGAAAAAACACAGGTAAGTTGTCAGTGACACGGCTAGAGCTGTGACGATGAGACTCCGCATGT
TCATTCACTTTAATTGTTAGAAAAGCTACACAAAAAGCACATCAGAAAAAGAACAGTATTAGGTACTACT
AGTGCAACTGCAATAATGATGATAAAATCTGCACAAGCCATAGCTATGCTATAGCTATGTACACAAA
AAATACATTGCTATTGCTATTGCTACCGCTAGTATAATATCCATGTCTGCTACAACACACAATCATATTAAACCTATAAA
AAAATAATTAAATATTAAAACATATGGCCACACCATATATTAAACTGCTAAAACAAATATTATAACTCATTGATCG
TTCATCCTCTTCCGGTTAGTGAGGTGGACAGTGAGAGCGCTGCATCGTGTATTGGGTTGACTGGTTCTCAGGCTCATCTGT
GTTGTAACGACCTATCTATGGTCAAACAAACTATTAGGATTATTGTTAGGCGAAAATGAGGGAGATAAAACCTATAAGCA
GGACACATGAAACATATGCTTAAACAGTAGAGATTAACAACATAAAATAAAAAGGCAAACCGGGAGCGTGCAAGCCAAA
GCCAATCGGCCAGAACAGCTCCACGGTTGTCGTCCGCCACGTGGCACGCCGCCATTCCGGGCCACAGATCCGGCTC
AGGGTCATGTGCCACTGCCATGGCCCCCTCCTGTCGCAGCGGAGATTGCGACGGGAAGAAAGGTGAGGAGACCAAGCGAAAA

AAATCACGCTTCATTGCGAGGGGGAGGATAGGGAGGAAGACCCAAGCCAGCTCCAGTCCGGCACCGATATAAGCGGCAG
GCACTTGGATTGCTGACGAGATGGACTCACACGCCGTACAATGCTGTGCCTCGTCGCCCTCTCCTGCCGACTCCGCTTCC
GCCGCCGCCGCGCTCGCTCGCATGCTGATCGGGCGGCCGCCGGGATCGCGTAAGCTGCCGATCCGGGGCTGGTGG
TTTACTACTTTGCTTTTTCTTCTGTACTGATGGTCATAGTTCGCAGGGTGGCGCAATGTGCCCTGAGTGTGTTCT
GTCCAGTGCAAGGCTGCCGGTCAGGGTGCAGAAGGTAGATCTTCCCCAGATTAGAACACGTTGTTACGGACAAAATGGAATT
TGGTAGTAGTTGGAGAGAGAAAAAAACTCTGAAATTGTTGAGATTGGGCTCGCTCGCTTGGATTGGCTCTAGTGCTT
TGTTATCAGTAGTAATCATTACCAAGTCTAGCGGATCTCAGATTCAACTGAAGTTGTTAAATTGGTGGTTGGTTTTCTT
CAGCCATCCTAACATCATTATTACATAATAATTAGTTGAAATAAAAGTGCATATTGATATTCTGTGTTGCTGCAGCAGCTAA
TTAGCTTCACTACATTCACGTGTTAGCTCTATTGCTCGTGTAAATTCTGAATCTGGCTTAACGCACTGTGCAAGGTCAAGAG
CAAATTGCCACTGCAGCTACTGTGCAAGAAGATAAAACTATGGCAACTGCCAAGGGCAGTCGACCCTCCTCCATATACGAC
CTGGACCCCAGCTGGAGATATTCAAGGACCATTTCAGGTACCGGATGAAAAGATTCTCTAGAGCAGAAAGGATCAATTGAAGAA
AATGAGGGAAAGTCTGAATCTTTCTAAAGGTTAGGCTTAATACATTCAAATGCTAACATACAAGGACCATTTCACAATATTAT
AGCACCTGCCATGCCGAAAATATTATCTGCATCATCACAAACATTCCGGATTGGTATTGGCTATTGAAATTGGGA
TTAATACAAATGAGGAGTGAACGTATATCGTGAATGGGCACCTGCTGCCAGTAAGTTCTAACATGTCATGCAAACATGATG
TACTGGCGGGGTATCGTTTCCCATTGCTGTGAAGAGATATCGTGTAGTAACATTAAATTAAAGGAAACAGCTA
AAACACAGGAGAGTAATCAATGTTGGAGTAGAAAACGTTGGATATTCTTGTGCAAGACTGTCTAGCTGA
GGAGGCTATTGACTTGAGTTTACTCATGGGTGAGGAGCTATTGGTCAATGACTGGAATGGTCAAACACCATA
AGATGGAGAAGGATAAATTGGTGTGATCAAATTGACCATGTCAAAGGGAAACCTGCCATCCCTACAATTCCAAGG
TTAAATTGCTTCTACATGGTGGAGTATGGGTGATCGTATTCCAGCATTGATTGCTATGCCACTGTTGATGCCCTCAAATT
TGGAGCTCCCTATGATGGTGTGATTGGATCCTCCTGCTGAAAGGCTCTTCTACTGTCCTGGACCACATTGTAACCTTA
AGCAATAGACCTTAGCAGACAAAAATTATGACAAAATTATAGTACCTTACCTCTGGTTGAGGTACACATTAAAGCATCC
TCGGCCTCAAAGCCTGCTGCCACGTATCTGAAGGCCATGTAGGTATGAGTGGGAGGAGCTATTGGTCAATGACTGGAATGGTCAAAC
GAATTGAGACAATGTGTTGCCACGCATACGAGCAAATAACTACAACACAGTTGAGTGGCAGTTGAGGACCTCAAATATCTGTTG
TATGCTTCTTCGGGTACCATGTCAGAAATTCTTGCAGGTTAGCAGCAGATCAGGCACACCAGAGGACCTCAAATATCTGTTG
ATAAGGCACACAGTTGGGTTGCGAGTTCTGATGGATGTTGTCATGCCATGCCAGTAATAATGTCACAGATGGTTAAATG
GCTATGATGTTGGACAAAGCACCCAAAGAGTCCTATTTCATGCCAGGAGATAGAGGTTATCAAAACTTGGGATAGTCGGCTGT
TCAACTATGCTAACTGGGAGGTATTAAGGTTCTTCTTAACCTGAGATATTGGTGGATGAATTGATGTTGATGGCTTCCG
ATTGATGGAGTTACATCAATGCTGATCATCACCATGGTATCAATGTGGGTTACTGGAAACTACCAGGAATATTTCAGTT
GGACACAGCTGTGGATGCAGTTGTTACATGATGCTGCAAACCATTAAATGCACAAACTCTGCCAGAAGCAACTGTTGTTGCT

GAAGATGTTCAGGCATGCCGGCTTGCAGCCAGTGATGAAGGTGGGTTGGTTGACTATGCCCTGGCAATGGCTATCC
CTGATAGATGGATTGACTACCTGAAGAATAAGATGACTCTGAGTGGTCATGGTGAAATAGCGCATACTTGACTAACAGGA
GATATACTGAAAATGCATCGCATATGCTGAGAGCCATGATCAGGTACCTGCATTATATAACTTATAAGGAAGTATAGT
TGGATGCAGCAAAGTATTTATTCCTGTGGGGTAGACAAACACATGGGCAAGTATCTTTAATCAGACAGTACTATATTCA
TCACATTTCTATCCTGATTGCTAGTACTGGATTAGTTATTCAAAAAAATTAGGCCCTCCTAAGCATGTTAAGAATTGCAAT
CACATATGACCTGTTATCTTAACTGGAAATTAAATCATGCAAATTTCAGTCTATTGTTGGCACAAGAACTATTGCATTCT
CCTGATGGACAAGGAAATGTACACTGGCATGTCAGACTTGCAGCCTGCTCACCTACAATTGATCGAGGGATTGCACTCCAAAAG
GTTCCATTCTCCTCAAGTTCTGGTTGAACCTGGTTCAATAATTCTGAATGAGTTCCCTCAATATACTTGCTTATTGTGTT
TGTACACTCCAGATGATTCACTCACAATGCCCTGGAGGTGATGGCTACTTGAATTGAGGTTACCTGCTTATTGTGTT
GGTCTTTGAAAATGTTCCCATTAAATAAGCCTGCATAAACCTTTGTATTTTTCTATTGAGGTTTCAGCATTAGAGTC
GACCCTCTATTTCTCAGTAACTGAAGTTCTAATGGCTATTGAATGGTTAATGTTAATTCCGAGTAGCGCTCGTGACATGA
AAATGTGGCTGTTATGGCTGCTAACCTTTGTGACTTGTCCAATATACTCGTACAACATGGGATACATGTAACCCCTCACTA
TTCAAGCATACTGCTTAAATGTCAAACATCATAAGAGATATTATCAAGTCTTCTCCTGCACTATCCTGGAATGAAAAAAAAG
AGTTGTTCATATGCTATCTGTACTTTACAAATGAGTGTGATCTTGGAGAAGTTAGTTGACGGAATGGTCCACTGTATTTG
TTTGTATATGTTCTCCTTATTCAAGTGTGCAATTCTCTTGTGACCTTGGTCAACCCAGAATGGATTGACTT
TCCAAGAGAAGGAACAACGGAGCTATGATAAAATGCAGACGACAGTGGAGCCTGAGACTGATCACTTGGGTACAAGGT
TATGTCTATGAATGCAATCCTTATAAGATTGTTCTGGCACCATTCTAGGCTCTTGTGACCTTACCTCTTACCTCCATTATCGC
TGTCTCCTATACTAGCTAGATCTGTCTGAGACTAGCTAGATGTCAGTTCTTACTACTATTACACTCTTGAGTTGAGCTGGGT
CCAGATATGCTTCCACACTTGTGCTGCCCACTGCCCTACTATAGTAAATTGACCAACCCGTACATGTTACTCAATA
AACAGGTTGGATTGGCCTGCAAACCTAGTATTTGTAAGTTGACCTGGCTTATGTATTGCCATTGTTGAATAAAAATAATT
TTGATGCATTGATTGGTATGTCATTTCATAACTTGCAGACCTAGGAATGTAATTCTCAATCATTGGTTGTTGATAGAA
ATTATTCTGTTACAGCATATGGGACTAAATATCCAAGTGAACGTTGTTGCTGTTTCTACCCCTCAAGTTAC
AATTATCCGGCTAACATATTAAATGTTCTCCTTGTCTAAATGCTGAACAGTACATGAATGCGTTGACCAAGCGATGAATGC
GCTCGATGAGAGATTTCCTTCTCGTCGTCAAAGCAGATCGCAGCGACATGAACGATGAGGAAAAGGTAAGGATTTCAGA
ATACTGGTATGAGAGTGTGCGACGTTCTTCTTCTTAGGAAGAGTGGTAACCTAGCTTGTGCTGTATTGCGATT
AGGCAGCTCAATTAGGAGTGGATGGTTGTCAGCATTATTTCTACTTCGTTCAGGTTATTGTCTTGAACGTTGGAGAT
TTAGTTTGTGTTCAATTCCATCCAAAGAAAACCTACGAGGGTAAGTCACCAGTGTAAAACCTGTCTTTCAGAGTCCCT
TTGCTGTGGTATAATATAATAGTGTGCTTACTCCCATCTGCTCTGCAACTTATATGCAGCTACAAAGTGGATGCGATT
TGCCTGGAAATACAGAGTAGCCCTGGACTCTGATGCTCTGGTCTCGGTGGACATGGAAGAGTAAGTAGTGACGGTAGACGCT
GAAAGATGTTTTTTTAATTGCCCCACTCCGTAGTTGGGCCGGCGTCGAGAATCGATCATCAGGCTGTC

GTGTTTGCAGAGACTCATGGATGCTGTGACGCCAGGTGGACACTTCACGTCGCCTGAAGGGTGCAGGGTGC
 CCGAAACGAACCTCAACAACCGGCCGAACTCGTTCAAAGTCCTTCTCCGCCCGCACCTGTGTGTAATGTTCACTTACTCTCAG
 CTGAACGTGATGAGCTAGAATGTATCCGCCCTGACAAACCGTCTGCTGCCAGGCTTATTACCGTGTAGACGAAGCAGGGCTGGA
 CGACGTCTCACGCGAAAGCAGAGACAGGAAAGACGTCTCCAGCAGAGAGCAGTCAGCTCAAAGCTTCCAGAGACTAGCAGAAA
 GAAGACAAGGAGGCAACGGCTGGCAAGAAGGGATGGAAGTTGCGCGGCAGCCATCCGATCAAGATAACCAAATGAAGCCAG
 GAGTCCTTGGTGAGGACTGGACTGGCTGCCGGCCCTGTTAGTAGTCCTGCTACTGGACTAGCCGCCCTGGCGCCCTGGA
 ACGGTCTTCTGTAGCTGCAGGCCACTGGTGTCTCATCACCAGCAGGCAGGACTGCTGTATAGCTTTCTAGAATAATA
 ATCAGGGATGGATGGATGGTGTATTGGCTATCTGGCTAGACGTGCATGTGCCCAGTTGTATGTACAGGAGCAGTCCCGTCC
 AGAATAAAAAAAACTTGTGGGGGGTTTCTTACTCTGTAGTCTGTTCTGCTAGGTTGACGAAGATGTTGATATTAGA
 TGCCATAGATCATGTACTGTTAACGTTCTCGTTCCCTGTCCAGTTCACATTGATTCCAGCTGTTCAGCAGGCCGT
 CAGCTCAGCTCCACACCGGGGCCAGGCCGGCTCACGCAGGCATCTTCATGCGTCATAACACAAACACTTTGATCT
 TTGACAAAAAAAGATGGATCGCTAAC

>Bear Island

GTCGACTGCCCTCTAGACCCGATGAAGTCAAGGATAGTGAGCGCCAACCAAGTTAGGCTCCCCAGCCAGATGATCATGTTA
 GGTGTTCCACTGCCATAAAAGAAAGCGTCCGTGATGTCGTACTTGGGGCGGTGAATACGTAAGGGACAGATGCTCATATACC
 TTCATCTGTTTACTCGAAATTACTAATGTTCCCTATGTCAGCTAAAGTGAATCTCACCCGACCAATCTGAGATTGTGAA
 TGACTTGAAGTTACCGTAACCATGCTGTGGAACCCATCAATGAAAAGCTGCACATGATATCCGAGAACATCAAAAGCGTGA
 GAAGGGAAAGAGGAAACGAATGATGATAGCTGCATCAGTCACCAACATCCTGACCAGGGTCATCAGTGGATTGATGATCC
 GCTCCTGAACGGAAGCTTGAGTGACAACAGCGGTCAAAGAAAGCACGGAGGCAGCGCAGGAAATCAGGCTATGCAAGCGCAGA
 GAGCGGTGGGAGAGCAGCGACCATGGCCTAGCGGGTTGAGATCCGAGGGAACAGATGGATTACTAGGGAGTGACAGCTAGG
 AGCAATCTGAGGAGATACTATGTAATGTCACAGGAGTTGGCCTGTGGTATGTCAGGATAACCGGGCAGTGGTTCTGAGCGT
 AAGACGAGGTCTCTAGCAATGATATGTTGAGCGTACTAAATCGAGATGAGCAATCAGGTTGTTGATTCTTCGGC
 TGACCAATTGCGCTGCTGAGGCCCTGATCCTGTATTGAGATGTCAGGCCTACTTAGAGCAAATGCTGGAAGGAAGCAATGTGCC
 TGTCTGAGGTCCCTCCAGCATCACTGTAATTGAAAGTACTCAAGTACAGACTAGAACTAGTCATGCATACCAAGAATAG
 ATAGATGTTGAGATGCCGCTGAGATGCCACTCTATTGCTCTGTTCATGCTTGCCTTATTATATCACTATTT
 TCACTGTTCATCTAAGGCCGTTGTACACCGGGTACCAAGAGAGCAGAACACCTTTACGTTCTTGTGCTATGGATGGAC
 TTGAGAGTTCCCTGAGAAAGCACTCTCATCTATCTTCCAATTCTGTTGATCCTGATCACTGAAGATGGCCATT
 TGATTTTCACTTTCAAGTTATATAAGTGAAGACGGTTGTCTCACGCAATATGTGAAGTGCAAGATGAGCTACACTGCA

AGGAACCCCAAGAAAAAACACAGGTAAGTTGTCTGATTGACAACGGCTAGAGCTGTCTGACGATGCAGATGACTCCGCATGT
TCATTCACTCACTTAATTGTTAGAAAAGCTACACAAAAAGCACATCAGAAAAAAAGAAGAAAAAGCTATTAGTGGTACTACT
AGTGCAACTGCAATAATGATGATGATAAATCTGCACAAGCCATAGCTATGCTATATGCTATAGCTATGTATATGTACACAAA
AAATACATTTTGCTATTTCACCGCTAGTATAATATCCATGTCTGCTACAACACACAATCATATTAAATACCTATAA
AAAATAATTAAATATTAAAATAAACATATGGTCCACACCATAATTAAACTGCTAAAACAAATATTATAACTCATTGATCG
TTCATCCTTTCGGTTAGTGAGGTGGACAGTGAGAGCGCTGCATCGTGTATTGGGTTGACTGGTTCTACGGCTCATCTGT
GTTGTAACGACCTATCTATGGTCAAACAAACTATTAGGATTATTGTTAGGCAGGGAGATAAATAACCTATAAGCA
GGACACATGAAACATATGCTTAAACAGTAGAGATTAACAACATAAAATAAAAAGGCAAACCGGGAAAGCGTCAAGCCC
GGCCAATCGGCCAGAACCGCTCCACGGTTGTCGTCCGCCACGTGGCACGCCGGCATTCCGGGCCACAGATCCGGCTC
AGGGTCATGTGCCACTGCCATGGCCCCCTCCTGTCGCAGCGGAGATTGCGACGGGAAGAAAGGTGAGGAGAGAAACAACCAA
GCGAAAAAAATCACGCTTCATTGCGAGGGGGAGGATAGGGAGGAAGACGCCAAGCCAGCTCCAGTCCGGCACCCGATATAAA
GCGGCAGGCACTTGGATTGCTGACGAGATGGACTCACACGCCGTACAATGCTGTGCCCTGTCGCCCTCTCGCCGACTC
CGCTTCCGCCGCCGCGCTCTCGCTCGATGCTGATGGCGCACGCCGGGATCGCGTAAGCTGCGGCATCCGGGGCT
GGTGGATTACTACTTTGCTTTCTTCTGTACTGATGGTCATAGTTCGCAGGGTGGCGCAATGTGCCCTGAGTGTG
TTGTCTGTCAGTGAAGGCTGCCGTCAAGGGTGGAGAGAAAGGACTCTGGAATTGTTGGATTGGCTCGCTCGCTTG
GTTGCTGTTATCAGTAGTAATCATTTACCAAGTCTAGGGATCTCAGATTCAACTGAAGTTGTTAAATTGGTGGTGG
TTTCTTCAGCCATCTAATCATTTATTACATAATAATTAGTTGAAATAAGTGTATATTGATATTCTGTGGTGTG
AGCTAATTAGCTTCACTACATTTCACGTGTTAGCTCTATTGCTCGTGTAAATTCTGAATCTGGCTTAACGCACTGTGCAAGGT
CAAGAGCAAATTGCCACTGCAGCTACTGTGCAAGAAGATAAAACTATGCAACTGCCAAGGGCAGTCGACCATCTCCCATA
TACGACCTGGACCCCAAGCTGGAGATATTCAAGGACCATTCAGGTACCGGATGAAAAGATTCTAGAGCAGAAAGGATCAATT
GAAGAAAATGAGGGAAAGTCTGAAATCTTTCTAAAGGTTAGGCTTAATACATTCAAATGCTAAACAAAGACCATTCAAAAT
ATTTATAGCACCTGCCATGCCGAAAATATTATCTGCATCATCAACATTCCGGATTGTTGTTTCAGGCTATTGAAAT
TTGGGATTAATACAAATGAGGATGGAACGTGATATCGTGAATGGGCACCTGCTGCCAGTAAGTTCTAATGTTGTCATGCAAAC
ATGATGACTGGGGGTATCGTTTCCCATTGCTGTGAAGAGATATCGTGTGATAGTAACTATATTAAAAAAAGAA
CAGCTAAACACAGGAGAGTAATCAATGTTGGGAGTAGAAAAGTGTGCAAGACTGTCATGTCTT
AGCTGAGGAGGCTATTGACTTGAGTTTACTCATGGGTGTAGGGAGGCAGAGCTTATTGGTACTCAATGACTGGAATGGTGC
ACCATAAGATGGAGAAGGATAAATTGGTGTGATCAAATTGACCATGTCAGGAAACCTGCCATCCCTCACAAATT
CCAAGGTTAAATTGCTTCTACATGGTGGAGTATGGTTGATCGTATTCCAGCATGGATTGCTATGCGACTGTTGATGCC

TAAATTGGAGCTCCTATGATGGTGTTCATTGGATCCTCCTGCTTCTGAAAGGTCTTTCTACTGTCCTGGACCACATTGTA
AACTTAAGCAATAGACCTTAGCAGACAAAAATATGACAAAATTATAGTACCTTTACCTCTGGTTGCAGGTACACATTAA
GCATCCTCGGCCCTCAAAGCCTGCTGCTCACGTATCTATGAAGCCATGTAGGTATGAGTGGTAAAAGCCAGCAGTAAGCACA
TATAGGAATTGCAAGACAATGTGTTGCCACGCATACGAGCAAATAACTACAACACAGTCAGTTGATGGCAGTTATGGAGCAT
TCGTACTATGCTTCTTCGGTACCATGTGACAAATTCTTGCAGGTTAGCAGCAGATCAGGCACACCAGAGGACCTCAAATATC
TTGTTGATAAGGCACACAGTTGGGTTGCGAGTTCTGATGGATGTTGCCATAGCCATGCAAGTAATAATGTCACAGATGGTT
TAAATGGCTATGATGTTGGACAAAGCACCCAAAGAGTCCTATTTCATGCGGGAGATAGAGGTTATCATAAACTTGGGATAGTC
GGCTGTTCAACTATGCTAAGTGGGAGGTATTAAGGTTCTTCTAACCTGAGATATTGGTTGGATGAATTGATGTTGATG
GCTTCCGATTGATGGAGTTACATCAATGCTGATCATCACCATGGTATCAATGTGGGTTACTGGAAACTACCAGGAATATT
CAGTTGGACACAGCTGTGGATGCAAGTTACATGATGCTTGCAAACCAATTAAATGCACAAACTCTTGCCAGAACGAACTGTT
GTTGCTGAAGATGTTCAGGCATGCCGTCCTTGCCGCCAGTTGATGAAGGTGGGTTGGGTTGACTATGCCCTGGCAATGG
CTATCCCTGATAGATGGATTGACTACCTGAAGAATAAGATGACTCTGAGTGGTCGATGGGTAAGTAGCGCATACTTGACTA
ACAGGAGATATACTGAAAAATGCATCGCATATGCTGAGAGCCATGATCAGGTACCCCTGCATTATATAAACTTTATAAGGAAG
TATAGTTGGATGCAGCAAAGTATTTATTCCTTGTGGGTTAGACAACACATGGGCAAGTATCTTTAATCAGACAGTACTAT
ATTTCATCACATTCTATCCTGATTGCTAGTAACGGATTAGTTATTCAAAAAATTAGGCCCTCTAACATGTTAAGAATT
TGCAATCACATATGACCTGTTATCTTAACTGGAAATTAAATCATGCAAATTTCAGTCTATTGTTGGCGACAAACTATTGC
ATTTCCTGATGGACAAGGAAATGTACACTGGCATGTCAGACTTGCAAGCCTGCTTCACCTACAATTGATCGAGGGATTGCACTC
CAAAAGGTTCCATTCTCCTCAAGTTGGTGAACCTGGTTTCAATAATTGAAATGAGTCCCTCAATATACCTTGCTTATT
GTGTTCTGTACACTCCAGATGATTCACTCATACAATGCCCTGGAGGTGATGGCTACTTGAATTGAGGTTCAAGCATT
AATCTCGGTCTTTGAAAAATGTTCCCATTAAATAAGCCTGCATAAACCTTTGTATTTTTCTATTGAGGTTCAAGCATT
AGAGTCGACCCCTCTATTCTCAGTAACGAAAGTTCTAATGGCTATTGAAATGGTTAATTCCGAGTAGCGCTCGTTGC
ACATGAAAATGTGGCTGTTATGGCTGTAATCCTTTGTGACTTGTCCAATATACTCGTACAACATGGGATACATGTAACCC
TCACTATTCAAGCATACTGCTAAATGTCAAACATCATACAGAGATATTATCAAGTCTTCTCCTGCACTATCCTGAAATGAAAA
AAAAGAGTTGTTCATATGCTATCTGACTTTACAAATGAGTGTGATCTTGGAGAAGTTAGTTGACGGAATGGTCCACTGTA
TTTGTGTTATGTTCTCCTTATTCAAGTGTGATGCAATTCTCTTCTAGTTGGTCACCCAGAATGGATT
GACTTCCAAGAGAAGGAAACAACGGAGCTATGATAATGCAGACGACAGTGGAGCCTGAGACACTGATCACTTGCGGTAC
AAGGTTATGTCTATGAATGCAATCCTTATAAGATTGTTCTGGCACCATTCTAGGCTCTTGCACCTTACCTCTCCATT
ATCGCTGTCCTATACTAGCTAGATCTGCTCTGAGACTAGCTAGATGTCAGTTCTTACTACTATTACACTCTTGAGTTGAGC
TGGGTCCAGATATGCTTTCCACACTTGTGTTGCTGCCCTACTATAGTAAATTGCACCAACCCGTACATGTTACTC
AATAAACAGGTTGGATTGGCCTGTGCAAACCTAGTATTGTAAGTTGACCTGGCTTATGTATTGCCATTGTTGAATAAAAT

AATTTGATGCATTGATTGGTATGTCATTTCATAACTTGCAGACCTAGGAATGTACTTCTCAATCATTGGTTGTTTGAT
 AGAAATTATTCTGTTACAGCATATGGTGGACTAAATATCCAAGTGAACGTTGTTGTCGTTTTCTACCCCTCAAGT
 TTACAATTATCCCGCTAACATATTAAATGTTTCTCCTGCTCAATGCTGAACAGTACATGAATGCGTTGACCAAGCGATGA
 ATGCGCTCGATGAGAGATTTCCCTCCTTCGTCGTCAAAGCAGATCGTCAGCGACATGAACGATGAGGAAAAGGTAAAGGATTTC
 AGAATACTTGGTATGAGAGTGTGCCACGTTCTTCTTAGGAAGAGTGGTAACCTAGCTGTTGCTGTATTGTCTTGACAGTGG
 TTAAGGCAGCTCAATTAGGAGTGGATGGTTGTCAGCATTATTTTCTACTTCGTTCAGGTTATTGTCTTGACAGTGG
 GATTAGTTTGTGTTCAATTCCATCCAAAGAAAACCTACGAGGGTAAGTCACCAGTTGTAACCCCTGTCTTCAAGAGTC
 CCTTTGCCTGTGGTATAATATAATAGTGTGCTTACTCCCATCTGCTGCAACTTATATGCAGCTACAAAGTGGATGCG
 ATTGCGCTGGAAATACAGAGTAGCCCTGGACTCTGATGCTCTGGCTTCGGTGGACATGGAAGAGTAAGTAGTGACGGTAGAC
 GCTGAAAGATGTTTTTTAATTGCCCCACTCCGTAGTTGGGCCGGCGCGTCAGAATCGATCATATCAGGCTGTC
 GTGTTGCCAGACTCATGGATGCTGTGACGCAGGTTGCCACGACGTGGATCACCTCACGTCGCTGAAGGGTGCCAGGGTGC
 CCGAAACGAACCTCAACAACCGGCCAACTCGTTCAAAGTCCTTCTCCGCCCCGCACCTGTGTTGAAATGTTCACTTACTCTCAG
 CTGAACGTGAGCTAGAATGTATCCGCCCTGACAAACCGTCTGCTGCCAGGCTTATTACCGTGTAGACGAAGCAGGGCTGGA
 CGACGTCTCACCGAAAGCAGAGACAGGAAAGACGTCTCCAGCAGAGACATCGACGTCAAAGCTCCAGAGCTAGTAGCAA
 GAAGACAAGGAGGCAACGGCTGGCAAGAAGGGATGGAAGTTGCGCGGCAGCCATCCGATCAAGATAACAAATGAAGCCAG
 GAGTCCTGGTGAGGACTGGACTGGCTGCCGGCCCTGTTAGTAGTCCTGCTCTACTGGACTAGCCGCCGTGGCCCTTGG
 ACGGTCTTCTGTAGCTGCAGGCCACTGGTGTCTCATCACCGAGCAGGCAGGCACTGCTGTATAGCTTTCTAGAATAATA
 ATCAGGGATGGATGGATGGTGTATTGGCTATCTGGTAGACGTGCATGTGCCAGTTGATGTACAGGAGCAGTCCGCT
 AGAATAAAAAAAACTTGTGTTGGGGGTTTTCTTACTCTGTAGTCTGTTCTGCTAGGTTGACGAAGATGTTGATATTAGA
 TGCCATAGATCGTGTACTGTTAAGTTCTCGTTCTGTTCCCTGTCAGTCACATTGATTCCAGCTGTTCAGCAGGCCGT
 CAGCTCAGCTCCACACCGGGGCCAGGCCGGTCACGCAGGCATCTTCATGCGTCATAACACAAACACTTTGATCT
 TTTGACAAAAAGATGGATCGCTAAC

>CML 247

GTCGACTGCCCTAGACCCCGATGAAGTCAAGGATAGTGAGGCCAACCAAGTTAGGCTCCCCAGCCAGATGATCATGTTA
 GGTGTTCCACTGCCATAAAAGAAAGCGTCCGTGATGTCGTACTTGGGGCGGTGAATACGTAAGGGACAGATGCTCATATACC
 TTCATCTGTTTACTCGAAATTACTAATGTTCCCTATGTCAGCTAAAGTGAATCTCACCGACCAATCTGCAGATTGTGAA
 TGACTTGAAGTTACCGTGAACCATGCTGTGAAACCCATCAATGAAAAGCTGCACATGATATCCGAGAACATCAAAAGCGTGA
 GAAGGGAAAGAGGAAAACGAATGATGATAGCTGCATCAGTCACCAACATCCTGACCAGGGCATCAGTGGGATTGATGATCC

GCTCCTGAACGGAAGCTTGAGTGACAACACGGCGTCAAAGAAAGCACGGAGGCAGCGCAGGAAATCAGGCTATGCAAGCGCAGA
GAGCGGTGGGAGAGCAGCGACCATTGCCCTAGCGGGTTGAGATCCGAGGGAACAGATGGATTACTAGGGAGTGACAGCTAGG
AGCAATCTGTGGAGATACTATGTAATGTACAGGAGTTGCCCTGTGGTATGTGCGATAACCAGGGCAGTGGTTCTGAGCGT
AAGACGAGGTCTCTAGCAATGATATGTTGAGCGTACTAAATCGAGATGAGCAATCAGGTTGTCTGTTGATTCTTCGGC
TGACCATTCGGCTGCTGAGGCCTTGATCCTGATTTGAGATGTCAGGCCTACTTAGAGCAAATGCTGGAAGGAAGCAATGTGCC
TGTTCTGAGGTCCCTCCAGCATCACTGTAATTGTAAGTACTCAAGTACAGACTAGAACTAGTCATGCATACCAGAAGAATAG
ATAGATGTTTCAGAAGTTGAGGCCTGAGATGCCGTGCCACTCTATTGCTCTGTTCATGCTTGCCATTATATACACTATTT
TCACTGTTCAATTCTAAGGCCGTTGTCACACGGTACCAAGAGCAGAACACCTTTTACGTTCCCTTGCTGCTATGGATGGAC
TTCGAGAGTTCCCTGAGAAAGCACTCTCATCTATCTTCCAATTCTTGTCTGATCCTGATCACTGAAGATGCCATT
TGATTTTCACCTTCAGTTATATATAAGTGAAGACGGTTGTCACGCCATATGTGAAGTGCAAGATGAGCTCTACACTGCAA
GGAACCCCCAAGAAAAAACACAGGTAAGTTGTCGATTGACAACGCCAGAGCTGACGATGCCAGATGACTCCGATGTT
ATTCACTCACTTAATTGTTAGAAAAGCTACACAAAAAGCACATCAGAAAAAAAGAAGAAAAAGCTATTAGGGTACTACTAG
TTGCAACTTGCAATAATGATGATAATCTGCACAAGCCATAGCTATGCTATATGCTATAGCTATGTATATGTACACAAAAA
ATACATTTTGCTATTACCGCTAGTATAATATCCATGTCTGCTACAACACACAATCATATTAATACCTATAAAA
AATAAATTAAATATAAAACATATGGTCCACACCATATTTAAACTGCTAAAACAAATATTAAACTCATTTGATCGTT
CATCCTCTTCGGTTAGTGAGGTGGACAGTGAGAGCGCTGCATCGTGTATTGGTTGACTGGTTCTCACGGCTCATCTGTT
TGTAACGACCTATCTATGGTCAAACAAACTATTAGGATTATTGTTAGGCAAAAGGAGATAAAACCTATAAGCAGG
ACACATGAAACATATGCTTAAACAGTAGAGATTAACAACATAAAATAAAAAGGCAAACCGGGAAAGCGTGAAGGCCAAAGG
CCAATGGGCCAGAACCGAGCTCCACGGTTGTCGTGTCGCCACGTGGCACGCCGGCATTCCGGGCCACAGATCCGGCTCAG
GGTCATGTGCCACTGCCATGCCCTCCTGTCGAGGGGGAGGATAGGGAGGAAGACGCCAAGCCAGCTCCAGTCCGGCACCCGATATAAGC
GAAAAAAATCACGCTTCATTGCGAGGGGGAGGATAGGGAGGAAGACGCCAAGCCAGCTCCAGTCCGGCACCCGATATAAGC
GGCAGGCAGTTGATTGCTGACGAGATGGACTCACACGCCGTACAATGCTGTGCGCTCGTCCCTCGCCACTCC
CTTCCGCCGCCGGCTCTGCTCGCATGCTGATCGGGCGCACCGCCGGGATCGCGTAAGCTGCCGATCCGGGGCTGG
TGGATTTAACCTTTGCTTTCTCTGACTGATGGTTCATAGTTGCGAGGGTGGCGGAATGTGCGCTGAGTGTGTT
GTCTGTCAGTGCAAGGCTGCCGGTCAGGGTGGAGGAAGGTAGATCTTCCCCAGATTAGAACACGTTGTTACGGACAAAATGG
AATTGGTAGTAGTTGGAGAGGAGAAAAAAACTCTGGAATTGAGATTGGGCTCGCTCGCTTGGATTGGCT
GCTTGTATCAGTAGTAATCATTTACCAAGTCTAGCGGATCTCAGATTCAACTGAAGTTGTTAAATTGGGTTGGTT
TCTTCAGCCATCTAATCATTTATTACATAATAATTAGTTGAAATAAAAGTGCATATTGATATTCTGTGGTTGCTGCAAGCAGC
TAATTAGCTTCACTACATTTCACGTGTTAGCTTATGCTCGTGAATTCTGAATCTGGCTTAACGCACTGTGCAAGGTCAA
GAGCAAATTGCCACTGCAGCTACTGTGCAAGAAGATAAAACTATGGCAACTGCCAAAGGCGATGTCGACCCTCCCCATATAC

GACCTGGACCCCAAGCTGGAGATATTCAAGGACCATTCAAGGTACCGGATGAAAAGATTCTAGAGCAGAAAGGATCAATTGAA
GAAAATGAGGGAAGTCTTGAATCTTTCTAAAGGTAGGCTTAATAACATTCAAATGCTAATAACAAGGACCATTTCACAATATT
TATAGCACCTGCCCATGCCGAAAATATTATCTGCATCATCAACATTCCGGATTGTATTTCAGGCTATTGAAATTG
GGATTAATACAAATGAGGATGGAAGTGTATATCGTGAATGGCACCTGCTGCGAGTAAGTCTAATGTTGTCATGCAAACATG
ATGTAAGTGCAGGGTATCGTTTCCCATTGCTGTGAAGAGATATCGTCTGATAGTAAGTAACTATAATTAAAAAAAGAACAG
CTAAAACACAGGAGAGTAATCAATGTTGGGAGTAGAAAAGTGTCTGGATATTCAATTCTTGCAAGACTGTCATGTCTTAGC
TGAGGAGGCTATTTCCTGCTGTGATTACATAATGCTGTTCTTCTTATGACAATATACTTCCACTATTAAATAGATT
GATGCATTGACTTGAGTTTACTCATGGGTGTAGGGAGGCAGAGCTATTGGTGACTTCATGACTGGAATGGTGCAAAC
ATAAGATGGAGAAGGATAAATTGGTGGTGGTCATGAAAGGAAACCTGCCATCCCTACAATTCCA
AGGTTAAATTGCTTCTACATGGTGGAGTATGGGTTGATCGTATTCCAGCATTGATTGCTTATGCGACTGTTGATGCCTCTAA
ATTGAGCTCCCTATGATGGTGTTCATTGGATCCTCCTGCTTCTGAAAGGTCTCTTACTGTCCTGGACCACATTGAAAC
TTAAGCAATAGACCTAGCAGACAAAAATATGACAAAATTATAGTACCTTTACCTCTGGTTGCAGGTACACATTAAAGCA
TCCTCGGCCCTCAAAGCCTGCTGCTCACGTATCTATGAAAGCCATGTAGGTATGAGTGGTAAAAGCCAGCAGTAAGCACATAT
AGGAATTGCAAGACAATGTTGCCACGCATACGAGCAAATAACTACAACACAGTTGATGGCAGTTATGGAGCATTG
TACTATGCTCTTCGGGTACCATGTCACAAATTCTTGCCTGAGTGTGAGTGGTACCGAGATCAGGCACACCAGAGGACCTCAAATATCTG
TTGATAAGGCACACAGTTGGTTGCGAGTTCTGATGGATGTTGTCATGCCATGCAAGTAATAATGTCACAGATGGTTAA
ATGGCTATGATGTTGGACAAAGCACCAAGAGTCCTATTTCATGCCGGAGATAGAGGTTATCATAAACTTGGGATAGTCGGC
TGTTCAACTATGCTAACTGGGAGGTATAAGGTTCTCTTCTAACCTGAGATATTGGTTGGATGAATTCATGTTGATGGCTT
CCGATTGATGGAGTTACATCAATGCTGTATCATCACCATGGTATCAATGTGGGTTACTGGAAACTACCAGGAATATTCAG
TTGGACACAGCTGGATGCAAGTTGTTACATGATGCTTGCAAACCATTAAATGCACAAACTCTGCCAGAAGCAACTGTTGTT
GCTGAAGATGTTCAAGGCATGCCGGCTTGGCCAGTTGATGAAGGTGGGTTGGTTGACTATGCCCTGGCAATGGCTA
TCCCTGATAGATGGATTGACTACCTGAAGAATAAGATGACTCTGAGTGGTCAAGTACCGCATACTTGAACA
GGAGATATACTGAAAAATGCATCGCATATGCTGAGAGCCATGATCAGGTACCCCTGCATTATAATAACTTATAAGGAAGTAT
AGTTGGATGCAGCAAAGTATTTCATTCTGAGGGTAGACAACACATGGGGCAAGTATCTTAAATCAGACAGTACTATATT
TCATCACATTCTATCCTGATTGCTAGTAAGTGGATTAGTTACATAAAAAAATTAGGCCCTCTAACGATGTTAAGAATTG
AATCACATATGACCTGTTACTGAAATTAAAATCATGCAAATTTCAGTCTATTGTTGGCGACAAAATATTG
TTCTCCTGATGGACAAGGAAATGTACACTGGCATGTCAGACTGCAAGCCTGCTTCACCTACAATTGATCGAGGGATTGCACTCCA
AAAGGTTCCATTCTCCTCAAGTTCTGGTTGAACCTGGTTCAATAATTCTGAAATGAGTCCCTCAATATACTTGCCTATTG
GTTCTGTAACCTCCAGATGATTCACTCATCACAATGGCCCTGGAGGTGATGGCTACTTGAATTATGGGAAATGAGGTGAA
ATCTGGTCTTTGAAAATGTTCCATTAAATAAGCCTGCATAAACCTTTGTATTGAGGTTCAGCATTAA

GAGTCGACCCCTATTTCTAGTAACTGAAGTCCTAATGGCTATTGAATGGTTAATGTTAATTCCGAGTAGCGCTCGTGCA
CATGAAAATGTGGTCTGTTATGGCTGCTAACATCCTTGTGACTTGTCCAATATACTCGTACAACATGGATACATGTAACCCT
CACTATTCAAGCATACTGCTAAATGTCAAACATCATAACAGAGATATTCAAGTCTTCTCCTGCACATACCTGGAATGAAAAA
AAAGAGTTGTTCATATGCTATCTGACTTTACAAATGAGTGTGATCTTGGAGAAGTTAGTTGACGGAATGGTCACTGTAT
TTTGTGTTATATGTTCTCCTTATTCAAGTGTATTGATGTGCAATTCTCTTCTAGTTGGTCACCCAGAATGGATTG
ACTTTCCAAGAGAACAGGAACTGGAGCTATGATAAATGCAGACGACAGTGGAGCCTGTGGACACTGATCACTGCAGTACA
AGGTTATGTCTATGAATGCAATCCTTATAAGATTTGTTCTGGCACCATCTAGGCTCTTGTACCTTACCTCTTCCATT
TCGCTGTCTCCTATACTAGCTAGATCTGCTCTGAGACTAGCTAGATGTCAGTCAGTTACTACTATTACACTCTTGAGTTGAGCT
GGGCCAGATATGCTTTCCACACTTGTGCTGCCACTGCCACTATAGTAAATTGCAACCAACCCGTACATGTTACTCA
ATAAACAGGTTGGATTGGCCTGTGCAAACCTAGTATTTGTAAGTTGACCTGGCTTATGTATTGCCATTGTTGAATAAAAATA
ATTGATGCATTGATTGGTATGTCATTTCATAACTTGCAGACCTAGGAATGTACTTCTCAATCATTGGTTGTTGTTGATA
GAAATTATTCTGTTACAGCATATGGGGACTAAATATCCAAGTGAACGTTGTTGCTGTTTTCTACCCCTCAAGTT
TACAATTATCCGGCTAACATATTAATGTTCTCCTGCTTAATGCTGAACAGTACATGAATGCGTTGACCAAGCGATGAA
TGGCCTCGATGAGAGATTTCCCTTCCGTCAAAGCAGATCGTCAGCGACATGAACGATGAGGAAAAGGTAAGGATTCA
GAATACTGGTATGAGAGTGTGCGACGTTCTTCTTAGGAAGAGTGGTAACTCTAGCTGTGCTGTATTGCTGTTGAG
TAAGGCAGCTTCAATTAGGAGTGGATGGTTGTCAGCATTATTTCTACTTCGTTCAGGTTATTGCTTGAACGTGGAG
ATTAGTTTGTGTTCAATTCCATCCAAGAAAATTACGAGGGTAAGTCACCAGTTGTAACACCTGTCTTCAAGAGTCC
CTTTGCCCTGTTGATAATATAATAGTGTGCTACTCCATCTGCTCTGCAACTATATGCAAGCTACAAAGTGGATGCGA
TTGCCCTGGAAATACAGAGTAGCCCTGGACTCTGATGCTCTGGCTTCGTCAGGACATGGAAGAGTAAGTAGTGACGGTAGACG
CTGAAAGATGTTTTTTTAATTGCTACTCCGTAGTTGGGGCCGGCCGTCAGAATCGATCATATCAGGCTG
TCGTGTTGCGAGACTCATGGATGCTGTGACGCCAGGTTGGCCACGACGTGGATCACTCACGTCGCTGAAGGGGTGCCAGGGGT
GCCCGAAACGAACCTCAACAACCGGCCGAACTCGTTCAAAGTCCTTCTCCGCCACCTGTGTTGGAATGTCACCTACTCTC
AGCTGAACGTGAGCTAGAATGTATCCGCCCTGACAAACCGTCTGCTGCCAGGCTTATTACCGTGTAGACGAAGCAGGGCTG
GACGACGTCTCACCGCAAAGCAGAGACAGGAAAGACGTCTCCAGCAGAGAGCATCGACGTCAAAGCTCCAGAGCTAGTAGCA
AAGAAGACAAGGAGGCAACGGCTGGTGGCAAGAAGGGATGGAAGTTGCGCGGCAGCCATCCGATCAAGATACCAATGAAGCC
AGGAGTCCTGGTGGACTGGACTGGCTGCCGCCCTGTTAGTAGTCCTGCTACTGGACTAGCCGCCCTGGCCGCCCTG
GAACGGCTTCTGCTAGCTGCAGGCCAGTGGTGTCTCATACCGAGCAGGCAGGCACTGCTGTATAGCTTCTAGAATAA
TAATCAGGGATGGATGGATGGTGTATTGGCTATCTGGCTAGACGTGCATGTGCCAGTTGTATGTACAGGAGCAGTTCCG
CCAGAATAAAAAAAACTGTTGGGGGTTTTCTACTCTGAGTCTGTTCTGCTAGGTTGACGAAGATGTTGATATTA
GATGCCATAGATCATGTAAGTTCTCGTTCCCTGTCCAGTTCACATTGATTGATTCCAGCTGTTCAGCAGGCCG

GTCAGCTCAGCTCCACACCGGGGCCAGGCCGTCACGCAGGCATTTCATGCGTCATAACACAAACACTTTGAT
CTTTCGACAAAAAAGATGGATCGCTAAC

>CML 277

GTCGACTGCCCTAGACCCGATGAAGTCAAGGATAGTGAGCGCCAACCAAGTTAGGCTCCCCAGCCAGATGATCATGTTA
GGTGTCCACTGCCATAAAAGAAAGCGTCCGTGATGTCGTACTTGGGGCGGTGAATACGTAAGGGACAGATGCTCATATACC
TTCATCTGTTTACTCGAAATTACTAATGTTCCCTATGTCAGCTAAAGTGAATCTCACCGACCAATCTGCAGATTGTGAA
TGACTTGAAGTTACCGTAACCATGCTGTGGAACCCATCAATGAAAAGCTGCACATGATATCCGAGAACATCAAAAGCGTGA
GAAGGGAAAGAGGAAAACGAATGATGATAGCTGCATCAGTCACCAACATCCTGACCAGGGTCATCAGTGGATTGATGATCC
GCTCCTGAACGGAAGCTTGAGTGACAACAGCGGTCAAAGAAAGCACGGAGGCAGCGCAGGAAATCAGGCTATGCAAGCGCAGA
GAGCGGTGGGAGAGCAGCGACCATGGCCTAGCGGGTTGAGATCCGAGGGAACAGATGGATTACTAGGGAGTGACAGCTAGG
AGCAATCTGTGGAGATACTATGTAATGTCACAGGAGTTGGCCTGTGGTATGTCGATAACCGGCCAGTGGTTCTGAGCGT
AAGACGAGGTCTCTAGCAATGATATGTTAGCGTGAACATCGAGATGAGCAATCAGGTTGTTGATTCTTCGGC
TGACCAATTGCGCTGCTGAGGCCCTGATCCTGTATTGAGATGTCAGGCCTACTTAGAGCAAATGCTGGAAGGAAGCAATGTGCC
TGTCTGAGGTCCCTCCAGCATCACTGTAATTGAAAGTACTCAAGTACAGACTAGAAACTAGTCATGCATACCAAGAACATAG
ATAGATGTTTCAAGAGTTGAGGCCCTGAGATGCCGTGCACTCTATTGCTCTGTTCATGCTTGCCTTATTATATCACTATT
TCACTGTTCTTAAGGCCCTGTCACACGGGTACCAAGAGCAGAACACCTTTACGTTCTTGTGCTATGGATGGAC
TTCGAGAGTTCTTGAGAAAGCACTCTCTATCTTCCAATTCTGTTGCCCTGAGATCAGTGAAGATGCCATT
TGATTTCACTTCACTTCAAGTATATAAGTGAAGACGGTGTCTCACGCAATCTGTAAGTGAAGATGAGCTTACACTGCAA
GGAACCCCAGAAAAACACAGGTAAAGTTGCTGATTGACAACGGCTAGAGCTGTGACGATGAGCTTACCGCATGTT
ATTCACTTTAATTGTTAGAAAAGCTACACAAAAAGCACATCAGAAAAAGAACAGTATTAGTGGTACTACTAG
TTGCAACTTGCATAATGATGATGATAATCTGCACAAGCCATAGCTATGCTATAGCTATGTATATGTACACAAAAA
ATACATTGCTATTGCTATTGCTATTACCGCTAGTATAATATCCATGCTTGTACAACACACAATCATATTAAATACCTATAAAA
AATAAATTAAATATAAAACATATGGTCCACACCATAATTAAACTGCTAAAAACAAATTATAACTCATTTGATCGTT
CATCCTCTCGGTTAGTGAGGTGGACAGTGAGAGCGCTGCATCGTGTATTGGGTTGACTGGTTCTCACGGCTCATCTGTGT
TGTAAACGACCTATCTATGGTCAAACAAACTATTAGGATTATTGTTAGGCGAAAATGAGGGAGATAAAACCTATAAGCAGG
ACACATGAAACATATGCTTAAACAGTAGAGATTAACAACATAAAATAAAAAAGGCAAACCGGAAGCGTGAAGCCAAAGG
CCAATCGGCCAGAACCGAGCTCCACGGTTGTCGTCCGCCACGTGGCACGCCGCCATTCCGGGCCACAGATCCGGCTCAG
GGTCATGTGCCACTGCCATGCCCTCCTGTCGCAGCGGAGATTGCGACGGGAAGAAAGGTGAGGAGAGAACACCAAGC
GAAAAAAATCACGCTTCATTGCGAGGGGGAGGATAGGGAGGAAGACCCAAGCAGCTCAGTCCGGCACCGATATAAGC
GGCAGGCACTTGGATTGCTGACGAGATGGACTCACACGCCGTACAATGCTGTGCCTCGTGCCTCGCCACTCCG

CTTCCGCCGCCGCGCGCTCTCGCTCGCATGCTGATCGGGCGCACCGCCGGGATCGCGTAAGCTCGGCATCCGGGGCTGG
TGGATTACTACTTTGCTTTCTTCTGTACTGATGGTCATAGTTCGCAGGGTGGCGAAGGTAGATCTTCCCCAGATTAGAACACGTTGTTACGGACAAAATGG
AATTGGTAGTAGTTGGAGAGAGAAAAAAACTCTGAATTGTGGATTGGCTCGCTCTCGCTTGATTTGGCTCTAGT
GCTTGTTATCAGTAGTAATCATTACCAAGTCTAGGGATCTCAGATTCAACTGAAGTTGTTAAATTGGTGGCTGGTT
TCTCAGCCATCCTAATCATTATTACATAATAATTAGTTGAAATAAGTGTATATTGATATTCTGTGGTGCAGCAGC
TAATTAGCTCACTACATTTCACGTGTTAGCTCTATTGCTCGTAATTCTGAATCTGGCTTAACGCAGTGTGCAAGGTCAA
GAGCAAATTGCCACTGCAGCTACTGTGCAAGAAGATAAAACTATGGCAACTGCCAAAGGGATGTCGACCCTCCTACATAC
GACCTGGACCCAAGCTGGAGATATTCAAGGACCATTCAAGGTACCGGATGAAAAGATTCTAGAGCAGAAAGGATCAATTGAA
GAAAATGAGGGAAGTCTGAAATCTTTCTAAAGGTTAGGCTTAATACATTCAAATGCTAATACAAGGACCATTACAATATT
TATAGCACCTGCCATGCCAAAATATTATCTGCATCATCATATTCCGGATTGTGATTTCAGGCTATTGAAATTG
GGATTAATACAAATGAGGATGGAAGTGTATATCGTGAATGGCACCTGCTCGCAGTAAGTTCTAATGTTGTCATGCAAACATG
ATGTAAGTGGGGGTATCGTTTCCCATTGCTGTGAAGAGATATCGTGTAGTAACTATTTAAAGGAAAGACAG
CTAAAACACAGGAGAGTAATCAATGTTGGGAGTAGAAAAGTCTCGGATATTCAATTGCAAGACTGTCATGTCTAGC
TGAGGAGGCTATTTCCTGCTGTGATTACATAATGCTGTTCTTCTTGTGACAATATACTTCACTATTAAATAGATT
GATGCATTGACTTGAGTTTACTCATGGGTGAGGGAGGCGAGCTATTGGTCAATTGACTGGAATGGTCAAAC
ATAAGATGAAAAGATAAATTGGTGGTCAATGGTCAAGGAAACCTGCCATCCCTACAATTCCA
AGGTTAAATTGCTTCTACATGGTGGAGTATGGTCACTGATTCCAGCATGGATTCAATTGCGACTGTTGATGCCTCTAA
ATTGGAGCTCCCTATGATGGTGTTCATTGGATCCTCCTGCTTCTGAAAGGTCTCTTCTACTGTCCTGGACCACATTGAAAC
TTAAGCAATAGACCTAGCAGACAAAATATGACAAAATTAGTACCTTACCTCTGGTCAAGGTACACATTAAAGCA
TCCTCGGCCCTCAAAGCCTGCTGCTCACGTATCTATGAAGCCCATGTAGGTATGAGTGGTAAAAGCCAGCAGTAAGCACATAT
AGGAATTGCAAGACAATGTGTTGCCACGCATACGAGCAAATAACTACAACACAGTTCAAGTGTGAGTTGAGCTG
TACTATGCTTCTTCGGTACCATGTGACAAATTCTTGGTCACTGAGGAGATAGAGGTTATCATAAACTTGGGATAGTCGGC
TTGATAAGGCACACAGTTGGGTTGGAGTTCTGATGGATGTTGTCATGCCATGCAAGTAATAATGTCACAGATGGTTAA
ATGGCTATGATGGGACAAGCACCAAGAGTCCTATTTCATGCGGGAGATAGAGGTTATCATAAACTTGGGATAGTCGGC
TGTCAACTATGCTAAGTGGGAGGTATTAAGGTTCTTCTTCTAACCTGAGATATTGGTGGATGAATTGTCATGTTGATGGCTT
CCGATTGATGGAGTTACATCAATGCTGTATCATCACCAGGTCAATGTGGGTTACTGGAAACTACCAGGAATATTCAG
TTGGACACAGCTGTGGATGCAAGTGTGTTACATGATGCTGCAAACCAATTAAATGCACAAACTCTTGGCAGAAGCAACTGTTGTT
GCTGAAGATGTTCAAGGCATGCCGTCTTGGCCAGTTGATGAAGGTGGGTTGGGTTGACTATCGCCTGGCAATGGCTA
TCCCTGATAGATGGATTGACTACCTGAAGAATAAGATGACTCTGAGTGGTCAGGGTGAATAGCGCATACTTGACTAACAA

GGAGATATACTGAAAAATGCATCGCATATGCTGAGAGCCATGATCAGGTACCCCTGCATTATATAATAACTTTATAAGGAAGTAT
AGTGGATGCAGCAAAGTATTTATTCCTTGCGGGTAGACAACACATGGGCAAGTATCTTTAATCAGACAGTACTATATT
TCATCACATTCTATCCTGATTGCTAGTAACTGGATTAGTTATTCAAAAAATTAGGCCCTCTAACGATGTTAAGAATTG
AACACATATGACCTGTTATCTTAACTGGAAATTAAAATCATGCAAATTTCAGTCTATTGTTGGCGACAAAACATTGCAT
TTCTCCTGATGGACAAGGAAATGTACACTGGCATGTCAGACTTGCGAGCCTGCTCACCTACAATTGATCGAGGGATTGCACTCCA
AAAGGTTCCATTCTCCTCAAGTTCTGGTTAACCTGGTTCAATAATTCTGAATGAGTCCCTCAATATACCTGCTTATTGT
GTTCTGTACACTCCAGATGATTCACTCATACAATGGCCCTGGAGGTGATGGCTACTTGAATTGGAAATGAGGTGAA
ATCTCGGTCTTTGAAAAATGTTCCATTAAATAAGCCTGCATAAACCTTTGTATTTTTCTATTGAGGTTTCAGCATT
GAGTCGACCCCTCTATTTCTCAGTAACTGAAGTCTTAATGGCTATTGAATGGTTAATGTTAATTCCGAGTAGCGCTCGTGCA
CATGAAAATGTGGTCTGTTATGGCTGCTAACCTTTGTGACTTGTCCAATATACTCGTACAACATGGGATACATGTAACCCTT
CACTATTCAAGCATACTGCTAAATGTCACATACAGAGATATTATCAAGTCTTCTCCTGCACTATCCTGGAATGAAAAAA
AAAGAGTTGTTCATATGCTATCTGTACTTTACAAATGAGTGTGATCTTGGAGAAGTTAGTTGACGGAATGGTCACTGTAT
TTGTTGTTATGTTCTCCTTATTCAAGTGTATTCAATTGATGTGCAATTCTCTTCTAGTTGGTCACTTACCTTCCATT
ACTTTCCAAGAGAAGGAAACAACGGAGCTATGATAATGCAGACAGTGGAGCCTTGTGGACACTGATCACTGCGGTACA
AGGTTATGTCTATGAATGCAATCCTATAAGATTTGTTCTGGCACCATTCTAGGCTCTTTGACCTTACCTTCCATT
TCGCTGTCTCCTATACTAGCTAGATCTGTCTGAGACTAGCTAGATGTGAGTCCCTACTACTATTACACTCTGAGTTGAGCT
GGGTCAGATATGCTTTCCACACTTGTGCTGCCACTGCCACTATAGTAAATTGACCAACCCGTACATGTTACTCA
ATAAACAGGTTGGATTGGCCTGTGCAAACCTAGTATTTGTAAGTTGACCTGGCTTATGTATTGCCATTGTTGAATAAAAATA
ATTGTTGATGCATTGATTGGTATGTCATTTCATAACTTGAGACACTAGGAATGTAATTCTCAATCATTGTTGTTGATA
GAAATTATTCTGTTACAGCATATGGGACTAAATATCCAAGTGAACGTTGTTGCTGTTCTACCTGGCTTACCCCTCAAGTT
TACAATTATCCGGCTAACATATTAATGTTCTCCTGCTCTAATGCTGAACAGTACATGAATGCCATTGTTGAACAGCAGTGA
TGGCCTCGATGAGAGATTTCCTTCTCGTGTCAAAGCAGATCGTCAGCGACATGAACGGATGAGGAAAAGGTAAGGATT
GAATACCTGGTATGAGAGTGTGCGACGTTCTTCTTAGGAAGAGTGGTAACTCTAGCTGTGCTGTATTGCTTGGGAT
TAAGGCAGGCTCAATTAGGAGTGGATGGTTGTCAGCATTATTTCTACTCGTTCTAGGTTATTGCTTGAACGTTGGAG
ATTAGTTTTGTTCAATTCCATCCAAGAAAACCTACGAGGGTAAGTCACCAGTTGTAACCCCTGTCTTCAAGAGTCC
CTTTGCCTGTGGTATAATATAATAGTGTGTTACTCCCCTCTGCTCTGCAACTTATGCAAGCTACAAAGTGGATGCGA
TTGCGCTGGAAATACAGAGTAGCCCTGGACTCTGATGCTCTGGCTTCTCGTGGACATGGAAGAGTAAGTAGTGACGGTAGACG
CTGAAAGATGTTTTTTTAATTGGCTTACTCCGTAGTTGGGGCCGGCCGTCGAGAATCGATCATATCAGGCTG
TCGTGTTGGAGACTCATGGATGCTGTGACGCCAGGTTGGCAGACGTGGATCACTCACGTCGCCCTGAAGGGGTGCCAGGGT
GCCGAAACGAACCTCAACAACCGGCCGAACTCGTTCAAAGTCCTTCTCCGCCCGCACCTGTTGGTAATGTTCACTCTC

AGCTGAAC TGATGAGCTAGAATGTATCCGCCCTGACA AACC GT CCTGCTGCCAGGCTTATTACCGTGTAGACGAAGCAGGGCTG
 GACGACGTCTTCACCGCAAAGCAGAGACAGGAAAGACGGTCTCCAGCAGAGAGCATCGACGTCAAAGCTTCCAGAGCTAGTAGCA
 AAGAAGACAAGGAGGCAACGGCTGGCAAGAAGGGATGGAAGTTGCGCGGCAGCCATCCGATCAAGATACCAAATGAAGCC
 AGGAGTCCTGGTGAGGACTGGACTGGCTGCCGGCCCTGTTAGTAGTCCTGCTACTGGACTAGGCCGCTGGCGCCCTG
 GAACGGCCTTCCTGTAGCTGCAGGCAGTGGTGTCTCATCACCGAGCAGGCAGGCAGTGTGCTAGCTTGTATAGCTTTCTAGAATAA
 TAATCAGGGATGGATGGATGGTGTATTGGCTATCTGGCTAGACGTGCATGTGCCAGTTGTATGTACAGGAGCAGTCCCGT
 CCAGAATAAAAAAAACTTGGTGGGGGGTTTTCTTCTACTCTGTAGTCTGTTGCTAGGTTGACGAAGATGTTGATATT
 GATGCCATAGATCATGTACTGTTAACGTTCTCGTTCCCTGTCAGTCACATTGATTCCAGCTGTTCAGCAGGCCG
 GTCAGCTCAGCTCCACACCAGGGGCCAGGCCGTACGCAGGCATTTTCATTTCATGCGTCATAACACAAACACTTTGAT
 CTTTCGACAAAAAAGATGGATCGCTAAC

>Diploperennis

GTCGACTGCCCTAGACCCCCATGAAGTCAAGGATAGTGAGGCCAACCAAGTTAGGCTCCCCCAGCCAGATGATCATGTTA
 GGTGTTCCACTGCCATAAAAGAAAGTGTCCGTATGTCGTACTTGGGGCGGTGAATACGTAAGGGACAGATGCTCATATACC
 TTCATCTGTTTACTCGAAATTACTAATGTTCCCTATGTCAGCTAAAGTGAATCTGCCCGACCAATCTGCAGATTGTGAA
 TGACTTGAAGTTACCGTAACCATGCTGTGGAACCCATCAATGAAAAGCTGCACATGATATCCGAGAACATAAAAAGCGCGA
 GAAGGGAAAGAGGAAAACAAATGATGATAGCTGCATCAGTCACCAACATCCTGACCAGGGTATCAGTGGATTGATGATCC
 GCTCCTGAACGGGAGCTTGAGTGACAACACAGCGGTCAAAGAAAGCACGGAGGCAGCGCAGGAAATCAGGCTATGCAAGCGCAGA
 GAGCGGTGGGAGAGCAGCGACCATGCCCTAGCGGGTTGAGATCCGAGGGAACAGATGGATTACTAGGGAGTGACTGCTAAT
 AGCAATCTGAGGAGATACTATGTAATGTCACAGGAGTTGGCCTGTGGTATGTCAGGTTATTGTCAGGTTATTGTCAGGCT
 AAGATGAGGTCTCTGCAATGATATGTTGATCGCAGTAAATCGAGATGAGCAATCAGGTTATTGTCAGGTTATTGTCAGGCT
 TGACCAATTGCGCTGCTGAGGCCTTGATCCTGATTGAGATGTCAGGCCTACTTAGAGCAAATGCTGGAAGGAAGCAATGTC
 TGTTCTGAGGTCCCTCCAGCATCACTGTAATTGTAAGTACTCAAGTACAAACTAGAACTAGTCATGCATACCAGAAGAACAG
 ATAGATGTTCAAGAGTTGAGGCCTGAGATGCCGTGCACTCTATTGCTCTGTTCATGCTTGCCTTATTATACACTATAT
 TTCACTGTACATTCTAAGGCCGTGTCACACGGTACCAAGAAGAGCAGAACACCTTTACGTTCTTGTGCTATGGATGGA
 CTTCGAGAGTCCTTGAGAAAGCACTCTCATCTATCTTCCAATTCCCTGTGGATCCTGATCACTGAAGATGGCCATTGATT
 TCACTTTCAAGTTATATAAGTGAAGACGGTTGTCTCACACGCAATATGTGAAGTGCAAGATGAGCTACACTGCAGGGAA
 CCCCAAGAAAAAACACAGGCAAGTTGTCTGATTGACAACGGCTAGAGCTGTGACGATGCAGATGACTCCGCATGTCATT
 ATCACTTTAATTGTTAGAAAAGCTACACAAAAAGCACATCAGAAAAAAAGAAGAAAAGCTATTAGGGTACTACTAGTTGC

AACTTGCAATAATGATGATGATAAATCTGCACAAGCCATAGCTATGCTATAGCTATGTACACAAAAAAATAC
ATTTTTTGTGCTATTTTTTACCGCTAGTATAATATCCATGTCTGCTACAACACACAATCATTTAACCTATAAAAAAATA
AATTAATATTAAAATAACATATGGTCCACACCATAATTAAACTGCTAAAACAAATATTAAACTCATTTGATCGTCATC
CTCTTCGGTTAGTGANGGTGACAGTGAGAGCGCTGCATCGTATTGGGTTGACTGGTTCTCACGGCTCATCTGTGTTGTA
ACGACCTATCTATGGTCAAACAAACTATTAGGATTATTGTTAGGGAAAAATGAGGGAGATAAAATAACCTATAAGCAGGACAC
ATGAAACATATGCTTAAACAGTAGAGATTAACAACATAAAATAAAAAAGGCAAACCGGGAAGCGTGCAAGCCAAAGGCCAA
TCGGCCCAGAACAGCTCCACGGTTGTCGTCGCCCCACGTGGCACGCCGGCATTCCGGGCCACAGATCCGGCTCAGGGTC
ATGTGCCACTGCCATGGCCCCCTCTGTGCGACGGCAGATTGGCACGGGAAGAAAGGTGAGGAGAGAAACACCAAGCGAAA
AAAATCACGCTTCATTGCGAGGGGGAGGATAGGGAGGAAGACGCCAAGCCAGCTCCAGTCCGGCACCCGATATAAGCGGCA
GGCACTTGGATTGCTGACGAGATGGGACTCACACGCCGTACAATGCTGTGCGCTCGCCCTTCCCTCGCCGACTCCGCTTC
CGCCGCCGGCGCTCGCTCGATGCTGATGGGCCACCGACGGGATCGCGTAAGCTGCCGATCCGGGGCTGGTGG
ATTACTACTTTGCTTTCTCTGTACTGATGGTCATAAGTTGCGAGGGTGGCGCAATGTGCGTCTGAGTGTGTTGTC
TGTCCAGTCAAGGCTGCCGGTCAGGGTGCGGAAGGTAGATCTTCCCCAGATTAGAACACGTTGTTACGGACAAAATGGAAT
TTGGTAGTAGTTGGAGAGAGAAAAAAACTCTGGAATTGTTGATTGGCTCGCTCGCTTGATTTGGCTAGTGTGCT
TTGTTATCAGTAGTAATCATTACCAAGTCTAGCGGATCTCAGATTCAACTGAAGTTGTTAAATTGGTGGCTAGTGT
TCAGCCATCTAACATCATTATTACATAATAATTAGTTGAAATAAGTGTATATTGATATTCTGTTGCTGCAAGCAGCTA
ATTAGCTTCACTACATTTCACGTGTTAGCTCTATTGCTCGTGTAAATTGAAATCTGGCTTAACGCACTGTGCAAGGTCAAGA
GCAAATTGCCACTGCAAGCTACTGTGCAAGAAGATAAAACTATGGCAACTGCCAAGGCATGTCGACCATCTCCCCATATACGA
CCTGGACCCAAGCTGGAGATATTCAAGGACCATTTCAAGGTACCGGATGAAAAGATTCTAGAGCAGAAAGGATCAATTGAAGA
AAATGAGGGAAAGTCTGAATCTTTCTAAAGGTTAGGCTTAATACATTCAAATGTAATACAAGGACCATTCACGATATT
TAGCACCTGCCATGCCCAAATATTCTGCATCATCAACATTCCGGATTGTTGATTCTTCAGGCTATTGAAATTGGG
ATTAATACAAATGAGGATGGAAGTGTATATCGTGAATGGGACCTGCTGCAAGTAAAGTTCTAATGTTGCTGCAACATGAT
GTACTGGCAGGGTATCGTTCTCCATTGCTGTGAAGAGATATCGTGTAGTAACATATTAAAAAGAACAAACTA
AAACACAGGAGAGTAATCAATGTTGGAGTAGAAAAGTGTGCAAGACTGTGCAAGACTGTGCTTGTGCAAGACTGT
GAGGAGGCTATTCTACTTTCTTGTTGATTACATAATGCTGTTCTTCTATGACAATATACTTCACTATT
TTAATAGATTGATGCATTGACTTGAGTTTACTCATGGGTGAGGGAGGCAGAGCTTATTGGTACTTCATGACTGGAAT
GGTGCACAAACATAAGATGGAGAAGGATAAATTGGTGGCTGATCAAATTGACCATGTCAGGAAACCTGCCATCCCT
CACAATTCCAAGGTTAAATTGCTTCTGCATGGTGGAGTATGGGATGCTGCAAGACTGTGCTTGTGCAAGACTGT
ATGCCTCTAAATTGGAGCTCCCTATGATGGTGTTCATTGGGATCCTCCTGCTGAAAGGTCTTTCTACTGTCCTGGACCA
CATTGTAACCTTAAGCAATAGACCTTAGCAGACAAAAATATGACAAAATTATAGTACCTTACCTCTGGTTGCAGGTACA

CATTTAACATCCTCGGCCTCAAAGCCTGCTGCCACGTATCTATGAAGCCCAGTAGGTATGAGTGGTGAAAGCCAGCAGT
AAGCACATATAAGGAATTGCAGACAATGTGTTGCCACGCATACGAGCAAATAACTACAACACAGTCAGTTGATGGCAGTTAT
GGAGCATTGCTACTATGCTCTTCGGGTACCATGTGACAAATTCTTGCAGGTTAGCAGCAGATCAGGCACACCAGAGGACCTC
AAATATCTTGTGATAAGGCACACAGTTGGGTTGCGAGTTCTGATGGATGTTGCCATAGCCATGCAAGTAATAATGTCACA
GATGGTTAAATGGCTATGATGTTGGACAAAGCACCCAAAGAGTCCTATTTCATGCCGGAGATAGAGTTATCATAAAACTTTGG
GATAGTCGGCTGTTCAACTATGCTAACACTGGGAGGTATTAAGGTTCTTCTAACCTGAGATATTGGCTGGATGAATTGATGT
TTGATGGCTTCCGATTGATGGAGTTACATCAATGCTGATCATCACCATGGTATCAATGTAAGGTTACTGGAAACTACCAAGGA
ATATTCAGTTGGACACAGATGTGGATGCAGTTACATGATGCTGCAAACCATTTAATGCACAAACTCTGCCAGAACAGCA
ACTGTTGTTGCTGAAGATGTTCAGGCATGCCGGCTTGCAGGCCAGTTGATGAAGGTGGGTTGGGTTGACTATGCCCTGG
CAATGGCTATCCCTGATAGATGGATTGACTACCTGAAGAATAAAGATGACTCTGAGTGGTCATGGTGAATAGCGCATACTT
TGACTAACAGGAGATATACTGAAAAATGCATCGCATATGCTGAGAGCCATGATCAGGTACCCCTGCATTATATTATAACTTTATA
AGGAAGTATAGTGGATGCAGCAAAGTATTTATTCCTGTGGGGTAGACAACACATGGGCAAGTATCTTTAATCAGACAG
TACTATATTCATCACATTCTATCCTGATTGCTAGTAACTGGATTAATTATTCAAAAAATTAGGCCCTCTAACATGATGTTAA
GAATTGCAATCACATATGACCTGTTATCTTAACTGAAATTAAATATCATGCAAATTTCAGTCATTGTTGGCGACAAAC
TATTGCAATTCTCCTGATGGACAAGGAAATGTACACTGGCATGTCAGACTGCAAGCCTGCTTCACCTACAATTGATCGAGGGATT
GCACCTCAAAGGTTCCATTCTCCTCAAGTTCTGGTTGAACCTGGTTTCAATAATTCTGAATGAGTCCCTCAATATACCTTG
CTTATTGTGTTCTGTACACTCCAGATGATTCACTCATCACAAATGCCCTGGAGGTGATGGCTACTTGAATTATGGGAAATG
AGGTGAAATCTCGGTCTTTGAAAAATGTTCCATTAAATAAGCCTGCATAAACCTTTGTATTTTTCTATTGAGGTTCA
GCATTAGAGTCGACCCCTCTATTCTCAGTAACTGAAGTTCTAAATGGCTATTGAATGGTAATGTTAATTCCGAGTAGCGCT
CGTTGCACATGAAAATGTGGCTGTTATGGCTGCTAACCTTTGTGACTTGTCCAATATACTCGTACAACATGGGATACATGT
AACCCCTCACTATTCAAGCATACTGCTAAATGTCAAACATCATACAGAGATATTCAAGTCTTCTCCTGCACTATCCTGGAA
TGAAAAAAAAGAGTTGTTCATATGCTATCTGACTTTACAAATGAGTGTGATCTTGGAGAAGTTAGTTGACGGAATGGTCC
ACTGTATTTGTTGTTATGTTCTCCTTATTCAAGTGTATTCAATTGATGTCAATTCTCTTCTAGTTGGTCACCCAGAA
TGGATTGACTTCCAAGAGAAGGAAACAACCTGGAGCTATGATAAAATGCAGACGACAGTGGAGCCTGTTGACACTGATCACTTG
CGGTACAAGGTTATGTCTATGAATGCAATCCTATAAGATTGTTCTGGCACCATTCTAGGCTCTTGCACCTTACCTCTT
CCATTATCGCTGTCCTATACTAGCTAGATCTGTCTGAGACTAGCTAGTTGTCAGTTCCATACTACCATTACACTCTTGGG
TTGAGCTGGGTCCAGATATGTTTCCACACTTGTGTTCTGCCCCACTGCCCTACTATAGTAAATTGCAACCTGGCTTATGTATTGACATTGAATAA
AAATAATTGATGCATTGATTGGTATGTCATTTCATAACTTGCAGACCTAGGAATGTACTTCTCAATCATTGGTTGTTTGT
CGATAGAAATTATTGTTACAGCATATGGTGGACTAAATATCCAAGTGAACGTTGTTGCTGTTTCTACCGCTCA

AGTTTACAATTATCCGGCTAACATATTAATGTTTCTCCTGCTCTAATGCTAACAGTACATGAATGCCTTGACCAAGCGA
 TGAATGCGCTCGATGAGAGATTTCCTCCTTCGTCAAAAGCAGATAAGCGACATGAATGATGAGGAAAAGGTAAGGA
 TTTCAGCATACTTGGTATGAGAGTGGTGCACGTTCTTAGGAAGAGTGGTAACTCTAGCTTGTGCTGTATTTG
 CCGATTAAGGCAGCTCAATTAGGAGTGGATGGTTGTAGCATTATTTTCTACTTCAGGTTATTGTCTTGAACG
 TGGAGATTAGTTTGTTCATTTCCATCCAAGAAAACCTACGAGGGTAAGTCACCAGTTGAAAACCTGTCTTCAG
 AGTCCCCTTTGCCTGTGGTATAATATAATAGTGTGCTTACTCCATCTGCTCTGCAACTTATATGCAGCTACAAAGTGGG
 TCGGATTTGCCTGGAAATACAGAGTAGCCCTGGACTCTGATGCTCTGGTCTCGGTGGACATGGAAGAGTAAGTAGTACGGT
 AGACGCTGAAAGATGTTTTTTAATTGGCCCTACTCCGTAGTTGGGCCGGCCGTGAGAATCGATCATATCA
 GGCTGTCGTGTTGCGAGACTCATGGATGCTGACGCAGGTTGGCCACGACGTGGATCACTCACGTCGCCTGAAGGGTGCCA
 GGGGTGCCGAAACGAACCTCAACAACCGGCCAACCTGTTCAAAGTCCTTCTCCGCCCGCACCTGTGTGGTAATGTTCACTT
 ATTCTCAGCTGAACGTGAGCTAGAATGTATCCGCCCTGACAAGCCGTCTGCTGCCAGGCTTATTACCGTGTAGACGAAGCAG
 GGGCTGGACGAGGTCTCACGCCAACAGCAGAGACAGGAAAGACGTCTCCAGCAGAGACATCGACGTCAAAGCTTCCAGAGCTAG
 TAGCAAAGAAGACAAGGAGGCAACGGCTGGCAAGAAGGGATGGAAGTTGCGCCGGCAGCCATCCGATCAAGATAACAAATG
 AAGCCAGGAGTCCTGGTGAGGACTGGACTGGCTGCCGCCCTGTTAGTAGTCCTGCTACTGGACTAGCCGCCCTGGCGC
 CCTTGGAACGGTCCTTCCTGTAAGCTCGCAGCGACTGGTGTCTCATACCGAGCAGGCAGGCACTATTGTATAGCTTTCTAG
 AATAATAATCAGGGATGGATGGATGGTGTATTGGCTATCTGGCTAGACGTGCATGTGCCAGTTGTATGTACAGGAGCAGT
 TCCCGTCCAGAATAAAAAAAACTGTTGGGGGTTTTCTTACTCTGTAGTCTGTTCTGCTAGGTTGACGAAGATGTT
 TGATATTAGATGCCATAGATCATGTACTGTTAAGTTCTCGTCTGTTCCCTGTCAGTTCACATTGATTCCAGCTGTTCA
 GCAGGCCGGTCAGCTCAGCTCACACCGGGGCCAGGCCGGCGTCACGCAGGCATTTCATGCGTCATAACACAAACA
 CTTTGATTTCGACAAAAAGATGGATCGCTAAC

>GEMS

GTCGACTGCCCTAGACCCGATGAAGTCAAGGATAGTGAGCGCCAACCAAGTTAGGCTCCCCAGCCAGATGATCATGTTA
 GGTGTTCCACTGCCATAAAAGAAAGCGTCCGTGATGTCGTACTTGGGGCGGTGAATACGTAAGGGACAGATGCTCATATACC
 TTCATCTGTTTACTCTAAATTACTAATGTTCCCTATGTCAGCTAAAGTGAATCTGCCGACCAATCTGCAGATTGTGAA
 TGACTTGAAGTTACCGTGAACCATGCTGTGGAACCCATCAATGAAAAGCTGCACATGATATCCGAGAACATCAAAAGCGCGA
 GAAGGGAAAGAGGAAAACAAATGATGATAGCTGCATCAGTCACCAACATCCTGACCAGGGTCATCAGTGGATTGATGATCC
 GCTCCTGAACGGGAGCTTGAGTGACAACAGCGTCAAAGAAAGCACGGAGGCAGCCAGGAAATCAGGCTATGCAAGCGCAGA
 GAGCGGTGGGAGAGCAGCGACCATGGCCTAGCGGGTTGAGATCCGAGGAAACAGATGGATTACTAGGGAGTGACAGCTAAG

AGCAATCTGTGGAGATACTATGTAATGTCACAGGAGTTGGCCTGTGGTATGTGCGATAACCAGGCCAGTGGGTTCTGAGCGT
AAGACGAGGTCTCTAGCAATGATATGTTGAGCGCGACTAAATCGAGATGAGCAATCAGGTGTTGATTCTTCGGCT
TGACCATTCGGCTGCTGAGGCCTGATCCTGATTGAGATGTCAGGCCTACTTAGAGCAAATGCTGGAAGGAAGCAATGTGCG
TGTTCTAGGTCCCTCCAGCATCACTGTAATTGTAAGTACTCAAGTACAGACTAGAACTAGTCATGCATACCAAGAAGAATAGA
TAGATGTTCAGAAGTTGAGGCCTGAGATGCCGCTACTCTATTGCTCTGTTCATGCTTGCCGTTATTATATCACTATATT
TCACTGTTCATCTAACGGCCTGTCACACGGTACCAAGAGCAGAACACCTTTACGTTCTTGTGCTATGGATGGAC
TTCAAGAGTCCTTGAGAAAGCACTCTCATCTATCTTCCAATTCTGTTGATCCTGATCACTGAAGATGCCATT
TGATTTTCACTTTCAAGTTATATAAAAGTGAAGACGGTGTCTCACGCAATATGTGAAGTGCAAGATGAGCTACACTGCA
AGGAACCCCAAGAAAAAACACAGGTAAGTTGCTGATTGACAACAGGCTAGAGCTGTGACGATGCAAGATGACTCCGCATGT
TCATTCACTACTTAATTGTTAGAAAAGCTACACAAAAAGCACATCAGAAAAAAAGAAGAAAAAGCTATTAGTGGTACTACT
AGTGCAACTGCAATAATGATGATGATAAATCTGCACAAGCCATAGCTATGCTATAGCTATGTATATGTACACAAA
AAATACATTGCTATTGCTATTGCTACCGCTAGTATAATATCCATGTCTGCTACAACACACAATCATATTAAACTCATCG
TTCATCCTCTTCGGTTAGTGAGGTGGACAGTGAGAGCGCTGCATCGTGTATTGGGTTGACTGGTTCTCACGGCTCATCTGT
GTTGTAACGACCTATCTATGGTCAAACAAACTATTAGGATTATTGTTAGGCAGGGAGATAAAATAACCTATAAGCA
GGACACATGAAACAGATGCTTAAACAGTAGAGATTACAACATAAAATAAAAAAGGCAAACCGGGAAAGCGTGCAAGCCAAA
GGCCAATCGGCCAGAACCGCTCCACGGCTGTCGTCCGCCACGTGGCACGCCGGCCATTCCGGGCCACAGATCCGGCTC
AGGGTCATGTGCCACTGCCATGGCCGCTCCTGTCGAGCGCAGATTGCGACGGGAAGAAAGGTGAGGAGAGAAACAACCAA
GCGAAAAAAATCACGCTTCATTGCGAGGGGGAGGATAGGGAGGAAGACGCCAAGCCAGCTCCAGTCGGCACCCGATATAAG
CGGCAGGCAGTGAGGACTCACCGCCACAAATGCTGCGCTCGCCGATCGCGTCTCGCCCTCTCGCCGACTCC
GCTTCCGCCGCCGCGCTCGCTCGCATGCTGATCGGGGGACCGACGGGATCGCGTAAGCTGCGCGATCCGGGGCTG
GTGGATTACTACTTTGCTTTCTGTACTGATGGTCATAGTTGCGAGGGGCAATGTGCGTCTGAGTGTGT
TGTCTGTCCAGTGCAAGGCTGCCGGTCAGGGGTGCGGAAGGTAGATCTTCCCCAGATTAGAACACGTTGTTACGGACAAAATG
GAATTGGTAGTAGTTGGAGAGAGAAAAAAACTCTGGAATTGGAATTGGGATGGGCTCGCTTGGATTGGCTTAGTGCTTT
GTTATCAGTAGTAATCATTACAAAGTCTAGCGGATCTCAGATTCAACTGAAGTTGTTAAATTGGGTTGGTTCTTCTTC
AGCCATCCTAATCATTATTACATAATAATTAGTGAATAAAAGTCTATATTGATATTCTGTGGTTGCTGCAGCAGCTAAT
TAGCTTCACTACATTTCACGTGTTAGCTCTATTGCTCGTGAATTCTGAATCTGGCTTAACGCAGTGTGCAAGGTCAAGAGC
AAATTGCCACTGCGAGCTGTGCAAGAAGATAAAACTATGGCAACTGCCAAAGGCAGTGCACCATCTCCCCATATACGACC
TGGACCCCAAGCTGGAGATATTCAAGGACCAATTCAAGGACCAATTGAGTACGGGATGAAAAGATTCTAGAGCAGAAAGGATCAATTGAAGAAA
ATGAGGGAAGTCTGAATCTTTCTAAAGGTTAGGCTTAATACATTCAAATGCTAATACAAGGACCAATTCAAGGACCAATTGAGTCTTATA

GCACCTGCCATGCCACAAAATTATCTGCATCATCAACATTCCGGATTTATTTTTTCAGGCTATTGAAATTGGGAT
TAATACAAATGAGGATGAAACTGTATATCGTAATGGCACCTGCTGTGAGTAAGTCTAATGTTGTCATGCAAACATGATGT
ACTGGCGGGTATCGTTTCCCATTGCTGTGAAGAGATATCGTCTGATAGTAACTATATAAAAAAAAAGAACAGCTAA
AACACAGGAGAGTAATCAATGTTGGGTAGAAAAGTTCGGATATTCTTCTGTGCAAGACTGTCATGTCTAGCTGAG
GAGGCTATTCTTCTGTGATTACATAATGCTGTTCTTAAGACAATATACTTCACTATTAAATAGATTGATG
CATTTGACTTGAGTTTACTCATGGGTAGGGAAGCAGAGCTTATTGGTCAATGACTGGAATGGTCAAACCATAA
GATGGAGAAGGATAAATTGGTGTGATCAAATTGACCATGTCAAAGGGAAACCTGCCATCCCTACAATTCCAAGGT
TAAATTGCTTCTACATGGTGGAGTATGGTTGATCGTATTCTGCATGGATTGTTGACTGTTGATGCCCTAAATT
GGAGCTCCCTATGATGGTGTGATGGATCCTGCTTCTGAAAGGTCTTCTACTGTCCTGGACCACATTGAAACTAA
GCAATAGACCTTAGCAGACAAAATATGACAAAATTATAGTACCTTCACCTCTGGTTGCAGGTACACATTAAAGCATCTC
GGCCTCAAAGCCTGCTGCTCACGTATGAAAGCCATGTAGGTATGAGTGGTAAAAGCCAGCAGTAAGCACATAGGGA
ATTGAGACAATGTGTTGCCACGCATAGGAGCAAATAACTACAACACAGTTGATGGCAGTTATGGAGCATTGTA
TGCTTCTTCGGGTACCATGTGACAAATTCTTGCAGGTTAGCAGCAGATCAGGCACACCAGAGGACCTCAAATATCTGTTGAT
AAGGCACACAGTTGGGTTGCGAGTTGATGGATGTTGCATAGGCATGAAAGTAATAATGTCACAGATGGTTAAATGGC
TATGATGTTGGACAAAGCACCAAGAGTCCTATTTCATGCCGGAGATAGAGGTTATCATAAAACTTGGGATAGTCGGCTGTC
AACTATGCTAATGGGAGGTATTAAGGTTCTTCTAACCTGAGATATTGGTTGGATGAATCCATGTTGATGGCTCCGAT
TTGATGGAGTTACATCAATGCTGTATCATCACCATGGTATCAATGTGGATTACTGGAAACTACCAGGAATATTGAGTTGG
ACACAGATGTGGATGCAAGTGTTCATGATGCTGCAAACCATTAAATGCACAAACTCTGCCAGAAGCAACTGTTGCTG
AGATGTTCTGGCATGCCGGCTTGGCCAGTTGATGAAGGTGGGTTGGTTGACTATCGTCTGCCATGGCTATCCCT
GATAGATGGATTGACTACCTGAAGAATAAGATGACTCTGAGTGGTCAATGGGTGAAATAGGCATACTTGA
TACTGAAAAATGCATGCATATGCTGAGAGCCATGATCAGGTACCTGCATTATATTAAACTTATAAGGAAGTATAGTTG
GATGCAGCAAAGTATTATTCCTGTGGGTAGACAACACATGGGCAAGTATCTTAAATCAGACAGTGCATATTTCATC
ACATTCTATCCTGATTGCTAGTAACGGATTAATTATTCAAAAAATTAGGCCCTCTAACGCATGTTAAGAATTGCAATC
ACATATGACCTGATTATCTTAACTGGAAATTAAATCATGCAAATTTCAGTCTATTGTTGGGACAAAACATTGCATTCTC
CTGATGGACAAGGAAATGTACACTGGCATGTCAGACTGCAAGCCTGCCATCACATTGACCGAGGGATTGCACTCCAAAAGG
TTCCATTCTCCTCAAGTTCTGGTGAACCTGGTTATATAATTCTGAAATGAGTCCCTCAATATACCTGCTTATTGTTCT
GTACACTCCAGATGATTCACTCATCACAAATGCCCTGGAGGTGATGGCTACTGAAATTATGGGAAATGAGGTGAAATCTCG
GTCTTTGAAAAATGTTCCATTAAATAAGCCTGCATAAACCTTGTATTCTTCTATTGAGGTTCAAGCATTAGAGTCG
ACCCTCTATTCTCAGTAACGAAAGTCCATGGCTATTGAATGGTTAATGTTAATTCCGAGTAGCGCTGTTGACATGAA
AATGTTGGCTGTTATGGCTGCTAATCCTTGTGACTTGTCCAATATACTCGTACAACATGGGATACATGTAACCCTCACTAT

TCAAGCATACTGCTTAAATGTCAAACATCATACAGAGATATTATCAAGTCTTCCTGCACTATCCTGGAATGAAAAAAAAGA
GTTGTTCATATGCTATCTGTACTTTACAAATGAGTGTGATCTTGAGAAGTAGTTGACGGAATGGTCCACTGTATTTGT
TTGTTATATGTTCTCCTTATTCAATGATGTGCAATTCTCTTAGTTGGTCACCCAGAATGGATTGACTTT
CCAAGAGAAGGGAAACAACGGAGCTATGATAATGCAGACAGTGGAGCCTGTGGACACTGATCACTTGCGGTACAAGGTT
ATGTCTATGAATGCAATCCTTATAAGATTTGTTCTGCCACCATTCTAGGCTCTCTTGACCTTACCTCTCCATTATCGCT
GTCTCCTATACTAGCTAGATCTGTCTGAGACTAGCTAGATGTCAAGTCCCTACTACTATTACACTCTTGAGTTGAGCTGGTC
CAGATATGCTTTCCACACTTGTGCTGCCACTGCCCTACTATAGTAATTCACCAACCCGTACATGTTACTCAATAA
ACAGGTTGGATTGCCGTGCAAACCTAGTATTTGTAAGTTGACCTGGCTTATGTATTGCCATTGTTGAATAAAAATAATT
TGATGCATTGATTGGTATGTCATTTCTAACTTGCAGACCTAGGAATGTAACCTCTCAATCATTGGTGTGTTGATAGAA
ATTATTCTGTTACAGCATATGGTGGACTAAATATCCAAGTGAACGTTGTTGCTGTTCTACCCCTCAAGTTAC
AATTATCCGGCTAACATATTAATGTTCTCCTGCTCTAATGCTGAACAGTACATGAATGCGTTGACCAAGCGATGAATGC
GCTCGATGAGAGATTTCCTCCTTCGTCGTCAAAGCAGATCGTAAGCGACATGAACGATGAGGAAAAGGTAAGGATTTCAGA
ATACTTGGTATGAGAGTGTGCGACGTTCTTCTTAGGAAGAGTGGTAACTCTAGCTTGTGCTGTATTGCGATT
AGGCGAGCTCAAATTAGGAGTGGATGGTTGTCAGCATTATTTTCTACTTCGTTCAAGGTTATTGCTTGAACGTTGAGA
TTTAGTTTTGTTCAATTCCATCCAAGAAAACCTACGAGGGTAAGTCACCAGTTGTAACAAACCTGTCTTCAAGAGTCCC
TTTGCCTGTTGATAATATAATAGTGTGCTTACTCCATCTGCTCTGCAACTTATATGCAAGCTACAAAGTGGATGCGAT
TTGCCTGGAAATACAGAGTAGCCCTGGACTCTGATGCTCTGGTCTTCGGTGGACATGGAAGAGTAAGTAGTACGGTAGACGC
TGAAAGATTTTTTAATTTCGCCCCACTCCGTAGTTGGGGCCGGCCGGCTCGAGAACATGATCATATCAGGCTGTCGT
GTTTGCAGACTCATGGATGCTGTGACGCAGGTTGGCCACGACGTGGATCACTTCACGTCGCTGAAGGGTGCCAGGGTGCC
GAAACGAACCTCAACAACCGGCCAACCTCGTTCAAAGTCCTTCTCCGCCCCCACCTGTGTTGAATGTCACATTCTCAGC
TGAACGTGAGCTAGAATGTATCCGCCCTGACAAACCGTCTGCTGCCAGGCTTATTACCGTGTAGACGAAGCAGGGTGGAC
GACGTCTCACGCGAAAGCAGAGACAGGAAAGACGTCTCCAGCAGAGAGCATGACGTCAAAGCTCCAGAGCTAGACAAAG
AAGACAAGGAGGCAACGGCTGGCAAGAAGGGATGGAAGTTGCGCGGCAGCCATCCGATCAAGATAACAAATGAAGCCAGG
AGTCCTGGTGGAGGACTGGACTGGCTGCCGGCCCTGTTAGTAGTCCTGCTACTGGACTAGCCGCCGTGGCCCTTGGAAC
GGTCCTTCTGTTAGCTCGCAGGCAGCTGGTCTCATACCGAGCAGGCAGGCAGCTGCTGTATAGCTTTCTAGAATAATAAT
CAGGGATGGATGGATGGTGTGTTAGGGCTATCTGGCTAGACGTGCATGTGCCAGTTGTTAGTACAGGAGCAGTCCCGTCCAG
AATAAAAAAAAAACTGTTGGGGGGTTTTCTTCTACTCTGTAGTCTGTTCTGCTAGGTTGACGAAGGTGTTGATATTAGATG
CCATAGATCGTGTACTGTTAAGTTCTCGTCTGTTCCCTGTCAGTCAGTTCACATTGATTCCAGCTGTTCAGCAGGCCGTCA
GCTCAGCTCCACACCGGGGGCAGGCCGGCTACGCAGGCATTTCATGCGTCATAACACAAACACTTTGATCTTT
TCGACAAAAAAGATGGATCGCTAAC

>Mandan Black

GTGCACTGCCCTAGACCCCGATGAAGTCAAGGATAGTGAGC GCCAACCAAGTTAGGCTCCCCAGCCAGATGATCATGTTA
GGTGTCCACTGCCATAAAAGAAAGCGTCCGTGATGTCGTACTTGGGGCGGTGAATACGTAAGGGACAGATGCTCATATACC
TTCATCTGTTTACTCGAAATTACTAATGTTCCCTATGTCAGCTAAAGTGAATCTCACCGACCAATCTGCAGATTGTGAA
TGACTTGAAAGTTACCGTAACCATGCTGTGGAACCCATCAATGAAAAGCTGCACATGATATCCGAGAACATCAAAAGCGTGA
GAAGGGAAAGAGGAAAACGAATGATGATAGCTGCATCAGTCACCAACATCCTGACCAGGGTCATCAGTGGATTGATGATCC
GCTCCTGAACGGAAGCTTGAGTGACAACAGCGGTCAAAGAAAGCACGGAGGCAGCGCAGGAAATCAGGCTATGCAAGCGCAGA
GAGCGGTGGGAGAGCAGCGACCATGGCCTAGCGGGTTGAGATCCGAGGGAACAGATGGATTACTAGGGAGTGACAGCTAGG
AGCAATCTGTGGAGATACTATGTAATGTCACAGGAGTTGGCCTGTGGTATGTCGATAACCGGGCAGTGGTTCTGAGCGT
AAGACGAGGTCTCTAGCAATGATATGTTAGCGTGACTIONATCGAGATGAGCAATCAGGTTGTTGATTCTTCGGC
TGACCAATTGCGCTGCTGAGGCCTTGATCCTGTATTGAGATGTCAGGCCTACTTAGAGCAAATGCTGGAAGGAAGCAATGTGCC
TGTCTGAGGTCCCTCCAGCATCACTGTAATTGAAAGTACTCAAGTACAGACTAGAACTAGTCATGCATACCAGAAGAATAG
ATAGATGTTTCAGAAGTTGAGGCCTGAGATGCCGTGCACTCTATTGCTCTGTTCATGCTTGCCATTATATACACTATTT
TCACTGTTCAATTCTAAGGCCGTTGTACACCGGGTACCAAGAGCAGAACACCTTTACGTTCTTGTGCTATGGATGGAC
TTCGAGAGTTCTTGAGAAAGCACTCTCATCTATCTTCCAATTCTTGTTCTTGAGATCCTGATCACTGAAGATGCCATT
TGATTTCACTTCACTTCAAGTAAAGTGAAGACGGTTGTCACGCAATATGTAAGTGCAAGATGAGCTCTACACTGCA
AGGAACCCCAAGAAAAAACACAGGTAAGTTGTCGATTGACAACAGGCTAGAGCTGTGACGATGCAGATGACTCCGCATGT
TCATTCACTTTAATTGTTAGAAAAGCTACACAAAAAGCACATCAGAAAAAGAAGAAAAAGCTATTGTTGAGTACT
TGTGCAACTTGCAATAATGATGATGATAATCTGCACAAGCCATAGCTATGCTATATGCTATAGCTATGTACACAAA
AAATACATTGCTATTGCTATTGCTACCCCTGTATAATATCCATGTCTGGTACAACACACAATCATATTAAACCTATAA
AAAATAATTAAATTTAAACATATGGTCCACACCATAATTAAACTGCTAAAACAAATATTAAACTCATTGATCG
TTCATCCTTTCGGTTAGTGAGGTGGACAGTGGAGAGCGCTGCATCGTATTGGGTTGACTGGTTCTACGGCTCATCTGT
GTTGTAACGACCTATCTGTGGTCAAACAAACTATTAGAGATTATTGTTAGGGAAAAATGGGGATATAAAACCTATAAGC
AGGACACATGAAACATATGCTTACACAGTAGAGATTAACCACATAAAATAAAAAGGCAAACCGGGAGCGTGCAAGCCCAA
AGGCCAATCGGCCAGAACAGCTCCACGGTTGTCGTGCGCCACGTGGCACGCCGGCCATTCCGGCCACAGATCCGGCT
CAGGGTCATGTGCCACTGCCATGGCCCCCTCCTGTCGAGCGGAGATTGCGACGGGAAGAAAGGTGAGGAGAGAACACCA
AGCGAAAAAAATCACGCTTCATTGGAGGGGGAGGATAGGGAGGAAGACGCCAGCTCCAGTCCGGCACCGATATAA
AGCGCAGGCACTTGGATTGCTGACGAGATGGACTCACGCCGTACAATGCTGTGCGCTCGCCCTTCCCTGCCGACT

CCGCTTCCGCCGCCGGCGCTCTCGCTCGCATGCTGATCGGGCGGCACGCCGGGATCGCGTAAGCTGCCGATCCGGGGC
TGGTGGATTACTACTTTGCTTTCTCTGTACTGATGGTCATAGTTGCCAGGGTGGCGAATGTGCCCTGAGTGT
GTTGCTGTCAGTCAAGGCTGCCGGTCAGGGTGCGGAAGGTAGATCTTCCCCAGATTAGAACCTCGTTACGGACAAAA
TGAATTGGTAGTAGTTGGAGAGAGAAAAAAACTCTGAATTGTGGATTGGGCTCGCTCGCTTGATTTGGCTCT
AGTGTGTTACAGTAGTAATCATTACCAAGTCTAGCGGATCTCAGATTCAACTGAAGTTGTTAAATTGGTGGTTG
GTTTCTTCAGCCATCCTAATCATTACATAATAATTAGTGAATAAGTGTATATTGATATTCTGTGGTTGCTGCAG
CAGCTAATTAGCTTCACTACATTTCACGTGTTAGCTCTATTGCTCGTAGTTGAATCTGGCTTAACGCACTGTGCAAGG
TCAAGAGCAAATTGCCACTGCAGCTACTGTGCAAGAAGATAAAACTATGCCAAGGCGATGTCGACCACATCCCCAT
ATACGACCTGGACCCAAGCTGGAGATATTCAAGGACCATTCAGGTACCGGATGAAAAGATTCTAGAGCAGAAAGGATCAAT
TGAAGAAAATGAGGGAAAGTCTGAATCTTTCTAAAGGTTAGGCTTAATACATTCAAATGCTAATACAAGGACCATTCACGA
TATTATAGCACCTGCCATGCCGCAAATATTATCTGCATCATCAACATTCCGGATTGTATTGCTATTGCTATTGAAA
TTTGGGATTAATACAAATGAGGATGGAAGTGTATATCGTGAATGGGACCTGCTGCGCAGTAAGTTCTAATGTCATGCAA
CATGATGTAAGTGGGGGTATGTTTCCATTGCTGTGAAGAGATATCGTCTGATAGTAACTATATTAAAAAAAAGA
ACAGCTAAAACACAGGAGAGTAATCAATGTTGGAGTAGAAAAGTTCGGATATTCAATTCTGTGCAAGACTGTCATGCT
TAGCTGAGGAGGTTATTGCTGTGATTACATAATGCTGTTCTTCTTACATGACATTGAACTATTTCAATTGCTGCAAGACTGTCATGCT
GATTGATGCATTGACTTGAGTTTACTCATGGGTGAGGGAGGAGCTATTGGTGAATTCAATGACTGGAAATGGTCA
AACCATAAAGATGGAGAAGGATAAAATTGGTGTGCGATCAAATTGACCATGCTAAAGGGAAACCTGCCATCCCTACAAT
TCCAAGGTTAAATTGCTTCTACATGGTGGAGTATGGGTTGATCGTATTCCAGCATTGATTGCTATGCGACTGTTGATGCC
CTAAATTGGAGCTCCCTATGATGGTGTGATTGGGATCCTCTGCTGAAAGGTCTTTCTACTGTCCTGGACCACATTGT
AAACTTAAGCAATAGACCTAGCAGACAAAAATATGACAAAATTATAGTACCTTTACCTCTGGTTGAGGTACACATT
AGCATCCTCGGCCTCAAAGCCTGCTGCCACGTATGAAGCCCAGTGTAGGTATGAGTGGTGAAGGCCAGCAGTAAGC
ATATAGGGAATTGCGACAAATGTGTTGCCACGATACGAGCAAATAACTACAACACAGTTGATGGCAGTTATGGAGCA
TTCGTACTATGCTTCTTCGGGTACCATGTGACAAATTCTTGCAGTTCTGATGGATGTTGCTCATGCCATGCAAGTAATAATGTC
CTTGTGATAAGGCACACAGTTGGGTTGCGAGTTCTGATGGATGTTGCTCATGCCATGCAAGTAATAATGTC
TTAAATGGCTATGATGTTGGACAAAGCACCAAGAGTCCTATTTCATGCCGGAGATAGAGGTTATCATAAAACTTGGGATAGT
CGGCTGTTCAACTATGCTAAGGGAGGTATTAGGTTCTTCTTCAACCTGAGATATTGGTGGATGAATTGTTGATG
GCTTCCGATTGATGGAGTTACATCAATGCTGATCATCACCAGGTATCAATGTCAGGGTTACTGGAAACTACCAGGAATATT
CAGTTGGACACAGCTGTGGATGCAAGTTACATGATGCTGCAAACCAATTAAATGCACAAACTCTTGCCAGAAGCAACTGTT
GTTGCTGAAGATGTTCAGGCATGCCGGCCTTGCCGCCAGTTGATGAAGGTGGGTTGGGTTGACTATGCCCTGGCAATGG
CTATCCCTGATAGATGGATTGACTACCTGAAGAATAAGATGACTCTGAGTGGTCATGGTGAAATAGCGCATACTTGACTA

ACAGGAGATATACTGAAAAATGCATCGCATATGCTGAGAGCCATGATCAGGTACCCCTGCATTATATAACTTTATAAGGAAG
TATAGTTGGATGCAGCAAAGTATTTATTCCTTGTGGGTAGACAACACATGGGGCAAGTATCTTTAATCAGACAGTACTAT
ATTTCATCACATTCTATCCTGATTGCTAGTAACCTGGATTAGTTATTCAAAAAATTAGGCCCTCTAACATGTTAAGAATT
TGCAATCACATATGACCTGTTATCTTATACTGGAAATTAAAATCATGCAAATTTCAGTCTATTGTTGGCAGAAAACATTGC
ATTTCCTGATGGACAAGGAAATGTACACTGGCATGTCAGACTGCGCCTGCTCACCTACAATTGATCGAGGGATTGCACTC
CAAAAGGTTCCATTCTCCTCAAGTTCTGGTTGAACCTGGTTCAATAATTCTGAATGAGTTCCCTCAATATACCTGCTTATT
GTGTTCTGTACACTCCAGATGATTCACTCATACAATGGCCCTGGAGGTGATGGCTACTTGAATTATGGAAATGAGGTGA
AATCTCGGTCTTTGAAAAATGTTCCCATTAAATAAGCCTGCATAAACCTTTGTATTTTTCTATTGAGGTTCAACATT
AGAGTCGACCCTCTATTTCTCAGTAACCTGAAGTTCTAAATGGCTATTGAATGGTTAATGTTAATTCCAATAACGCTCGTTGC
ACATGAAAATGTGGTCTGTTATGGCTGTAATCCTTTGTGACTTGTCCAATATACTCGTACAACATGGGATACATGTAACCC
TCACTATTCAAGCATACTGCTAAATGTCAAACATCATACAGAAATTATTAAGCTTCTCCTGCACTATCCTGGAATGAAAA
AAAAGAATTGTTCATATGCTATCTGACTTTACAAATGAATGTGATCTTGGAGAAGTTAGTTGACGGAATGGTCCACTGGA
TTTGTGTTATGTTCTCCCTAATCATAGTGTATTGCAATTGATGTGCAATTCTCTTAGTTGGTACCCAGAATGGATT
GACTTCCAAGAGAAGGGAAACAACGGCTATGATAATGCAGACGACAGTGGAGCCTTGGAACACTGATCACTTGGGTAC
AAGGTTATGTCTATGAATGCAATCCTTATAAGATTGTTCTGGCACCATTCTAGGCTCTTGTACCTTACCTCTCCATT
ATCGCTGTCCTATACTAGCTAGATCTGTCTGAGACTAGCTAGATGTCAGTTCTTACTACTATTACACTCTTGAGTTGAGC
TGGGTCCAGATATGCTTTCCACACTTGTGCTGCCCCACTGCCCTACTATAGTAAATTGACCAACCCGTACATGTTACTC
AATAAACAGGTTGGATTGGCTGTGCAAACCTAGTATTGTAAGTTGACCTGGCTTATGATTGCCATTGTTGAATAAAAAT
AATTTGATGCATTGATTGGTATGTCATTTCATAACTTGCAGACCTAGGAATGTAATTCTCAATCATTGGTTGTTGAT
AGAAAATTATTCTGTTACAGCATATGGGACTAAATATCCAAGTGAACGTTGTTGCTGTTTCTACCCCTCAAGT
TTACAATTATCCCGCTAACATATTAAATGTTTCTCCTGCTCTAATGCTGAACAGTACATGAATGCGTTGACCAAGCGATGA
ATGCGCTCGATGAGAGATTTCCTCCTTCGTCGTCAAAGCAGATCGCAGCGACATGAACGATGAGGAAAAGGTAAAGGATTTC
AGAATACTTGGTATGAGAGTGTGCGACGTTCTTCTTAGGAAGAGTGGTAACCTAGCTGTTGCTGTGTTGAGTC
TTAAGGCGAGCTTCAATTAGGAGTGGATGGTTGTCAGCATTATTTCTACTTCGTTAGGTTATTGTCCTTGAACGTGGA
GATTAGTTTGTGTTCAATTCCATCCAAAGAAAACCTACGAGGGTAAGTCACCAGTTGTAACCCCTGTCTTTCAGAGTC
CCTTTGCCTGTTATAATATAATAGTGTGCTTACTCCATCTGCTCTGCAACTTATATGCAAGTACAAAGTGGGATGCG
ATTGCGCTGGAAATACAGAGTAGCCCTGGACTCTGATGCTCTGCTTCCGGACATGGAAGAGTAAGTAGTGACGGTAGAC
GCTGAAAGAAGGTTTTTTAATTGTCCTACTCCGTAGTTGGGGCCGGCCGGCTGAGAATGATCATATCAGGCT
GTCGTGTTGCGAGACTCATGGATGCTGTGACGCAGGTTGCCACGACGTGGATCACTCACGTGCCCTGAAGGGGTGCCAGGG
TGCCGAAACGAACCAACCGGCCGAACTCGTTCAAAGTCCTTCTCCGCCCGCACGTGTTGAGTAATGTTCACTTACTCT

CAGCTGAACGTGAGCTAGAATGTATCCGCCCTGACAAACCGTCCTGCTGCCAGGCTTATTACCGTAGACGAAGCAGGGCT
 GGACGACGTCTTCACCGCAAAGCAGAGACAGGAAAGACGTCTCCAGCAGAGAGCATCGACGTCAAAGCTTCCAGAGCTAGTAGC
 AAAGAACACAAGGAGGCAACGGCTGGTGGCAAGAAGGGATGGAAGTTGCGCGGCAGCCATCCGATCAAGATACCAAATGAAGC
 CAGGAGTCCTTGGTGGACTGGACTGGCTGCCGCCCTGTTAGTAGTCCTGCTCTACTGGACTAGCCGCCGCTGGCGCCCTTG
 GAACGGTCCTTCCTGTAGCTGCAGGCAGTGGTGTCTCATCACCAGGCAGGCAGGCAGTGTGCTTGTATAGCTTTCTAGAATAA
 TAATCAGGGATGGATGGATGGATGGTGTATTGGCTATCTGGCTAGACGTGCATGTGCCAGTTGTATGTACAGGAGCAGTCCCGT
 CCAGAATAAAAAAAACTTGGTGGGGGGTTTTCTTCTACTCTGTAGTCTGTTGCTAGGTTGACGAAGATGTTGATATT
 GATGCCATAGATCATGTACTGTTAACGTTCTCGTCCCTGTTCCAGTTCACATTGATTCCAGCTGTTCAGCAGGCCG
 GTCAGCTCAGCTCCACACCAGGGGCCAGGCCGTACGCAGGCATTTTCATTTCATGCGTCATAACACAAACACTTTGAT
 CTTTCGACAAAAAAGATGGATCGCTAAC

>Mandan Red Clay

GTCGACTGCCCTAGACCCCCATGAAGTCAAGGATAGTGAGCCCCAACCAAGTTAGGCTCCCCCAGCCAGATGATCATGTTA
 GGTGTTCCACTGCCATAAAAGAAAGCGTCCGTGATGTCGTACTTGGGGCGGTGAATACGTAAGGGACAGATGCTCATATACC
 TTCATCTGTTTACTCGAAATTACTAATGTTCCCTATGTCAGCTAAAGTGAATCTCACCCGACCAATCTGCAGATTGTGAA
 TGACTTGAAGTTACCGTAACCATGCTGTGGAACCCATCAATGAAAAGCTGCACATGATATCCGAGAACATCAAAAGCGTGA
 GAAGGGAAAGAGGAAAACGAATGATGATAGCTGCATCAGTCACCAACATCCTGACCAGGGTCATCAGTGGATTGATGATCC
 GCTCCTGAACGGAAGCTTGAGTGACAACACGCGTCAAAGAAAGCACGGAGGCAGCGCAGGAAATCAGGCTATGCAAGCGCAGA
 GAGCGGTGGGAGAGCAGCGACCATGCCCTAGCGGGTTGAGATCCGAGGGAACAGATGGATTACTAGGGAGTGACAGCTAGG
 AGCAATCTGAGGAGATACTATGTAATGTCACAGGAGTTGGCCTGTGGTATGTCGATAACCGGGCAGTGGTTCTGAGCGT
 AAGACGAGGTCTCTAGCAATGATATGTTGAGCGTACTAAATCGAGATGAGCAATCAGGTTGTTGATTCTTCGGC
 TGACCAATTGGCTGCTGAGGCCTTGATCCTGATTGAGATGTCAGGCCTACTTAGAGCAAATGCTGGAAGGAAGCAATGTGCC
 TGTTCTGAGGTCCCTCCAGCATCACTGTAATTGTAAGTACTCAAGTACAGACTAGAACTAGTCATGCATACCAGAAGAACAG
 ATAGATGTTCAAGAGTTGAGGCCTGAGATGCCGTGCACTCTATTGCTCTGTTCATGCTTGGCTTATTATATCACTATTT
 TCACTGTTCAATTCTAAGGCCGTGTCACACGGTACCAAGAGCAGAACACCTTTTACGTTCCCTTGCTGCTATGGATGGAC
 TTGAGAGTTCCCTGAGAAAGCACTCTCATCTATCTTCCAATTCTGTTGCTGCTGATCAGTCAAGATGGCCATT
 TGATTTTCACTTTCAAGTTATATAAGTGAAGACGGTTGCTCACGCAATATGTGAAGTGCAAGATGAGCTCTACACTGCA
 AGGAACCCAAGAAAAAACACAGGTAAGTTGCTGATTGACAACGGCTAGAGCTGTGACGATGCAGATGACTCCGCATGT
 TCATTCACTTAATTGTTAGAAAAGCTACACAAAAAGCACATCAGAAAAAAGAAGAAAAAGCTATTAGGGTACTACT

AGTTGCAACTTGCATAATGATGATGATAAATCTGCACAAGCCATAGCTATGCTATAGCTATGTATGTACACAAA
AAATACATTTCGGCTATTTTACCGCTAGTATAATATCCATGTCTGCTACAACACACAATCATATTAAATACCTATAAA
AAAATAAATTAAATATTAAAATAAACATATGGTCCACACCATAATTAAACTGCTAAAACAAATATTATAACTCATTGATCG
TTCATCCTCTTCGGTTAGTGAGGTGGACAGTGAGAGCGCTGCATCGTGTATTGGGTTGACTGGTTCTCACGGCTCATCTGT
GTTGTAACGACCCATCTATGGTCAAACAAACTATTAGGATTATTGTTAGGCAGAAATGAGGGAGATAAAACACCTATAAGCA
GGACACATGAAACATATGCTTAAACAGTAGAGATTAACAACATAAAATAAAAAAGGCAAACCGGGAAAGCGTGCAAGCCAAA
GGCCTATCGGCCAGAACCAAGCTCCACGGTTGTCGTCCGCCACGTGGCACGCCGGCATTCCGGGCCACAGATCCGGCTC
AGGGTCATGTGCCACTGCCATGGCCCCCTCCTGTCGACGGCAGATTGCGACGGGAAGAAAGGTGAGGAGAGAAACAAACCAA
GCCAAAAAAATCACGCTTCATTGCGAGGGGGAGGATAGGGAGGAAGACGCCAAGCCAGCTCCAGTCCGGCACCCGATATAAA
GCGGCAGGCACTTGGATTGCTGACGAGATGGGACTCACACGCCGTACAATGCTGTGCTCGCCCTCTCCTCGCCGACTC
CGCTTCCGCCCGCCGGCGCTCTCGCTCGATGCTGATCGGCCACGCCGGGATCGCGTAAGCTGCCGATCCGGGGCT
GGTGGATTACTACTTTGCTTTCTTCTGTACTGATGGTTCATAGTTCGCAGGGTGGCGGAATGTGCCCTGAGTGTG
TTGTCTGTCAGTGCAGGCTGCCGGTCAGGGTGGAGGATAGGTAGATCTTCCCAGATTAGAACACTTTGTTACGGACAAAT
GGAATTGGTAGTTGGAGAGAGAAAAAAACTCTGGAATTGCTGAGGGTCTCGCTCGCTTGAGTTGGCTCTA
GTGCTTGTATCAGTAGTAATCATTACCAAGTCTAGCGGATCTCAGATTCAACTGAAGTTGTTAAATTGGTAGTTGGCT
TTTCTTCAGCCATCTAACATCATTATTACATAATAATTAGTTGAAATAAGTGTATATTGATATTCTGTGGTTGCTGCAGC
AGCTAATTAGCTTCACTACATTTCACGTGTTAGCTCTATTGCTCGTAATTCTGAATCTGGCTTAACGCACTGTGCAAGGT
CAAGAGCAAATTGCCACTGCAGCTACTGTGCAAGAAGATAAAACTATGCCAAAGGCGATGTCGACCATCTCCCCATA
TACGACCTGGACCCAAGCTGGAGATATTCAAGGACCATTCAGGTACCGGATGAAAAGATTCTTAGAGCAGAAAGGATCAATT
GAAGAAAATGAGGGAAAGTCTGAATCTTTCTAAAGGTTAGGCTTAATACATTCAAATGCTAACAGGACCATTCACAAT
ATTTATAGCACCTGCCATGCCGAAATATTCTGCATCATCAACATTCCGGATTGGTATTGGCTATTGAAAT
TTGGGATTAATACAAATGAGGATGGAAGTGTATATCGTGAATGGCACCTGCTCGCAGTAAGTTCTAACATGTTGTCATGCAAAC
ATGATGTACTGGGGGTATCGTTCTCCATTGCTGTGAAGAGATATCGTCTGATAGTAACATTAAAGGAA
CAGCTAAACACAGGAGAGTAATCAATGTTGGAGTAGAAAACCTGTCGGATATTCAATTCTGTGCAAGACTGTCATGCTT
AGCTGAGGAGGCTATTCTTGCTGTGATTACATAATGCTGTTCTCTTATGACAATATACTTCCACTATTAAATAG
ATTGATGCATTGACTTGAGTTTACTCATGGTGTAGGGAGGCAGAGCTTATTGGTACTTCATGACTGAAATGGTCAA
ACCATAAGATGGAGAAGGATAAATTGGTGTGATGCAAAATTGACCATGTCAAAGGAAACCTGCCATCCCTACAATT
CCAAGGTTAAATTGCTTCTACATGGTGGAGTGGGTTGATCGTATTCCAGCATGGATTGCTATGCGACTGTTGATGCC
TAAATTGGAGCTCCCTATGATGGTGTGATTGGGATCCTCCTGTTCTGAAAGGTCTTTCTACTGTCCTGGACCACATTGTA
AACTTAAGCAATAGACCTTAGCAGACAAAAATTATGACAAAATTAGTACCTTACCTCTGGTTGAGGTACACATTAA

GCATCCTCGGCCCTCAAAGCCTGCTGCTCACGTATCTATGAAGCCATGTAGGTATGAGTGGTAAAAGCCAGCAGTAAGCACA
TATAGGAATTGCAAGACAATGTGTTGCCACGCATACGAGCAAATAACTACAACACAGTCAGTGATGGCAGTTATGGAGCAT
TCATACTATGCTTCTTGGGTACCATGTGACAAATTCTTGCAGGTTAGCAGCAGATCAGGCACACCAGAGGACCTCAAATATC
TTGTTGATAAGGCACACAGTTGGGTTGCGAGTTCTGATGGATGTTGTCATAGCCATGCAAGTAATAATGTCACAGATGGTT
TAAATGGCTATGATGTTGGACAAAGCACCCAAAGAGTCCTATTTCATGCCGGAGATAGAGGTTATCATAAACTTGGGATAGTC
GGCTGTTCAACTATGCTAACACTGGGAGGTATTAAGGTTCTTCTAACCTGAGATATTGGCTGGATGAATTCATGTTGATGG
CTTCGATTGATGGAGTTACATCAATGCTGTATCATCACCATGGTATCAATGTGGGGTTACTGGAAACTACCAGGAATATTC
AGTTTGGACACAGCTGTTACATGATGCTGCAAACCATTAAATGCACAAACTCTGCCAGAAGCAACTGTT
TTGCTGAAGATGTTCAGGCATGCCGGCTTGCAGGTTAGTGAAGGTGGGGTTGGGTTGACTATGCCGGCAATGGC
TATCCCTGATAGATGGATTGACTACCTGAAGAATAAAGATGACTCTGAGTGGCGATGGGTGAAATAGCGCATACTTGA
CAGGAGATATACTGAAAAATGCATCGCATATGCTGAGAGCCATGATCAGGTACCCGCATTATATAATAACTTTATAAGGA
ATAGTTGGATGCAGCAAAGTATTTATTCCTGTTGGGGTAGACAACACATGGGCAAGTATCTTTAATCAGACAGTACTATA
TTTCATCACATTCTATCCTGATTGCTAGTACTGGATTAGTTATTCAAAAAATTAGGCCCTCTAACGATGTTAAGAATTT
GCAATCACATATGACCTGTTATCTTACTGAAATTAAACATGCAAATTTCAGTCATTGTTGGCGACAAACTATTGC
ATTCTCCTGATGGACAAGGAAATGTACACTGGCATGTCAGACTGCAGCCTGCTCACCTACAATTGATCGAGGGATTGCA
CAAAGGTTCCATTCTCCTCAAGTTGGTTGAAACCTGGTTTCAATAATTCTGAATGAGTCCCTCAATATACCTTGCTTATT
GTGTTCTGTACACTCCAGATGATTCACTCATCACAATTGGCCCTGGAGGTGATGGCTACTTGAATTGAGGAAATGAGGTGA
AATCTCGGTCTTTGAAAAATGTTCCCATTAAATAAGCCTGCATAAACCTTTGTATTTTTCTATTGAGGTTTCA
AGAGTCGACCCCTCTATTTCTCAGTAACTGAAGTTCTAATGGCTATTGAAATGGTTAATGTTAATTCCGAGTAGCGCTCGTTGC
ACATGAAAATGTGGCTGTTATGGCTGCTAACCTTTGTGACTTGTCCAATATACTCGTACAACATGGGATACATGTAACCC
TCACTATTCAAGCATACTGCTTAAATGTCAAACATCATACAGAGATATTCAAGTCTTCTCCTGCACTATCCTGGAATGAAAA
AAAAGAGTTGTTCATATGCTATCTGACTTTACAAATGAGTGTGATCTTGGAGAAGTTAGTTGACGGAAATGGTCCACTGTA
TTTGTTGTTATATGTTCTCCTTATTCAAGTGTATTCAATTGATGTGCAATTCTCTTCTAGTTGGTCACCCAGAATGGATT
GACTTCCAAAGAGAAGGGAAACAACGGAGCTATGATAAATGCAGACGACAGTGGAGCCTGTTGACACTGATCACTGCGGTAC
AAGGTTATGTCTATGAATGCAATCCTATAAGATTGTTCTGGCACCATTCTAGGCTCTTGCACCTTACCTCTCCATT
ATCGCTGTCCTATACTAGCTAGATCTGCTCTGAGACTAGCTAGATGTCAGTTCTTACTACTATTACACTCTTGAGTTGAGC
TGGGTCCAGATATGCTTCCACACTTGTGTTGCTGCCCACTGCCCTACTATAGTAAATTGACCAACCCGTACATGTTACTC
AATAAACAGGTTGGATTGGCCTGTGCAAACCTAGTATTGTAAGTTGACCTGGCTTATGTATTGCCATTGTTGAATAAAA
AATTTGATGCATTGATTGGTATGTCATTTCATAACTTGCAGACCTAGGAATGTACTTCTCAATCATTGGTGTGTTGAT
AGAAATTATTCTGTTACAGCATATGGTGGACTAAATCCAAGTGAACGTTGTTGCTGTTTCTACCCCTCAAGT

TTACAATTATCCGGCTAACATATTAATGTTTCTCCTGCTCTAATGCTGAACAGTACATGAATGCGTTGACCAAGCGATGA
 ATGCGCTCGATGAGAGATTTCCCTCCTTCGTCAAAGCAGATCGTCAGCGACATGAACGATGAGGAAAAGGTAAAGGATTTC
 AGAATACTTGGTATGAGAGTGTGCGACGTTCTTCTTAGGAAGAGTGGTAACTCTAGCTGTGCTGTATTGGCTTTGCCA
 TTAAGGCAGCTCAATTAGGAGTGGATGGTTGTCAAGCATTATTTCTACTTCGTTAGGTTATTGTCTTGACAGTC
 GATTTAGTTTGTCAATTCCATCCCAGAAAACCTACGAGGGTAAGTCACCAGTTGTAACCCAGTCTTCAAGGTC
 CCTTTGCCTGTGGTATAATATAATAGTGTGCTTACTCCATCTGCTCTGCAACTTATATGCAGCTACAAAGTGGATGCG
 ATTGCGCTGGAAATACAGAGTAGCCCTGGACTCTGATGCTCTGGTGGACATGGAAGAGTAAGTAGTGACGGTAGAC
 GCTGAAAGATGTTTTTTTAATTGCCCCACTCCGTAGTTGGGGCCGGCCGCGAGAATCGATCATATCAGGCT
 GTCGTGTTGCGAGACTCATGGATGCTGTGACCGCAGGTTGCCACGACGTGGATCACTCACGTCGCCTGAAGGGTGCCAGGG
 TGCCGAAACGAACCTCAACAACCGGCCGAACCGTTCAAAGTCCTTCTCCGCCCGCACCTGTGTAATGTTCACTTACTCT
 CAGCTGAACGTGAGCTAGAATGTATCCGCCCTGACAAACCGTCCGTGCTGCCAGGCTTATTACCGTAGACGAAGCAGGGCT
 GGACGACGTCTTCACCGCAGAGACAGGAAAGACGTCTCCAGCAGAGAGCATCGACGTCAAAGCTTCAAGAGCTAGTAGC
 AAAGAAGACAAGGAGGCAACGGCTGGCAAGAAGGGATGGAAGTTGCGCCGGCAGCCATCCGATCAAGATACCAATGAAGC
 CAGGAGTCCTGGTGAGGACTGGACTGGCTGCCGGCCCTGTTAGTAGTCCTGCTACTGACTAGCCGCCCTGGCGCCCTTG
 GAACGGTCCTTCCTGTAGCTGCAGGCAGTGGTCTCATACCGAGCAGGCAGTGTGCTGTAGCTTTCTAGAATAA
 TAATCAGGGATGGATGGATGGTGTATTGGCTATCTGGCTAGACGTGCATGTGCCAGTTGTATGTACAGGAGCAGTCCCGT
 CCAGAATAAAAAAAACTTGTGGGGGTTTTCTTACTCTGTTAGTCTGCTTAGGTTGACGAAGATGTTGATATT
 GATGCCATAGATCATGTAAGTTCTCGTTCCCTGTCCAGTTCACATTGATTCCAGCTGTTCAGCAGG
 GTCACTCAGCTCCACACCGGGGCCAGGCCGTACGCAGGCATTTCATGCGTCATAACACAAACTTTGAT
 CTTTCGACAAAAAGATGGATCGCTAAC

>Mandan Yellow Flint

GTCGACTGCCCTCTAGACCCCGATGAAGTCAAGGATAGTGAGCGCCCAACCAAGTTAGGCTCCCCAGCCAGATGATCATGTTA
 GGTGTTCCACTGCCATAAAAGAAAGCGTCCGTGATGTCGTACTTGGGGCGGTGAATACGTAAGGGACAGATGCTCATATACC
 TTCATCTGTTTACTCGAAATTACTAATGTTCCCTATGTCAGCTAAAGTGAATCTCACCCGACCAATCTGCAGATTGTGAA
 TGACTTGAAGTTACCGTGAACCATGCTGTGGAACCCATCAATGAAAAGCTGCACATGATATCCGAGAACATCAAAAGCGTGA
 GAAGGGAAAGAGGAAAACGAATGATGATAGCTGCATCAGTCACCAACATCCTGACCAGGGTCATCAGTGGGATTGATGATCC
 GCTCCTGAACGGAAGCTTGAGTGACAACAGCGTCAAAGAAAGCACGGAGGCAGCCAGGAAATCAGGCTATGCAAGCGCAGA
 GAGCGGTGGGAGAGCAGCGACCATGGCCTAGCGGGTTGAGATCCGAGGAAACAGATGGATTACTAGGGAGTGACAGCTAGG

AGCAATCTGTGGAGATACTATGTAATGTCACAGGAGTTGGCCTGTGGTATGTGCGATAACCAGGGCCAGTGGGTTCTGAGCGT
AAGACGAGGTCTCTAGCAATGATATGTTGACTGGTGACTAAATCGAGATGAGCAATCAGGTTGTTGATTCTTCGGCT
TGACCATTCGGCTGCTGAGGCCTGATCCTGATTTGAGATGTCAGGCCTACTTAGAGCAAATGCTGGAAGGAAGCAATGTGCC
TGTTCTGAGGTCCCTCCAGCATCACTGTAATTGTAAGTACTCAAGTACAGACTAGAACTAGTCATGCATACCAGAAGAATAG
ATAGATGTTTCAAGAAGTTGAGGCCTGAGATGCCGTGCCACTCTATTGCTCTGTTCATGCTTGCCCTTACGTTCTTGTGCTATGGATGGAC
TTCGAGAGTTCCCTGAGAAAGCACTCTCATCTATCTTCCAATTCTTGTGATCCTGATCACTGAAGATGGCCATT
TGATTTTCACTTTCAAGTATATAAAAGTAAGACGGTGTCTCACGCCATATGTGAAGTGCAAGATGAGCTACACTGCAA
GGAACCCCCAAGAAAAAACACAGGTAAAGTGTGATTGACAAGGGCCAGAGCTGTCAGCATGCAAGATGACTCCGCATGTT
ATTCACTTTAATTGTTAGAAAAGCTACACAAAAAGCACATCAGAAAAAAAGAAGAAAAGCTATTAGTGGTACTACTAG
TTGCAACTTGCAATAATGATGATGATAATCTGCACAAGCCATAGCTATGCTATATGCCACAGCTATGTATATGTACACAAAAA
ATACATTTTGTCGCTATTCTTACCGCTAGTATAATATCCATGTCTGCTACAACACACAATCATTTAACCTATAAA
AATAAATTAAATATTTAAACATATGGTCCACACCATAATTAAACTGCTAAAAACAAATATTAAACTCATTTGATCGTT
CATCCTCTTCGGTTAGTGAGGTGGACAGTGAGAGCGCTGCATCGTGTATTGGGTTGACTGGTTCTCACGGCTCATCGTGT
TGTAACGACCTATCTATGGTCAAACAAACTATTAGGATTATTGTTAGGCGAAAATGAGGGAGATAAAACCTATAAGCAGG
ACACATGAAACATATGCTTAAACAGTAGAGATTAACAACATAAAATAAAAAGGCAAACCGGGAAAGCGTGAAGCCCAAAGG
CCAATCGGCCAGAACCGCTCCACGGTTGTCGTGTCGCCACGTGGCACGCCGGCCATTCCGGGCCACAGATCCGGCTCAG
GGTCATGTGCCACTGCCATGGCCCCCTCCTGTCGAGCGGAGATTGCGACGGGGAGAAAGGTGAGGAGAGAAAACAACCAAGC
GAAAAAAATCACGCTTCATTGCGAGGGGGAGGATAGGGAGGAAGACGCCAAGCCAGCTCCAGTCCGGCACCCGATATAAGC
GGCAGGCACTGGATTGCTGACGAGATGGACTCACACGCCGTACAATGCTGCGCTCGCCCTCTCGCCACTCC
CTTCGCCGCCGCGCGCTCTGCTCGCATGCTGATGGCGCACGCCGGGATCGCGTAAGCTGCGCGATCCGGGGCTGG
TTGATTTACTCTTTGCTTTCTCTGTACTGATGGTTCATAGTTGCGAGGGTGGCGCAATGTGCGCCTGAGTGTGTT
GTCTGTCAGTCAAGGCTGCCGGTCAGGGTGGGAAGGTAGATCTTCCCCAGATTAGAACACGTTGTTACGGACAAAATGG
AATTGGTAGTAGTTGGAGAGAGAAAAAAACTCTGGAATTGTTGAGATTGGCTCGCTCTCGCTTGGATTGGCTCTAGT
GCTTTGTTATCAGTAGTAAATCATTACCAAGTCTAGCGGATCTCAGATTCACTGAAGTTGTTAAATTGGTTGGTT
TCTTCAGCCATCCTAATCATTATTACATAATAATTAGTTGAAATAAAAGTGTCTATATTGATATTCTGTTGCTGCTGAGCAGC
TAATTAGCTTCACTACATTTCACGTGTTAGCTTCTATTGCTCGTGTAACTGAATCTGGCTTAACGCACTGTGCAAGGTCAA
GAGCAAATCGCCACTGCAGCTACTGTGCAAGAACATAAAACTATGGCAACTGCCAAGGGCAGTCGACCATCTCCCCATATAC
GACCTGGACCCCAAGCTGGAGATATTCAAGGACCATTCAGGTACCGGATGAAAAGATTCCCTAGAGCAGAAAGGATCAATTGAA
GAAAATGAGGGAGTCTGAATCTTTCTAAAGGTTAGGCTTAATACATTCAAATGCTAATACAAGGACCATTTCACAATATT

TATAGCACCTGCCCATGCCGAAAATATTATCGCATCATCAACATTCCGGATTTGTATTTTTCAGGCTATTGAAATTG
GGATTAATACAAATGAGGATGGAACTGTATATCGTGAATGGCACCTGCTGCCAGTAAGTCTAATGTTGTCATGCAAACATG
ATGTAAGTGGCGGGGTATCGTTTTCCCATTGGCTGTGAAGAGATATCGTCTGATAGTAACTATATAAAAAAAAAGAACAG
CTAAAACACAGGAGAGTAATCAATGTTGGGAGTAGAAAAGTGTGGATATTCAATTCTTGCAAGACTGTCATGCTTAGC
TGAGGAGGCTATTTTTCTTGCTGTGATTACATAATGCTGTTCTTCTATGACAATATACTTTCCACTATTAAATAGATT
GATGCATTGACTTGAGTTTTACTCATGGGTAGGGAGGCAGAGCTATTGGTCAATTGACTGGAATGGTCAAACACC
ATAAGATGGAGAAGGATAAATTGGTGGTCAATGACCAGTCAAAGGAAACCTGCCATCCCTCACAAATTCCA
AGGTTAAATTTCGCTTCTACATGGTGGAGTATGGGTGATCGTATTCCAGCATGGATTGTTATGCCACTGTTGATGCTCTAA
ATTGGAGCTCCCTATGATGGTGTTCATTGGATCCTCCTGCTCTGAAAGGCTCTTCTACTGTCCTGGACCACATTGAAAC
TTAACAGCAATAGACCTTAGCAGACAAAAATATGACAAAATTATAGTACCTTACCTCTGGTTGAGGTACACATTAAAGCA
TCCTCGGCCTCAAAGCCTGCTCCACGTATCTATGAAGCCCAGTGTAGGTATGAGTGGTAAAAGCCAGCAGTAAGCACATAT
AGGAATTGCAAGACAATGTGTTGCCACGCATACGAGCAAATAACTACAACACAGTCAGTTGATGGCAGTTGGAGCATTG
TACTATGCTTCTTCGGTACCATGTCACAAATTCTTGCAGGTTAGCAGCAGATCAGGCACACCAGAGGACCTCAAATATCTG
TTGATAAGGCACACAGTTGGGTTGCGAGTTCTGATGGATGTTGTCATGCCATGCAAGTAATAATGTCACAGATGGTTAA
ATGGCTATGATGTTGGACAAAGCACCAAGAGTCCTATTTCATGCGGGAGATAGAGGTTATCATAAACTTGGGATAGTCGGC
TGTTCAACTATGCTAACTGGGAGGTATTAAGGTTCTTCTTAACCTGAGATATTGGTTGGATGAATTGATGTTGATGGCTT
CCGATTGATGGAGTTACATCAATGCTGTATCATCACCATGGTATCAATGTGGGTTACTGGAAACTACCAGGAATATTCA
TTTGGACACAGCTGGATGCAAGTTGTTACATGATGCTGCAAACCATTAAATGCACAAACTCTGCCAGAAGCAACTGTTG
GCTGAAGATGTTCAAGGCATGCCGTCCTTGCAGGTTGAGGTGATGAAGGTGGGTTGGTTGAATATGCCCTGGCAATGGCTA
TCCCTGATAGATGGATTGACTACCTGAAGAATAAGATGACTCTGAGAGCCATGATCAGGTACCTGCATTATAACTTATAAGGAAGTAT
AGTTGGATGCAAAAGTATTTATTCTTGTGGGTTAGACAACACATGGGCAAGTATCTTTAATCAGACAGTACTATATT
TCATCACATTCTATCCTGATTGCTAGTAACTGGATTAGTTATTCAAAAAATTAGGCCCTCTAACGATGTTAAGAATTG
AATCACATATGACCTGTTATCTTACTGGAAATTAAATCATGCAAATTTCAGTCTATTGTTGGCAGAAACTATTGAT
TTCTCCTGATGGACAAGGAATGTACACTGGCATGTCAGACTGTCAGCCTGCTTCACCTACAATTGATCGAGGGATTGCACTCCA
AAAGGTTCCATTCTCCTCAAGTTCTGGTTGAACCTGGTTCAATAATTCTTGAATGAGTCCCTCAATATAACCTTGCTTATTGT
GTTCTGTACACTCCAGATGATTCACTTCATCACAATGGCCCTGGAGGTGATGGCTACTTGAATTGTTATGGAAATGAGGTGAA
ATCTCGGTCTTTGAAAATGTTCCATTAAATAAGCCTGCATAAACCTTTGTATTGTTCTATTGAGGTTTCAGCATT
GAGTCGACCCCTCTATTCTCAGTAACTGAAGTTCTAACATGGCTATTGAATGGTTAATGTTAATTCCGAGTAGCGCTCGTTGCA
CATGAAAATGTGGTCTGTTATGGCTGCTAACATTGTTGTCAACTCGTACAACATGGGATACATGTAACCCTT

CACTATTCAAGCATACTGCTTAAATGTCAAACATCATACAGAGATATTATCAAGTCTTCCTGCACTATCCTGGAATGAAAAA
AAAGAGTTGTTCATATGCTATCTGTACTTTACAAATGAGTGTGATCTTGGAGAAGTTAGTTGACGGAATGGTCCACTGTAT
TTGTTGTTATATGTTCTCCTTATTCAAGTGTATTCAATTGATGTGCAATTCTCTTAGTTGGTCACCCAGAATGGATTG
ACTTTCCAAGAGAACAACTGGAGCTATGATAAATGCAGACGACAGTGGAGCCTGTGGACACTGATCACTGCGGTACA
AGGTTATGTCTATGAATGCAATCCTTATAAGATTTGTTCTGGCACCATCTAGGCTCTCTTGACCTTACCTCTTCCATT
TCGCTGTCTCCTATACTAGCTAGATCTGTCTGAGACTAGCTAGATGTCAAGTCCCTACTACTATTACACTCTGAGTTGAGCT
GGGTCCAGATATGCTTTCCACACTTGTGCTGCCACTGCCACTATAGTAAATTGCAACCAACCCGTACATGTTACTCA
ATAAACAGGTTGGATTGGCCTGTGCAAACCTAGTATTTGTAAGTTGACCTGGCTTATGTATTGCCATTGTTGAATAAAAATA
ATTTGATGCATTGATTGGTATGTCATTTCTAACTTGCAAGACCTAGGAATGTACTTCTCAATCATTGGTTGTTGATA
GAAATTATTCTGTTACAGCATATGGTGGACTAAATATCCAAGTGAACGTTGTTGCTGTTTCTACCCCTCAAGTT
TACAATTATCCCGCTAACATATTAATGTTTCTCCTGCTCTAATGCTGAACAGTACATGAATGCCATTGACCAAGCGATGAA
TGCCTCGATGAGAGATTTCCCTTCTCGTCGTCAAAGCAGATCGTCAGCGACATGAACGATGAGGAAAAGGTAAGGATTCA
GAATACTGGTATGAGAGTGTGCGAGGTTCTTCTTAGGAAGAGTGGTAACTCTAGCTTGTGCTGTATTGCTTGAACGTGGAG
TAAGGCGAGCTTCAATTAGGAGTGGATGGTTGTCAGCATTATTTCTACTTCGTTCAGGTTATTGCTTGAACGTGGAG
ATTAGTTTGTGTTCAATTCCATCCAAGAAAACCTACGAGGGTAAGTCACCAGTTGAAAACCTGTCTTCAAGGTCC
CTTTGCCTGTTGATAATATAATAGTGTGCTTACTCCCCTGCTCTGCAACTATATGCAAGCTACAAAGTGGATGCGA
TTGCCTGGAAATACAGAGTAGCCCTGGACTCTGATGCTCTGGCTTCCGGACATGGAAGAGTAAGTAGTACGGTAGACG
CTGAAAGATGTTTTTAATTTCGCTACTCCGTAGTTGGGGCCGGCCGCGTCAGAATCGATCATATCAGGCTGTG
TGTTGCGAGACTCATGGATGCTGTGACGCAGGTTGGCCACGACGTGGATCACTCACGTCGCTGAAGGGTGCAGGGTGC
CGAAACGAACCAACCGCCGAACCGTCAAAGTCCTTCTCCGCCCGCACCTGTGTTGAATGTTCACTTACTCTCAG
TGAACGTGAGCTAGAATGTATCCGCCCTGACAAACCGTCTGCTGCCAGGCTTATTACCGTGTAGACGAAGCAGGGTGGAC
GACGTCTCACGCGAAAGCAGAGACAGGAAAGACGTCTCCAGCAGAGAGCATCGACGTCAAAGCTCCAGAGCTAGCAAAG
AAGACAAGGAGGCAACGGCTGGCAAGAAGGGATGGAAGTTGCGCGGCAGCCATCCGATCAAGATAACAAATGAAGCCAGG
AGTCCTGGTGGAGACTGGACTGGCTGCCGGCCCTGTTAGTAGTCCTGCTACTGGACTAGCCGCCGTGGCCCTTGGAAAC
GGTCCTTCTGTTGAGCTTGCAGGCAGTGGTCTCATACCGAGCAGGCAGGCAGTGTGTTGATAGCTTCTAGAATAATAAT
CAGGGATGGATGGATGGTGTATTGGCTATCTGGCTAGACGTGCATGTGCCAGTTGTATGTACAGGAGCAGTCCCGTCCAG
AATAAAAAAAAAACTGTTGGGGGTTTCTTACTCTGTAGTCTGTTGCTAGGTTGACGAAGATGTTGATATTAGATG
CCATAGATCATGTACTGTTAACGTTAACGTTAACGTTAACGTTAACGTTAACGTTAACGTTAACGTTAACGTTAACGTTAAC
GCTCAGCTCCACACCGGGGCCAGGCCGGCGTACGCAGGCATTTCATGCGTCATAACACAAACACTTTGATCTT
TCGACAAAAAAGATGGATCGCTAAC

>Mandan Yellow Flour

GTGCACTGCCCTCTAGACCCCGATGAAGTCAAGGATAGTGAGC GCCAACCAAGTTAGGCTCCCCAGCCAGATGATCATGTTA
GGTGTTCAC TGCCATAAAAGAAAGCGTCCGTGATGTCGTACTTGGGGCGGTGAATACGTAAGGGACAGATGCTCATATACC
TTCATCTGTTTACTCGAAATTACTAATGTTCCCTATGTCAGCTAAAGTGAATCTCACCCGACCAATCTGCAGATTGTGAA
TGACTTGAAAGTTACCGTGAACCATGCTGTGGAACCCATCAATGAAAAGCTGCACATGATATCCGAGAACATCAAAAGCGTGA
GAAGGGAAAGAGGAAAACGAATGATGATAGCTGCATCAGTCACCAACATCCTGACCAGGGTCATCAGTGGATTGATGATCC
GCTCCTGAACGGAAGCTTGAGTGACAACAGCGGTCAAAGAAAGCACGGAGGCAGCGCAGGAAATCAGGCTATGCAAGCGCAGA
GAGCGGTGGGGAGAGCAGCGACCATGGCCTAGCGGGTTGAGATCCGAGGGAACAGATGGATTACTAGGGAGTGACAGCTAGG
AGCAATCTGTGGAGATACTATGTAATGTCACAGGAGTTGGCCTGTGGTATGTCGATAACCGGGCAGTGGTTCTGAGCGT
AAGACGAGGTCTCTAGCAATGATATGTTAGCGTGA CTAATCGAGATGAGCAATCAGGTTGTTGATTCTTCGGC
TGACCATT CGGCTGCTGAGGCCTTGATCCTGTATTGAGATGTCAGGCCTACTTAGAGCAAATGCTGGAAGGAAGCAATGTGCC
TGTCTGAGGTCCCTCCAGCATCA TTGTAATTGAAAGTACTCAAGTACAGACTAGAACTAGTCATGCATACCAGAAGAATAG
ATAGATGTTT CAGAAGTTGAGGCCTGAGATGCCGTGCACTCTATTGCTCTGTTCATGCTTGCCATTATATCACTATTT
TCACTGTT CATTCTAAGGCCGTGTCACACGGGTACCAGAACAGAGCAGAACACCTTTACGTTCTTGTGCTATGGATGGAC
TTCGAGAGTT CTTGAGAAAGCACTCTCATCTATCTTCCAATT CCTTGTTGAGATCCTGATCACTGAAGATGCCATT
TGATT T TCACTTTCA GTTATATATAAGTGAAGACGGTTGTCACGCAATATGTGAAGTGCAAGATGAGCTCTACACTGCA
AGGAACCCCAAGAAAAAACACAGGTAAAGTTGTCGATTGACAACAGGCTAGAGCTGTGACGATGCAGATGACTCCGCATGT
TCATT CATCACTTAATTGTTAGAAAAGCTACACAAAAAGCACATCAGAAAAAGAACAGCTATTAGTGTACACAAA
AAATACATT TGTGCTATT T TACCGCTAGTATAATATCCATGTCTGCTACAACACACAATCATATTAAACTACCTATAA
AAAATAAATTAAATATTAAAATAAACATATGGTCCACACCATAATTAAACTGCTAAAACAAATATTAAACTCATTGATCG
TTCATCCTTT CGGTTAGTGAGGTGGACAGTGAGAGCGCTGCATCGTATTGGGTTGACTGGTTCTACGGCTCATCTGT
GTTGTA CGACCTATCTATGGTCAAACAAACTATTAGGATTATTGTTAGGC AAAAGAGATAAATAAACCTATAAGCA
GGACACATGAAACATATGCTTAAACAGTAGAGATTAACAACATAAAATAAAAAGGCAAACCGGGAAGCGTGCAAGCCAAA
GGCCAATCGGCCAGAACCGAGCTCCACGGTTGTCGTCCGCCACGTGGCACGCCGGCCATTCCGGGCCACAGATCCGGCTC
AGGGTCATGTGCCACTGCCATGGCCCCCTCCTGTCG CAGCGG CAGATTGCGACGGGAAGAAAGGTGAGGAGAGAACACCAA
GCGAAAAAAATCAGCCTTCATTGCGAGGGGGAGGATAGGGAGGAAGACGCCAAGCCAGCTCCAGTCCGGCACCCGATATAAA
GCGGCAGGCACTGGATTGCTGACGAGATGGACTCACAGCCGTACAATGCTGTGCTCGCCCTTCCCTCGCCGACTC

CGCTTCCGCCGCGCGCTCGCTCGATGCTGATCGGGCGCACGCCGGGATCGCGTAAGCTCGGGCATCCGGGGCT
GGTGGATTACTACTTTGCTTTTTCTTCTGTACTGATGGTCATAGTTCGCAGGGTGGCGCAATGTGCCCTGAGTGTG
TTGTCTGCCAGTGAAGGCTGCCGGTCAGGGTGGAAAGGTAGATCTTCCCCAGATTAGAACACGTTGTTACGGACAAAAT
GGAATTGGTAGTAGTTGGAGAGAGAAAAAAACTCTGGAATTGTGGATTGGGTCTCGCTCGCTTGATTTGGCTCTA
GTGCTTGTATCAGTAGTAATCATTACCAAGTCTAGGGATCTCAGATTCAACTGAAGTTGTTAAATTGGTGGTGG
TTTCTCAGCCATCCTAATCATTACATAATAATTAGTTGAAATAAGTGCATATTGATATTCTGTGGTGCAGC
AGCTAATTAGCTTCACTACATTACGTGTTAGCTCTATTGCTCGTGAATTCTGAATCTGGCTTAACGCAGTGTGCAAGGT
CAAGAGCAAATTGCCACTGCAGCTACTGTGCAAGAAGATAAAACTATGCCAAAGGGCATGTCGACCATCTCCCCATA
TACGACCTGGACCCCAAGCTGGAGATATTCAAGGACCATTCAAGGTACCGGATGAAAAGATTCTAGAGCAGAAAGGATCAATT
GAAGAAAATGAGGGAAAGTCTGAAATCTTTCTAAAGGTTAGGCTTAATACATTCAAATGCTAATACAAGGACCATTGACAAT
ATTTATAGCACCTGCCCATGCCGAAAATATTATCTGCATCATCAACATTCCGGATTTGTATTTCAGGCTATTGAAAT
TTGGGATTAATACAAATGAGGATGGAACTGTATATCGTAATGGGCACCTGCTGCCAGTAAGTTCTAATGTTGTCATGCAAAC
ATGATGACTGGGGGTATCGTTTCCCATTGCTGTGAAGAGATATCGTCTGATAGTAACTATATTAAAAAAAGAA
CAGCTAAACACAGGAGAGTAATCAATGTTGGAGTAGAAAACCTGTCGGATATTCAATTGCAAGACTGTATGTCTT
AGCTGAGGAGGCTATTTCCTGCTGTGATTACATAATGCTTTCTCTTATGACAATATACTTCCACTATTAAATAG
ATTGATGCATTGACTTGAGTTTTACTCATGGGTGTAGGGAGGCAGAGCTTATTGGTCAATTGACTGGAATGGTCAA
ACCATAAGATGGAGAAGGATAAATTGGTGTGATGGTCAATTGACCATGTCAGGAAACCTGCCATCCCTACAATT
CCAAGGTTAAATTGCTTCTACATGGTGGAGTATGGTGTGATCGTATTCCAGCATGGATTGTTGACTGCAACTGTTGATGCC
TAAATTGGAGCTCCATGATGGTGTGATTGGGATCCTCCTGCTCTGAAAGGCTCTTACTGTCCTGGACCACATTGTA
AACTTAAGCAATAGACCTTAGCAGACAAAATATGACAAAATTATAGTACCTTACCTCTGGTTGCAGGTACACATTAA
GCATCCTCGGCCCTCAAAGCCTGCTGCTCACGTATCTGAAGCCATGTAGGTATGAGTGGAAAGCCAGCAGTAAGCACA
TATAGGAATTGCAAGACAATGTGTTGCCACGCATACGAGCAAATAACTACAACACAGTTGATGGCAGTTATGGAGCAT
TCGTACTATGCTTCTTCGGTACCATGTGACAAATTCTTGGGTTAGCAGCAGATCAGGCACACCAGAGGACCTCAAATATC
TTGTTGATAAGGCACACAGTTGGGTTGCGAGTTCTGATGGATGTTGTCATGCCATGCAAGTAATAATGTCACAGATGGTT
TAAATGGCTATGATGGACAAAGCACCAAGAGTCCTATTTCATGCGGGAGATAGAGGTTATCATAAACTTGGGATAGTC
GGCTGTTCAACTATGCTAAGCTGGAGGTATTAAGGTTCTTCTTAACCTGAGATATTGGTGGATGAATTGATGTTGATG
GCTTCCGATTGATGGAGTTACATCAATGCTGTATCATCACCAGGTATCAATGTGGGTTACTGGAAACTACCAGGAATATT
CAGTTGGACACAGCTGTGGATGCAAGTTACATGATGCTTGCACAAACCATTAAATGCACAAACTCTTGCAGAAGCAACTGTT
GTTGCTGAAGATGTTCAAGGCATGCCGGCCTTGCCGCCAGTTGATGAAGGTGGGTTGGGTTGACTATGCCCTGGCAATGG
CTATCCCTGATAGATGGATTGACTACCTGAAGAATAAGATGACTCTGAGTGGTCATGGTGAAATAGCGCATACTTGACTA

ACAGGAGATATACTGAAAAATGCATCGCATATGCTGAGAGCCATGATCAGGTACCCCTGCATTATATAACTTTATAAGGAAG
TATAGTTGGATGCAGCAAAGTATTTATTCCTTGTGGGTAGACAACACATGGGGCAAGTATCTTTAATCAGACAGTACTAT
ATTTCATCACATTCTATCCTGATTGCTAGTAACCTGGATTAGTTATTCAAAAAATTAGGCCCTCTAACATGTTAAGAATT
TGCAATCACATATGACCTGTTATCTTAACTGGAAATTAAAATCATGCAAATTTCAGTCTATTGTTGGCAGAAAACATTGC
ATTTCCTGATGGACAAGGAAATGTACACTGGCATGTCAGACTGAGCCTGCTTCACCTACAATTGATCGAGGGATTGCACTC
CAAAAGGTTCCATTCTCCTCAAGTTCTGGTTGAACCTGGTTTCAATAATTCTGAATGAGTTCCCTCAATATACCTGCTTATT
GTGTTCTGTACACTCCAGATGATTCACTCATACAATGGCCCTGGAGGTGATGGCTACTTGAATTATGGAAATGAGGTGA
AATCTCGGTCTTTGAAAAATGTTCCCATTAAATAAGCCTGCATAAACCTTTGTATTTTTCTATTGAGGTTTCAGCATT
AGAGTCGACCCTCTATTTCTCAGTAACCTGAAGTTCTAAATGGCTATTGAATGGTTAATGTTAATTCCGAGTAGCGCTCGTTGC
ACATGAAAATGTGGTCTGTTATGGCTGTAATCCTTTGTGACTTGTCCAATATACTCGTACAACATGGGATACATGTAACCC
TCACTATTCAAGCATACTGCTAAATGTCAAACATCATACAGAGATATTATCAAGTCTTCTCCTGCACTATCCTGGAATGAAAA
AAAAGAGTTGTTCATATGCTATCTGACTTTACAAATGAGTGTGATCTTGGAGAAGTTAGTTGACGGAATGGTCCACTGTA
TTTGTGTTATATGTTCTCTTATTCAAGTGTGATTCAATTGATGTGCAATTCTCTTAGTTGGTCACTTGGACACTGATCACTGCGGTAC
AAGGTTATGTCTATGAATGCAATCCTTATAAGATTGTTCTGGCACCATTCTAGGCTCTTTGACCTTACCTCTCCATT
ATCGCTGTCTCTATACTAGCTAGATCTGTCTGAGACTAGCTAGATGTCAGTTCTTACTACTATTACACTCTTGAGTTGAGC
TGGGTCCAGATATGCTTTCCACACTTGTGCTGCCCCACTGCCCTACTATAGTAAATTGACCAACCCGTACATGTTACTC
AATAAACAGGTTGGATTGGCTGTGCAAACCTAGTATTGTAAGTTGACCTGGCTTATGATTGCCATTGTTGAATAAAAAT
AATTTGATGCATTGATTGGTATGTCATTTCATAACTTGCAGACCTAGGAATGTAATTCTCAATCATTGGTTGTTGAT
AGAAAATTATTCTGTTACAGCATATGGGACTAAATATCCAAGTGAACGTTGTTGTCTGTTTTCTACCCCTCAAGT
TTACAATTATCCCGCTAACATATTAAATGTTTCTCCTTGCTCTAATGCTGAACAGTACATGAATGCGTTGACCAAGCGATGA
ATGCGCTCGATGAGAGATTTCCTCTTCGTCGTCAAAGCAGATCGCAGCGACATGAACGATGAGGAAAAGGTAAAGGATTTC
AGAATACTGGTATGAGAGTGTGCGACGTTCTTCTTAGGAAGAGTGGTAACCTAGCTGTTGCTGTGTTGAGC
TTAAGGCGAGCTTCAATTAGGAGTGGATGGTTGTCAGCATTATTTCTACTTCGTTAGGTTATTGTCCTTGACAGTGG
GATTAGTTTGTGTTCAATTCCATCCAAAGAAAACCTACGAGGGGTAAGTCACCAGTTGTAACCCCTGTTCAAGTC
CCTTTGCCTGTGGTATAATATAATAGTGTGCTTACTCCATCTGCTCTGCAACTTATATGCAAGTACAAAGTGGGATGCG
ATTGCGCTGGAAATACAGAGTAGCCCTGGACTCTGATGCTCTGGTCTCGGTGGACATGGAAGAGTAAGTAGTGACGGTAGAC
GCTGAAAGATGTTTTTTTAATTGCGCTACTCCGTAGTTGGGGCCGGCCGTCGAGAATGATCATATCAGGCT
GTCGTGTTGCGAGACTCATGGATGCTGTGACGCAGGTTGGCCACGACGTGGATCACTCACGTGCCCTGAAGGGGTGCCAGGG
TGCCGAAACGAACCAACCGGCCGAACTCGTTCAAAGTCCTTCTCCGCCCGCACGTGTGTTGAATGTTCACTTACTCT

CAGCTGAACGTGAGCTAGAATGTATCCGCCCTGACAAACCGTCCTGCTGCCAGGCTTATTACCGTAGACGAAGCAGGGCT
 GGACGACGTCTTCACCGCAAAGCAGAGACAGGAAAGACGTCTCCAGCAGAGAGCATCGACGTCAAAGCTTCCAGAGCTAGTAGC
 AAAGAACACAAGGAGGCAACGGCTGGTGGCAAGAAGGGATGGAAGTTGCGCGGCAGCCATCCGATCAAGATACCAATGAAGC
 CAGGAGTCCTGGTGGACTGGACTGGCTGCCGCCCTGTTAGTAGTCCTGCTCTACTGGACTAGCCGCCCTGGCGCCCTTG
 GAACGGTCCTTCCTGTAGCTGCAGGCAGTGGTGTCTCATCACCAGGCAGGCAGGCAGTGTGCTTGTATAGCTTTCTAGAATAA
 TAATCAGGGATGGATGGATGGTGTATTGGCTATCTGGCTAGACGTGCATGTGCCAGTTGTATGTACAGGAGCAGTCCCGT
 CCAGAATAAAAAAAACTTGGTGGGGGGTTTTCTTCTACTCTGTAGTCTGTTGCTAGGTTGACGAAGATGTTGATATT
 GATGCCATAGATCATGTAAGTTCTTCGTTCCCTGTCAGTCACATTGATTCCAGCTGTTCAGCAGGCCG
 GTCAGCTCAGCTCCACACCAGGGGCCAGGCCGTACGCAGGCATTTTCATTGCGTCATAACACAAACACTTTGAT
 CTTTCGACAAAAAAGATGGATCGCTAAC

>M162W

GTCGACTGCCCTCTAGACCCCCATGAAGTCAAGGATAGTGAGCCCCAACCAAGTTAGGCTCCCCCAGCCAGATGATCATGTTA
 GGTGTTCCACTGCCATAAAAGAAAGCGTCCGTGATGTCGTACTTGGGGCGGTGAATACGTAAGGGACAGATGCTCATATACC
 TTCACTGTTTACTCGAAATTACTAATGTTCCCTATGTCAGCTAAAGTGAATCTCACCCGACCAATCTGCAGATTGTGAA
 TGACTTGAAGTTACCGTAACCATGCTGTGGAACCCATCAATGAAAAGCTGCACATGATATCCGAGAACATCAAAAGCGTGA
 GAAGGGAAAGAGGAAAACGAATGATGATAGCTGCATCAGTCACCAACATCCTGACCAGGGCATCAGTGGATTGATGATCC
 GCTCCTGAACGGAAGCTTGAGTGACAACACGCGTCAAAGAAAGCACGGAGGCAGCGCAGGAAATCAGGCTATGCAAGCGCAGA
 GAGCGGTGGGAGAGCAGCGACCATGCCCTAGCGGGTTGAGATCCGAGGGAACAGATGGATTACTAGGGAGTGACAGCTAGG
 AGCAATCTGAGGAGATACTATGTAATGTCACAGGAGTTGGCCTGTGGTATGTCAGGTTGCTGAGCAATCAGGTTGCTGTTGATTCTTCGGC
 TGACCAATTGCGCTGCTGAGGCCTTGATCCTGATTGAGATGTCAGGCCTACTTAGAGCAAATGCTGGAAGGAAGCAATGTGCC
 TGTTCTGAGGTCCCTCCAGCATCACTGTAATTGTAAGTACTCAAGTACAGACTAGAACTAGTCATGCATACCAGAAGAACAG
 ATAGATGTTCAAGAGTTGAGGCCTGAGATGCCGTGCACTCTATTGCTCTGTTCATGCTTGCCTTATTATATCACTATTT
 TCACTGTTCAATTCTAAGGCCGTGTCACACGGTACCAAGAGCAGAACACCTTTTACGTTCCCTTGCTGCTATGGATGGAC
 TTCGAGAGTTCCCTGAGAAAGCACTCTCATCTATCTTCAATTCTGTTGCTGCTGATCAGTCAAGATGGCCATT
 TGATTTTCACTTCAAGTTATATAAGTGAAGACGGTTGCTCACGCCATATGTGAAGTGCAAGATGAGCTTACACTGCAA
 GGAACCCCCAAGAAAAACACAGGTAAGTTGCTGATTGACAACGCCAGAGCTGTCTGACGATGCAGATGACTCCGATGTT
 ATTCACTTAATTGTTAGAAAAGCTACACAAAAAGCACATCAGAAAAAAAGAAGAAAAAGCTATTAGGGTACTACTAG

TTGCAACTTGCATAATGATGATGATAAATCTGCACAAGCCATAGCTATGCTATAGCTATGTATATGTACACAAAAAA
ATACATTTTTGTGCTATTTTTACCGCTAGTATAATATCCATGTCTGCTACAACACACAATCATTTAATACCTATAAAA
AATAAATTAAATATTAAAATAACATATGGTCCACACCATAATTAAACTGCTAAAAACAAATATTATAACTCATTGATCGTT
CATCCTCTTCGGTTAGTGAGGTGGACAGTGAGAGCGCTGCATCGTGTATTGGTTGACTGGTTCTCACGGCTCATCTGTGT
TGTAACGACCTATCTATGGTCAAACAAACTATTAGGATTATTGTTAGGCGAAAAATGAGGGAGATAAATAAACCTATAAGCAGG
ACACATGAAACATATGCTTAAACAGTAGAGATTAACAACATAAAATAAAAAAGGCAAACCGGGAAAGCGTGAAGGCCAAAGG
CCAATGGGCCAGAACCGAGCTCCACGGTTGTCGTGTCCGCCACGTGGCACGCCGGCATTCCGGGCCACAGATCCGGCTCAG
GGTCATGTGCCACTGCCATGGCCCCCTCCTGTCGCAGCGGAGATTGCGACGGGAAGAAAGGTGAGGAGAGAAACAACCAAGC
GAAAAAAATCACGCTTCATTGCGAGGGGGGAGGATAGGGAGGAAGACGCCAAGCCAGCTCCAGTCCGGCACCCGATATAAGC
GGCAGGCAGTTGGATTGCTGACGAGATGGACTCACACGCCGTACAATGCTGTGCCTCGTGCCTCGACTCC
CTTCCGCCGCCGGCGCTCTGCTCGCATGCTGATCGGCCGACCGCCGGGATCGCGTAAGCTGCCGATCCGGGGCTGG
TGGATTTACTACTTTGCTTTTTCTCTGTACTGATGGTTCATAGTTGCGAGGGTGGCGGAATGTGCGCCTGAGTGTGTT
GTCTGTCAGTCAAGGCTGCCGGTCAGGGTGCAGGGAGATCTTCCCCAGATTAGAACACGTTGTTACGGACAAAACGG
AATTGGTAGTAGTTGGAGAGAGAAAAAAACTCTGAAATTGTTGAGATTGGCTCGCTCGCTTGAGTTGGCTCTAGT
GCTTGTATCAGTAGAATCATTTACCAAGTCTAGCGGATCTCAGATTCAACTGAAGTTGTTAAATTGGTGTCTGGTT
TCTTCAGCCATCTAATCATTTATTACATAATAATTAGTTGAAATAAAATGCGATATTGATATTCTGTGGTTGCTGCAGCAGC
TAATTAGCTTCACTACATTTCACCTGTTAGCTCTATTGCTCGTAAATTCTGAATCTGGCTTAACGCACTGTGCAAGGTCAA
GAGCAAATTGCCACTGCAGCTACTGTGCAAGAAGATAAAACTATGGCAACTGCCAAGGGCATGTCGACCACCTCCCCATATAC
GACCTGGACCCCAAGCTGGAGATATTCAAGGACCATTCAGGTACCGGATGAAAAGATTCTAGAGCAGAAAGGATCAATTGAA
GAAAATGAGGGAAAGTCTGAATCTTTCTAAAGGTTAGGCTTAATACATTCAAATGCTAATACAAGGACCATTTACAATATT
TATAGCACCTGCCATGCCAAAATATTATCTGCATCATCAACATTCCGGATTGGTATTGTTCTAGGCTATTGAAATTG
GGATTAATACAAATGAGGATGGAAGTGTATATCGTGAATGGCACCTGCTGCGAGTAAGTTCTAATGTTGTCATGCAAACATG
ATGTAAGTGGCAGGGTATCGTCTTCCCATTGCTGTGAAGAGATATCGTCTGATAGTAACATATTAAAAAAAGAACAG
CTAAAACACAGGAGAGTAATCAATGTTGGGAGTAGAAAAGTGTGGATATTCAATTGCTGCAAGACTGTCACTGTCTTAGC
TGAGGAGGCTATTGCTGTGATTACATAATGCTGTTCTTCTATGACAATATACTTCCACTATTAAATAGATT
GATGCATTGACTTGAGTTTACTCATGGGTGTAGGGAGGCAGAGCTATTGGTGAAGTCAATGACTGGAATGGTCAAACACC
ATAAGATGGAGAAGGATAAATTGGTGGTGGCGATAAAATTGACCATGTCAAAGGGAAACCTGCCATCCCTCACAATTCCA
AGGTTAAATTGCTTCTACATGGTGGAGTATGGGTTGATCGTATTCCAGCATTGATGCTTCTGAAAGGTCTTTCTACTGTCCTGGACCACATTGAAAC
ATTGGAGCTCCCTATGATGGTGTCTGGGATCCTCTGCTTCTGAAAGGTCTTTCTACTGTCCTGGACCACATTGAAAC
TTAAGCAATAGACCTTAGCAGACAAAAATATGACAAAATTAGTACCTTTACCTCTGGTTGAGGTACACATTAAAGCA

TCCTCGGCCTCAAAGCCTGCTCCACGTATCTATGAAGCCATGTAGGTATGAGTGGTAAAAGCCAGCAGTAAGCACATAT
AGGAATTGCAGACAATGTGTTGCCACGCATACGAGCAAATAACTACAACACAGTCAGTGATGCCAGTTATGGAGCATTG
TACTATGCTCTTCGGGTACCATGTGACAATTTCTTGCAGTTAGCAGCAGATCAGGCACACCAGAGGACCTCAAATATCTG
TTGATAAGGCACACAGTTGGGTTGCGAGTTCTGATGGATGTTGTCATAGCCATGCAAGTAATAATGTCACAGATGGTTAA
ATGGCTATGATGTTGGACAAAGCACCAAGAGTCCTATTTCATGCGGGAGATAGAGGTTATCATAAAACTTGGGATAGTCGGC
TGTTCAACTATGCTAACTGGGAGGTATTAAGGTTCTTCTAACCTGAGATATTGGTGGATGAATTATGTTGATGGCTT
CCGATTGATGGAGTTACATCAATGCTGTATCATCACCAGGTATCAATGTGGGTTACTGGAAACTACCAGGAATATTCAG
TTGGACACAGCTGGATGCAAGTGTACATGATGCTGCAAACCATTAAATGCACAAACTCTGCCAGAAGCAACTGTTGTT
GCTGAAGATGTTCAAGGCATGCCGTCCTTGCAGTTGACTGAAGGTGGGTTGGGTTGACTATGCCCTGGCAATGGCTA
TCCCTGATAGATGGATTGACTACCTGAAGAATAAAGATGACTCTGAGTGGTCATGGTGAATAGCGCATACTTGACTAAC
GGAGATATACTGAAAAATGCATCGCATATGCTGAGAGCCATGATCAGGTACCCCTGCATTATAATAACTTATAAGGAAGTAT
AGTGGATGCAGCAAAGTATTTATTCCTTGAGGTTAGACAACACATGGGCAAGTATCTTTAATCAGACAGTACTATATT
TCATCACATTCTATCCTGATTGCTAGTAACTGGATTAGTTATTCATAAAAAAATTAGGCCCTCTAACGATGTTAAGAATTG
AATCACATATGACCTGTTATCTTAACTGGAAATTAAAATCATGCAAATTTCAGTCTATTGTTGGCGACAAAATTG
TTCTCCTGATGGACAAGGAAATGTACACTGGCATGTCAGACTTGCAAGCCTGCTTCACCTACAATTGATCGAGGGATTG
AAAGGTTCCATTCCCCTCAAGTTCTGGTTAACCTGGTTCAATAATTCTGAATGAGTCCCTCAATATAACCTTGCTTATTG
GTTCTGTACACTCCAGATGATTCACTTCATCACAATGGCCCTGGAGGTGATGGCTACTTGAAATTATGGGAAATGAGGTGAA
ATCTGGTCTTTGAAAAATGTTCCATTAAATAAGCCTGCATAAACCTTGTATTGTTCTATTGAGGTTTCAGCATT
GAGTCGACCCCTTATTTCTCAGTAACTGAAGTCTTAATGGCTATTGAAATGGTTAATGTTAATTCCGAGTAGCGCTCGTTG
CATGAAAATGTGGCTGTTATGGCTGTAATCCTTGTGACTTGCAATATACTCGTACAACATGGGATACATGTAACCCT
CACTATTCAAGCATACTGCTTAAATGTCACACATACAGAGATATTCAAGTCTTCTCCTGCACTATCCTGGAATGAAAAAA
AAAGAGTTGTTCATATGCTATCTGACTTTACAAATGAGTGTGATCTTGGAGAAGTTAGTTGACGGAAATGGTCACTGTAT
TTTGTGTTATATGTTCTCCTTATTCAAGTGTATTGAAATTGATGTGCAATTCTCTTCTAGTTGGTCACCCAGAATGGATTG
ACTTCCAAGAGAAGGGAACAACACTGGAGCTATGATAATGCAGACGACAGTGGAGCCTGTTGACACTGATCACTGCGGTACA
AGGTTATGTCTATGAATGCAATCCTTATAAGATTTGTTCTGGCACCATTCTAGGCTCTTGTGACCTTACCTCTTCAATT
TCGCTGTCTCCTATACTAGCTAGATCTGCTCTGAGACTAGCTAGATGTCAGTCTTACTACTATTACACTCTGAGTTGAGCT
GGTCCAGATATGCTTCCACACTTGTGCTGCCACTGCCCTACTATAGTAAATTGCCACCAACCCGTACATGTTACTCA
ATAAACAGGTTGGATTGGCCTGTGCAAACCTAGTATTTGTAAGTTGACCTGGCTTATGTATTGCCATTGTTGAATAAAAATA
ATTGATGCATTGATTGGTATGTCATTTCATAACTTGCAAGACCTAGGAATGTAATTCTCAATTGGTTGTTGATA
GAAATTATTCTGTTACAGCATATGGGACTAAATCCAAGTGAACGTTGTTGCTGTTCTACCCCTCAAGTT

TACAATTATCCGGCTAACATATTAATGTTTCTCCTGCTAAATGCTGAACAGTACATGAATGCCTTGACCAAGCGATGAA
 TCGCCTCAATGAGAGATTTCCCTTCGTCAAAGCAGATCGTCAGCGACATGAACGATGAGGAAAAGTAAGGATTTC
 AGAATACTTGGTATGAGAGTGTGCGACGTTCTTCTTAGGAAGAGTGGTAACTCTAGCTGTGCTGTATTTCAGCGA
 TTAAGGCAGCTCAATTAGGAGTGGATGGTTGTCAAGCATTATTTCTACTTCAGGTATTGTCTTGAACGTGGA
 GATTTAGTTTGTCAATTCCATCCCAGAAAACCTACGAGGGTAAGTCACCAGTTGTAACCCCTGTCTTCAGAGTC
 CCTTTGCCTGTGGTATAATATAATAGTGTGCTTACTCCATCTGCTCTGCAACTTATATGCAGCTACAAAGTGGATGCG
 ATTGCGCTGGAAATACAGAGTAGCCCTGGACTCTGATGCTCTCGGTGGACATGGAAGAGTAAGTAGTGACGGTAGAC
 GCTGAAAGATGTTTTTTTAATTGCCCCCTACCCCGTAGTTGGGCCGGCCGGCCGCGAAATCGATCATATCAGGCT
 GTCGTGTTGCGAGACTCATGGATGCTGTGACCGCAGGTTGCCACGACGTGGATCACTCACGTCGCCTGAAGGGTGCCAGGG
 TGCCGAAACGAACCTCAACAACCGGCCAAACTCGTCAAAGTCCTTCTCCGCCCGCACCTGTGTAATGTTCACTTACTCT
 CAGCTGAACGTGAGCTAGAATGTATCCGCCCTGACAAACCGTCCGTGCTGCCAGGCTTATTACCGTAGACGAAGCAGGGCT
 GGACGACGTCTTCACCGAAGCAGAGACAGGAAAGACGTCTCAGCAGAGAGCATCGACGTCAAAGCTTCAAGAGCTAGTAGC
 AAAGAAGACAAGGAGGCAACGGCTGGCAAGAAGGGATGGAAGTTGCGCCGGCAGCCATCCGATCAAGATACCAATGAAGC
 CAGGAGTCCTGGTGAGGACTGGACTGGCTGCCGGCCCTGTTAGTAGTCTGCTACTGACTAGCCGCCCTGGCGCCCTTG
 GAACGGTCCTTCCTGTAGCTGCAGGCAGTGGTCTCATACCGAGCAGGCAGTGGCTGTATAGCTTTCTAGAATAA
 TAATCAGGGATGGATGGATGGTGTATTGGCTATCTGGCTAGACGTGCATGTGCCAGTTGTATGTACAGGAGCAGTCCCGT
 CCAGAATAAAAAAAACTTGTGGGGGTTTTCTTACTCTGTTAGTCTGCTTAGGTTGACGAAGATGTTGATATT
 GATGCCATAGATCATGTAAGTTCTCGTTCCCTGTCCAGTTCACATTGATTCCAGCTGTTCAGCAGG
 GTCACTCAGCTCCACACCGGGGCCAGGCCGTACGCAGGCATTTCATGCGTCATAACACAAACTTTGAT
 CTTTCGACAAAAAGATGGATCGCTAAC

>Mo18W

GTCGACTGCCCTAGACCCGATGAAGTCAAGGATAGTGAGC GCCAACCAAGTTAGGCTCCCCAGCCAGATGATCATGTTA
 GGTGTTCCACTGCCATAAAAGAAAGCGTCCGTGATGTCGTACTTGGGGCGGTGAATACGTAAGGGACAGATGCTCATATACC
 TTCATCTGTTACTCGAAATTACTAATGTTCCCTATGTCAGCTAAAGTGAATCTCACCCGACCAATCTGCAGATTGTGAA
 TGACTTGAAGTTACCGTGAACCATGCTGTGGAACCCATCAATGAAAAGCTGCACATGATATCCGAGAACATCAAAAGCGTGA
 GAAGGGAAAGAGGAAAACGAATGATGATAGCTGCATCAGTCACCAACATCCTGACCAGGGTCATCAGTGGATTGATGATCC
 GCTCCTGAACGGAAGCTTGAGTGACAACAGCGTCAAAGAAAGCACGGAGGCAGCCAGGAAATCAGGCTATGCAAGCGCAGA
 GAGCGGTGGGAGAGCAGCGACCATGGCCTAGCGGGTTGAGATCCGAGGAAACAGATGGATTACTAGGGAGTGACAGCTAGG

AGCAATCTGTGGAGATACTATGTAATGTCACAGGAGTTGGCCTGTGGTATGTGCGATAACCGGGCCAGTGGGTTCTGAGCGT
AAGACGAGGTCTCTAGCAATGATATGTTGACTGGTGACTAAATCGAGATGAGCAATCAGGTTGTTGATTCTTCGGCT
TGACCATTTCGGCTGCTGAGGCCTGATCCTGATTTGAGATGTCAGGCCTACTTAGAGCAAATGCTGGAAGGAAGCAATGTGCC
TGTTCTGAGGTCCCTCCAGCATCACTGTAATTGTAAGTACTCAAGTACAGACTAGAACTAGTCATGCATACCAGAAGAATAG
ATAGATGTTTCAGAAGTTGAGGCCTGAGATGCCGTGCCACTCTATTGCTCTGTTCATGCTTGCCCTTACGTTCTTGTGCTATGGATGGAC
TTCGAGAGTTCCCTGAGAAAGCACTCTCATCTATCTTCCAATTCTTGTGATCCTGATCACTGAAGATGCCATT
TGATTTTCACTTTCAAGTTGAGAAAGCACTCTCATCTATCTTCCAATTCTTGTGATCCTGATCCTGCTACGCAATATGTAAGTGCAAGATGAGCTACACTGCA
AGGAACCCCAAGAAAAAACACAGGTAAGTGTGATTGACAACAGGCTAGAGCTGTGACGATGCCAGATGACTCCGCATGT
TCATTCACTACTTAATTGTTAGAAAAGCTACACAAAAAGCACATCAGAAAAAAAGAAGAAAAAGCTATTAGTGGTACTACT
AGTGCAACTTGCAATAATGATGATGATAAATCTGCACAAGCCATAGCTATGCTATATGCTATAGCTATGTATATGACACAAA
AAATACATTTCGTGCTATTTCACCGCTAGTATAATATCCATGTCTGCTACAACACACAATCATATTAAACTACCTATAAA
AAAATAATTAAATATTAAACATATGGTCACACCATAATTAAACTGCTAAAACAAATATTAAACTCATTGATCG
TTCATCCTCTTCGGTTAGTGAGGTGGACAGTGAGAGCGCTGCATCGTGTATTGGGTTGACTGGTTCTCACGGCTCATCTGT
GTTGTAACGACCTATCTATGGTCAAACAAACTATTAGGATTATTGTTAGGCAAAAATGAGGGAGATAAAATAACCTATAAGCA
GGACACATGAAACATATGCTTAAACAGTAGAGATTACAACATAAAATAAAAAAGCAGGAAACCGGGAAAGCGTGCAAGCCAAA
GGCCAATCGGCCACAACCAGCTCCACGGTTGTCGTGTCGCCACGTGGCACGCCGGCCATTCCGGGCCACAGATCCGGCTC
AGGGTCATGTGCCACTGCCATGGCCCCCTCTGTCGAGCGGAGATTGCGACGGGAAGAAAGGTGAGGAGAGAAACAACCAA
GCGAAAAAAATCACGCTTCATTGCGAGGGGGAGGATAGGGAGGAAGACGCCAAGCCAGCTCCAGTCCGGCACCGATATAAA
GCGGCAGGCAGTGATTGCTGACGAGATGGACTCACACGCCGTCACAATGCTGTGCCCTCGTGTGCCCTTCCCTGCCGACTC
CGCTTCCGCCGCCGCGCTCTCGCATGCTGATCGGCCGGCACGCCGGGATCGCGTAAGCTGCGGCGATCCGGGGCT
GGTGGATTACTACTTTGCTTTCTTCTGACTGATGGTCATAGTTGCGAGGGTGGCGCAATGTGCGCCTGAGTGTG
TTGCTGTCCAGTGCAAGGCTGCCGGTCAGGGGTGCGGAAGGTAGATCTTCCCAGATTAGAACACGTTGTTACGGACAAAT
GGAATTGGTACTAGTTGGAGAGAGAAAAAAACTCTGGAATTGTTGAGATGGCTCGCTCGCTTGGATTGGCTCTA
GTGCTTGTATCAGTAGTAATCATTACCAAGTCTAGCGGATCTCAGATTCAACTGAAGTTGTTAAATTGGTGGTGG
TTTCTTCAGCCATCTAATCATTATTACATAATAATTAGTTGAAATAAGTGTCTATTGATATTCTGTGGTTGCTGAGC
AGCTAATTAGCTTCACTACATTTCACGTGTTAGCTCTATTGCTCGTGTAACTGCAATTCTGCTCTCGCTTGGATTGGCT
CAAGAGCAAATTGCCACTGCAGCTACTGTGCAAGAAGATAAAACTATGCCAAAGGCAGTGTGACCATCTCCCCATA
TACGACCTGGACCCCAAGCTGGAGATATTCAAGGACCATTTCAGGTACCGGATGAAAAGATCCTAGAGCAGAAAGGATCAATT
GAAGAAAATGAGGGAAGTCTGAATCTTTCTAAAGGTTAGGCTTAATACATTCAAATGCTAATACAAGGACCATTCAACAT

ATTTATAGCACCTGCCCATGCCGAAAATATTATCGCATCATCAACATTCCGGATTTGTATTTTCAGGCTATTGAAAT
TTGGGATTAATAACAAATGAGGATGGAACTGTATATCGTAATGGGCACCTGCTGCCAGTAAGTCTAATGTTGTCATGCAAAC
ATGATGTACTGGCAGGGTATCGTTTCCCATTGCTGTGAAGAGATATCGTCTGATAGTAACTATATAAAAAAAAGAA
CAGCTAAAACACAGGAGAGTAATCAATGTTGGGAGTAGAAAACGTGCTGGATATTCAATTCTGTGCAAGACTGTCATGTCTT
AGCTGAGGAGGCTATTTCTTCTGCTGTGATTACATAATGCTGTTCTTATGACAATATACTTCCACTATTAAATAG
ATTGATGCATTGACTTGAGTTTTACTCATGGGTGTAGGGAGGCAGAGCTTATTGGTACTTCATGACTGGAATGGTCAA
ACCATAAGATGGAGAAGGATAAATTGGTGTGGTCATCAAAATTGACCATGTCAAAGGGAAACCTGCCATCCCTCACAAATT
CCAAGGTTAAATTGCTTCTACATGGTGGAGTATGGGTGATCGTATTCCAGCATGGATTCAATTGCGACTGTTGATGCCCT
TAAATTGGAGCTCCATGATGGTGTGATTGGGATCCTCCTGCTCTGAAAGGCTCTTACTGTCCTGGACCACATTGTA
AACTTAAGCAATAGACCTTAGCAGACAAAAATATGACAAAATTATAGTACCTTACCTCTGGTTGCAGGTACACATTAA
GCATCCTCGGCCTCAAAGCCTGCTGCCACGTATCTATGAAGCCCAGTGTAGGTATGAGTGGTAAAGCCAGCAGTAAGCACA
TATAGGAATTGCAAGACAATGTGTTGCCACGCATACGAGCAAATAACTACAACACAGTCAGTTGATGGCAGTTGAGCAT
TCGTAATGCTTCTTCGGGTACCATGTCACAAATTCTTGCCTGCGTTAGCAGCAGATCAGGCACACCAAGGACCTCAAATATC
TTGTTGATAAGGCACACAGTTGGGTTGCGAGTTCTGATGGATGTTGTCATGCCATGCCAGTAATAATGTCACAGATGGTT
TAAATGGCTATGATGGACAAAGCACCAAGAGTCCTATTTCATGCCGGAGATAGAGGTTATCATAAAACTTGGGATAGTC
GGCTGTTCAACTATGCTAACTGGGAGGTATTAAGGTTCTTCTAACCTGAGATATTGGTGGATGAATTGATGTTGATG
GCTTCCGATTTGATGGAGTTACATCAATGCTGTATCATCACCAGGTATCAATGTCAGGTTACTGGAAACTACCAGGAATATT
CAGTTGGACACAGCTGTGGATGCAGTTGTTACATGATGCTGCAAACCAATTAAATGCACAAACTCTGCCAGAAGCAACTGTT
GTTGCTGAAGATGTTCAAGGATGCCCTTGCCTGCGCCAGTTGATGAAGGTGGGTTGGTTGACTATGCCCTGGCAATGG
CTATCCCTGATAGATGGATTGACTACCTGAAGAATAAGATGACTCTGAGTGGTCATGGTGAAATAGCGCATACTTGA
ACAGGAGATATACTGAAAAATGCATCGCATATGCTGAGAGCCATGATCAGGTACCCCTGCATTATATAAAACTTATAAGGAAG
TATAGTTGGATGCAGCAAAGTATTTATTCCCTGTCGGGTAGACAACACATGGGCAAGTATCTTTAATCAGACAGTACTAT
ATTTCATCACATTCTATCCTGATTGCTAGTAACGGATTAGTTATTCAAAAAATTAGGCCCTCTAACGATGTTAAGAATT
TGCAATCACATGACCTGTTATCTTATACTGGAAATTAAACATGCAAATTTCAGTCTATGTTGGCAGAAAACATTG
ATTTCCTGATGGACAAGGAAATGTACACTGGCATGTCAGACTGTCAGGCTGCTCACCTACAATTGATGAGGGATTGCACTC
CAAAAGGTTCCATTCTCCTCAAGTTCTGGTTGAAACCTGGTTCAATAATTGTAATGAGTTCCCTCAATATAACCTTGCTTATT
GTGTTCTGTAACACTCCAGATGATTCACTCACAATGCCCTGGAGGTGATGGCTACTTGAATTGAGGTTATGGAAATGAGGTGA
AATCTGGTCTTTGAAAAATGTTCCATTAAATAAGCCTGCATAAACCTTTGTATTTTCTATTGAGGTTTCAGCATT
AGAGTCGACCCCTCTATTTCAGTAACGTAAGTTCTAATGGCTATTGAAATGGTTAATGTTAATTCCGAGTAGCGCTCGTTGC
ACATGAAAATGTGGTCTGTTATGGCTGCTAACCTTTGTGACTTGTCCAATATACTCGTACAACATGGGATACTGTAACCCT

TCACTATTCAAGCATACTGCTTAAATGTCAAACATCATACAGAGATATTATCAAGTCTTCTCCTGCACTATCCTGGAATGAAAA
AAAAGAGTTGTTCATATGCTATCTGACTTTACAAATGAGTGTGATCTTGGAGAAGTAGTTGACGGAATGGTCCACTGTA
TTTGTGTTATATGTTCTCCTATTCAAGTGTATTCAATTGATGTGCAATTCTCTTAGTTGGTCACCCAGAATGGATT
GACTTCCAAGAGAACAGGAAACTGGAGCTATGATAATGCAGACGACAGTGGAGCCTGTGGACACTGATCACTTGCAGGTAC
AAGGTTATGTCTATGAATGCAATCCTTATAAGATTGTTCTGGCACCATCTAGGCTCTCTTGACCTTACCTCTCCATT
ATCGCTGTCCTATACTAGCTAGATCTGCTCTGAGACTAGCTAGATGTCAGTTCTTACTACTATTACACTCTGAGTTGAGC
TGGGCCAGATATGCTTTCCACACTTGTGTTGCTGCCCACTGCCCTACTATAGTAAATTGACCAACCCGTACATGTTACTC
AATAAACAGGTTGGATTGGCTGTGCAAACCTAGTATTGTAAGTTGACCTGGCTTATGTATTGCCATTGTTGAATAAAAAT
AATTTGATGCAATTGATTGGTATGTCATTTCATAACTTGCAAGACCTAGGAATGTAACCTCTCAATCATTGGTTGTTGTTGAT
AGAAATTATTCTGTTTACAGCATATGGTGGACTAAATATCCAAGTGAACGTTGTTGCTGTTTTCTACCCCTCAAGT
TTACAATTATCCCGCTAACATATTAAATGTTTCTCCTTGCTCTAATGCTGAACAGTACATGAATGCCATTGACCAAGCGATGA
ATGCGCTCGATGAGAGATTCCCTTCTCGTCGCAAAGCAGATCGCAGCGACATGAACGATGAGGAAAAGGTAAGGATTTC
AGAATACTTGGTATGAGAGTGTGCGACGTTCTTCTTAGGAAGAGTGGTAACTCTAGCTGTGCTGTATTGCGA
TTAAGGCGAGCTCAATTAGGAGTGGATGGTTGTCAGCATTATTTTCTACTTCGTTCAGGTATTGCTTTGAACGTGGA
GATTAGTTTGTGTTCAATTCCATCCAAAGAAAACCTACGAGGGTAAGTCACCAGTTGTAACCCCTGCTTTCAGAGTC
CCTTTGCCTGTGGTATAATATAATAGTGTGCTACTCCCATCTGCTCTGCAACTTATATGCAAGCTACAAAGTGGATGCG
ATTGCGCTGGAAATACAGAGTAGCCCTGGACTCTGATGCTCTGGTCTCGGTGGACATGGAAGAGTAAGTAGTGACGGTAGAC
GCTGAAAGATGTTTTTTTAATTGCCCCACTCCGTAGTTGGGCCGGCCGGCGTCGAGAATCGATCATATCAGGCT
GTCGTGTTGCGAGACTCATGGATGCTGTGACGCAGGTTGGCCACGACGTGGATCACTCATGTCGCTGAAGGGTGCAGGG
TGCCCCAAACGAACTCAACAACCGGCCGAACCTCGTCAAAGTCCTTCTCCGCCCGCACCTGTGTAATGTTCACTTACTCT
CAGCTGAACGTGAGCTAGAATGTATCCGCCCCGACAAACCGCTCTGCTGCCAGGCTTATTACCGTAGACGAAGCAGGGCT
GGACGACGTCTTCACCGCAAAGCAGAGACAGGAAAGACGTCTCCAGCAGAGAGCATCGACGTCAAAGCTCCAGAGCTAGTAGC
AAAGAAGACAAGGAGGCAACGGCTGGCAAGAAGGGATGGAAGTTGCGCGGCCAGCCATCCGATCAAGATACCAAAATGAAGC
CAGGAGTCCTGGTGGACTGGACTGGCTGCCGGCGCCCTGTTAGTAGTCCTGCTACTGGACTAGCCGCCGTGGCGCCCTTG
GAACGGTCTTCTGTAGCTTGAGCCGACTGGTGTCTCATACCGAGCAGGCAGGCACTGCTGTATAGCTTTCTAGAATAA
TAATCAGGGATGGATGGATGGTGTATTGGCTATCTGGCTAGACGTGCATGTGCCAGTTGTATGTACAGGAGCAGTCCCGT
CCAGAATAAAAAAAACTTGTGTTGGGGGTTTTCTTACTCTGTAAGTCTGCTTGTGCTAGGTTGACGAAGATGTTGATATTA
GATGCCATAGATCATGTAAGTTCTCGTTCCCTGTCCAGTTCACATTGATTCCAGCTGTTCAGCAGGCG
GTCAGCTCAGCTCCACACCGGGGCCAGGCCGGCGCAGGCATTTTCAATTGCGTCATAACACAAACACTTTGAT
CTTTCGACAAAAAGATGGATCGCTAAC

>NC 350

GTGCACTGCCCTCTAGACCCCGATGAAGTCAAGGATAGTGAGCGCCAACCAAGTTAGGCTCCCCAGCCAGATGATCATGTTA
GGTGTTCAC TGCCATAAAAGAAAGCGTCCGTGATGTCGTACTTGGGGCGGTGAATACGTAAGGGACAGATGCTCATATACC
TTCATCTGTTTACTCTAAATTACTAATGTTCCCTATGTCAGCTAAAGTGAATCTCGCCCACCAATCTGCAGATTGTGAA
TGACTTGAAAGTTACCGTAACCATGCTGTGGAACCCATCAATGAAAAGCTGCACATGATATCCGAGAACATCAAAAAGCGCGA
GAAGGGAAAGAGGAAAACAAATGATGATAGCTGCATCAGTCACCAACATCCTGACCAGGGTCATCAGTGGATTGATGATCC
GCTCCTGAACGGGAGCTTGAGTGACAACAGCGGTCAAAGAAAGCACGGAGGCAGCGCAGGAAATCAGGCTATGCAAGCGCAGA
GAGCGGTGGGGAGAGCAGCGACCATGGCCTAGCGGGTTGAGATCCGAGGGAACAGATGGATTACTAGGGAGTGACAGCTAAG
AGCAATCTGTGGAGATACTATGTAATGTCACAGGAGTTGGCCTGTGGTATGTCGATAACCGGGCAGTGGTTCTGAGCGT
AAGACGAGGTCTCTAGCAATGATATGTTAGCGCAGTAAATCGAGATGAGCAATCAGGTTGTTGATTCTTCGGC
TGACCAATT CGGCTGCTGAGGCCTTGATCCTGTATTGAGATGTCAGGCCTACTTAGAGCAAATGCTGGAAGGAAGCAATGTGCC
TGTTCTAGGTCCCTCCAGCATCACTGTAATTGTAAGTACTCAAGTACAGACTAGAACTAGTCATGCATACCAGAAGAATAGA
TAGATGTTT CAGAAGTTGAGGCCTGAGATGCCGTGCCACTCTATTGCTCTGTTCATGCTTGCGTTATTATATCACTATATT
TCACTGTTCAATTCTAAGGCCGTGTCACACGGGTACCAGAACAGAGCAGAACACCTTTACGTTCTTTGCTGCTATGGATGGAC
TTCGAGAGTT CTTGAGAAAGCACTCTCATCTATCTTCCAATT CCTTGTTGAGATCCTGATCACTGAAGATGCCATT
TGATT TTTCACTTTCA GTTATATATAAGTGAAGACGGTTGTCACGCAATATGTGAAGTGCAAGATGAGCTCTACACTGCA
AGGAACCCCAAGAAAAAACACAGGTAAAGTGTCTGATTGACAACACGGCTAGAGCTGTGACGATGCAGATGACTCCGCATGT
TCATT CATCACTTTAATTGTTAGAAAAGCTACACAAAAAGCACATCAGAAAAAGAAGAAAAAGCTATTAGTGGTACTACT
AGTGCAACTTGCAATAATGATGATGATAAATCTGCACAAGCCATAGCTATGCTATATGCTATAGCTATGTACACAAA
AAATACATT TTGCTATT TTTACCGCTAGTATAATATCCATGTCTGCTACAACACACAATCATATTAAACTACATTGATCG
TTCATCCTTT CGGTTAGTGAGGTGGACAGT GAGAGCGCTGCATCGTGTATTGGTTGACTGGTTCTACGGCTCATCTGT
GTTGTAACGACCTATCTATGGTCAAACAAACTATTAGGATTATTGTTAGGCAGGGAGATAAATAACCTATAAGCA
GGACACATGAAACATATGCTTAAACAGTAGAGATTAACAACATAAAATAAAAAGGCAAACCGGGAAAGCGTGCAAGCCAAA
GGCCAATCGGCCAGAACCGAGCTCCACGGCTGTCGTCCGCCACGTGGCACGCCGGCCATTCCGGGCCACAGATCCGGCTC
AGGGTCATGTGCCACTGCCATGGCCGCTCCTGTCGCA CGGGCAGATTGCGACGGGGAAAGAAAGGTGAGGAGAGAACACCAA
GCGAAAAAAATCACGCTTCA TTGCGAGGGGGAGGATAGGGAGGAAGACGCCAAGCCAGCTCCAGTCCGGCACCGATATAAG
CGGCAGGCACTGGATTGCTGACGAGATGGGACTCACAGCCGCCACAATGCTGTGCCTCGCCACTCC

GCTTCCGCCGCGCGCCTCGCTCGCATGCTGATCGGGCGCACCGACGGGATCGCGTAAGCTGC GGCGATCCGGGGCTG
GTGGATTTACTACTTTGCTTTTTCTGTACTGATGGTCATAGTTCGCAGGGTGGCGCAATGTGCGTCTGAGTGTGT
TGTCTGTCCAGTGCAAGGCTGCCGGTCAGGGTGCAGGAAGGTAGATCTTCCCCAGATTAGAACACGTTGTTACGGACAAAATG
GAATTTGGTAGTAGTTGGAGAGAAAAAAACTCTGAATTGTGGATTGGGTCTCGCTTGGATTGGCTTAGTGTGTT
TTATCAGTAGTAATCATTACCAAGTCTAGGGATCTCAGATTCAACTGAAGTTGTTAAATTGGTGGTTGGTTCTTCA
GCCATCCTAATCATTATTACATAATAATTAGTTGAAATAAAAGTGTATATTGATATTCTGTGGTTGCTGCAGCAGCTAATT
AGCTTCACTACATTTCACGTGTTAGCTTCTATTGCTCGTGAATTCTGAATCTGGCTTAAACGCACTGTGCAAGGTCAAGAGCA
AATTGCCACTGCAGCTACTGTGCAAGAAGATAAAACTATGGCAACTGCCAAAGGGATGTCGACCCTCCTTACGACCT
GGACCCAAGCTGGAGATATTCAAGGACCATTCAAGGTACCGGATGAAAGATTCTAGAGCAGAAAGGATCAATTGAAGAAAA
TGAGGGAAAGTCTTGAATCTTTCTAAAGGTTAGGCTTAATACATTCAAATGCTAATACAAGGACCATTACAGTATTATAG
CACCTGCCATGCCACAAATATTATCTGCATCATCAACATTCCGGATTGTATTTCAGGCTATTGAAATTGGGATT
AATACAAATGAGGATGGAACTGTATATCGTGAATGGCACCTGCGCAGTAAGTTCTAATGTTGTCATGCAAACATGATGTA
CTGGCGGGTATCGTTTCCATTGCTGTGAAGAGATATCGTGTAGTAACTATATTAAAAAGAACAGCTAA
ACACAGGAGAGTAATCAATGTTGGAGTAGAAAAGTCTCGGATATTCTGTGCAAGACTGTCATGTTAGCTGAGG
AGGCTATTCTGTGATTACATAATGCTGTTCTCTTAAGACAATATACTTCCACTATTAAATAGATTGATGC
ATTGACTTGAGTTTACTCATGGGTGAGGGAAAGCAGAGCTATTGGTACTTCATGACTGGAATGGTCAAACCCATAAG
ATGGAGAAGGATAATTGGTGTGATGGTCATCAAATTGACCATGTCAGGAAACCTGCCATCCCTCACAAATTCCAAGGTT
AAATTGCTTCTACATGGTGGAGTATGGGTGATCGTATTCTGCATGGATTGCTTGTGACTGCTGATGCCCTCAAATTG
GAGCTCCCTATGATGGTGTGATTGATCTCTGCTGCTTCTGAAAGGTCTTCTACTGTCCTGGACCACATTGTAACCTTAAG
CAATAGACCTTAGCAGACAAAAATATGACAAAATTATAGTACCTTCACCTCTGGTTGCAGGTACACATTAAAGCATCCTCG
GCCCTCAAAGCTGCTGCTCACGTATCTATGAAGCCCAGTAGGTATGAGTGGTAAAAGCCAGCAGTAAGCACATATAGGGAA
TTTCAGACAATGTGTTGCCACGCATACGAGCAAATAACTACAACACAGTTGATGGCAGTTATGGAGCATTGTTACTAT
GCTTCTTCGGTACCATGTGACAAATTCTTCTGGTAGCAGCAGATCAGGCACACCAGAGGACCTCAAATATCTGTTGATA
AGGCACACAGTTGGGTTGCGAGTTCTGATGGATGTTGCCATAGCCATGCAAGTAATAATGTCACAGATGGTTAAATGGCT
ATGATGTTGGACAAAGCACCAAGAGTCCTATTTCATGCGGGAGATAGAGGTTATCATAAACTTGGGATAGTCGGCTGTTCA
ACTATGCTAACTGGGAGGTATTAAGGTTCTTCTTAACCTGAGATATTGGCTGGATGAATTGTCATGTTGATGGCTCCGATT
TGATGGAGTTACATCAATGCTGTATCATCACCAGGTATCAATGTTGAGTTACTGGAAACTACCAGGAATATTCAGTTGGA
CACAGATGTGGATGCAAGTTGTTACATGATGCTGCAAACCAATTAAATGCACAAACTCTGCCAGAACGAACTGTTGCTGAA
GATGTTCAAGGCATGCCGGTCTTGCAGGCAAGTTGATGAAGGTGGGTTGGGTTGACTATCGTCTGGCAATGGCTATCCCTG
ATAGATGGATTGACTACCTGAAGAATAAGATGACTCTGAGTGGTCAATGGTCAAAGCGCATACTTGAACAGGAGAT

ATACTGAAAAATGCATCGCATATGCTGAGAGCCATGATCAGGTACCCCTGCATTATATTATAACTTATAAGGAAGTATAGTTGG
ATGCAGCAAAGTATTTATTTCCTGTGGGTAGACAACACATGGACAAGTATCTTTAATCAGACAGTGCTATATTTCATCA
CATTCTATCCTGATTGCTAGTAACGGATTAATTATTCAAAAAATTAGGCCCTCTAACGATGCTAAGAATTGCAATCAC
ATATGACCTGATTATCTTATACTGGAAATTAAATATCATGCAAATTTCAGTCTATTGTTGGCGACAAAACATTGCATTCTCCT
GATGGACAAGGAAATGTACACTGGCATGTCAGACTTGCAGCCTGCTCACCTACAATTGACCGAGGGATTGCACTCCAAAAGGTT
CCATTCTCCTCAAGTTCTGGTTGAACCTGGTTCAATAATTCTGAATGAGTTCCCTCAATATACCTGCTTATTGTGTTCTGT
ACACTCCAGATGATTCACTTCATCACAAATGCCCTGGAGGTGATGGCTACTTGAATTATGGAAATGAGGTGAAATCTCGGT
CTTTGAAAAATGTTCCCATTAAATAAGCCTGCATAAACCTTTGTATTTCTATTGAGGTTCAAGCATTAGAGTCGAC
CCTCTATTTCTCAGTAACGAAGTCTTAATGGCTATTGAATGGTTAATGTTAATTCCAGTAGCGCTCGTGCACATGAAAA
TGTGGTCTGTTATGGCTGCTAATCCTTGTGACTTGTCCAATATACTCGTACAACATGGGATACATATACATGTAACCTTCA
CTATTCAAGCATACTGCTTAAATGTCAAACATCATAACAGAGATTATCAAGTCTTCTCCTGCACTATCCTGGAATGAAAAAAA
AGAGTTGTTCATATGCTATCTGTACTTTACAAATGAGTGTGATCTTGGAGAAGTTAGTTGAGGGAATGGTCCACTGTATT
TGTGTTGTTATATGTTCTCCTTATTCAAGTGTGCAATTCTCTAGTTGGTACCCAGAATGGATTGAC
TTTCCAAGAGAAGGAAACAACGGAGCTATGATAAAATGCAGACGACAGTGGAGCCTGTGGACACTGATCACTGCGGTACAAG
GTTATGTCTATGAATGCAATCCTTATAAGATTGTTCTGGCACCATCTAGGCTCTTGTGACCTTACCTCTCCATTATC
GCTGCTCTTATACTAGCTAGATCTGCTCTGAGACTAGCTAGATGTCAGTCCCTACTACTATTACACTCTTGAGTTGAGCTGG
GTCCAGATATGCTTTCCACACTTGTGCCCCACTGCCCTACTATAGTAAATTGACCAACCCGTACATGTTACTCAAT
AAACAGGTTGGATTGGCCTGTGCAAACCTAGTATTTGTAAGTTGACCTGGCTTATGTATTGCCATGGTGAATAAAAATAAT
TTGATGCATTGATTGGTATGTCATTTCTTAACCTTGAGACCTAGGAATGTAATTCTCAATCATTGGTTGTTGATAGA
AATTATTTGTTACAGCATATGGGACTAAATATCCAAGTGAACGTTGTTGTCTGTTTTCTACCGCTCAAGTT
CAATTGTCCTGGCTAACATATTAAATGCTTCTCCTGCTTAATGCTGAACAGTACATGAATGCGTTGACCAAGCGATGAATG
CGCTCGATGAGAGATTTCCTTCTCGTCAAAGCAGATCGTAAGCGACATGAACGATGAGGAAAAGGTAAGGATTTCA
AATACCTGGTATGAGAGTGTGCGACGTTGTTCTTTAGGAAGAGTGGTAACCTAGGTTGTGCTGTATTGCG
TAAGGCAGGCTCAATTAGGAGTGGATGGTTGTCAGCATTATTTCTACTCGTTCAGGTATTGCTTGAACGTGGAG
ATTAGTTTTGTTCAATTCCATCCAAGAAAACCTACGAGGGTAAGTCACCCGTTGTAACACCCCTGTCTTCAAGAGTCC
CTTTGCCTGTGGTATAATATAAGTGTGTTACTCCCCTGCTCTGCAACTTATATGCAGCTACAAAGTGGATGCG
TTGCGCTGGAAATACAGAGTAGCCCTGGACTCTGATGCTCTGGCTTCTCGTGGACATGGAAGAGTAAGTAGTGACGGTAGACG
CTGGAAAGATGTTTTTTAATTGCGCTACTCCCGTAGTTGGGGCCGGCCGCGTCGAGAATCGATCATGTCAGGCT
GTCGTGTTGCGAGACTCATGGATGCTGTGACGCAGGTTGGCCACGACGTGGATCACTCACGTGCCCTGAAGGGGTGCCAGGG
TGCCGAAACGAACCAACCGGCCGAACTCGTTCAAAGTCCTTCTCCGCCCGCACGTGTGGTAATGTTCACTTACTCT

CAGCTGAAC TGATGAGCTAGAATGTATCCGCCCTGACAAACCGTCCTGCTGCCAGGCTTATTACCGTAGACGAAGCAGGGCT
 GGACGACGTCTTCACCGCAAAGCAGAGACAGGAAAGACGTCTCCAGCAGAGAGCATCGACGTCAAAGCTTCCAGAGCTAGTAGC
 AAAGAACACAAGGAGGCAACGGCTGGTGGCAAGAAGGGATGGAAGTTGCGCGGCAGCAATCCGATCAAGATACCAAATGAAGC
 CAGGAGTCCTTGGTGGACTGGACTGGCTGCCGGCGCCCTGTTAGTAGTCCTGCTCTACTGGACTAGCCGCCGCTGGCGCCCTTG
 GAACGGTCCTTCCTGTAGCTCGCAGGCAGTGGTGTCTCATCACCGAGCAGGCAGGCAGTGTAGCTTGTATAGCTTTCTAGAATAA
 TAATCAGGGATGGATGGATGGTGTATTGGCTATCTGGCTAGACGTGCATGTGCCAGTTGTATGTACAGGAGCAGTCCCGT
 CCAGAATAAAAAAAACTTGGTGGGGGGTTTTCTTCTACTCTGTAGTCTGTTGCTAGGTTGACGAAGGTGTTGATATT
 GATGCCATAGATCGTGTACTGTTAACGTTCTTCGTTCCCTGTCAGTCACATTGATTCCAGCTGTTCAGCAGGCCG
 GTCAGCTCAGCTCCACACCGGGGGCCAGGCCGGTCACGCAGGCATTTTCATTTCATGCGTCATAACACAAACACTTTGAT
 CTTTCGACAAAAAAGATGGATCGCTAAC

>NC 358

GTCGACTGCCCTCTAGACCCCGATGAAGTCAGGATAGTGAGCGCCCAACCAAGTTAGGCTCCCCAGCCAGATGATCATGTTA
 GGTGTTCCACTGCCATAAAAGAAAGCGTCCGTGATGTCGTACTTGGGGCGGTGAATACGTAAGGGACAGATGCTCATATACC
 TTCATCTGTTTACTCGAAATTACTAACATGTTTCCCTATGTCAGCTAAAGTCAAATCTCACCCGACCAATCTGCAGATTGTGAA
 TGACTTGAAGTTACCGTGAACCATGCTGTGGAACCCATCAATGAAAAGCTGCACATGATATCCGAGAACATAAAAAGCGTGA
 GAAGGGAAAGAGGAAAACGAATGATGATAGCTGCATCAGTCACCAACATCCTGACCAGGGTCATCAGTGGATTGATGATCC
 GCTCCTGAACGGAAGCTTGAGTGACAACACAGCGTCCAAGAAAAGCACGGAGGCAGCGCAGGAAATCAGGCTATGCAAGCGCAGA
 GAGCGGTGGGGAGAGCAGCGACCATGCCCTAGCGGGTTGAGATCCGAGGGAACAGATGGATTACTAGGGAGTGACAGCTAGG
 AGCAATCTGTGGAGATACTATGTAATGTCACAGGAGTTGGCCTGTGGTATGTCAGGTTGATGCGATAACCGGGCAGTGGTTCTGAGCGT
 AAGACGAGGTCTCTAGCAATGATATGTTGAGCGTGACTIONATCGAGATGAGCAATCAGGTTGTTGATTCTTCGGC
 TGACCATTCGGCTGCTGAGGCCCTGATCCTGATTGAGATGTCAGGCCTACTTAGAGCAAATGCTGGAAGGAAGCAATGTGCG
 TGTTCTGAGGTCCCTCCAGCATCACTGTAATTGTAAGTACTCAAGTACAGACTAGAACTAGTCATGCAACCAGAAGAATAG
 ATAGATGTTGAGAAGTTGAGGCCCTGAGATGCCGTGCCACTCTATTGCTCTGTTCATGCTTGGCCATTATTATATCACTATT
 TCACTGTTCATCTAAGGCCGTTGTCACACGGGTACAGAACAGAGCAGAACACCTTTACGTTCTTGTGCTATGGATGGAC
 TTGAGAGACTTCCTGAGAAAGCACTCTCATCTATCTTCCAATTCTGTTGATCAGTCAACTGAAGATGGCCATT
 TGATTTTCACTTTCAAGTTATATAAGTGAAGACGGTTGTCACGCAATATGTGAAGTGCAAGATGAGCTACACTGCA
 AGGAACCCCAAGAAAAACCACAGGTAAGTTGTCATTGACAACGGCTAGAGCTGACGATGACTCCGCATGT

TCATTCATCACTTTAATTGTTAGAAAAGCTACACAAAAAGCACATCAGAAAAAAAGAAGAAAAAGCTATTTAGTGGTACTACT
AGTGCAACTGCAATAATGATGATGATAAATCTGCACAAGCCATAGCTATGTTATGCTATAGCCATGTATATGTACACAAA
AAATACATTTTGTGCTATTTTACCGCTAGTATAATATCCATGTCTGCTACAACACACAATCATATTAAATACCTATAA
AAAATAATTTAATATTAAACATATGGTCCACACCATAATTAAACTGCTAAAACAAATATTATAACTCATTGATCG
TTCATCCTCTTCGGTTAGTGAGGTGGACAGTGAGAGCGCTGCATCGTGTATTGGGTTTACTGGTTCTCACGGCTCATCTGT
GTTGTAACGACCTATCTATGGTCAAACAAACTATTAGGATTATTGTTAGGCGAAAAATGAGGGAGATAAATAAACCTATAAGCA
GGACACATGAAACATATGCTTAAACAGTAGAGATTACAACATAAAATAAAAAAGGCAAACCGGTAAAGCGTGCAAGCCCCAA
GGCCAATCGGCCAGAACAGCTCCACGGTTTCGTGTCCGCCACGTGGCACGCCGGCATTCCGGGCCACAGATCCGGCTC
AGGGTCATGTGCCACTGCCATGGCCCCCTCCTGTCGACGGCAGATTGCGACGGGAAGAAAGGTGAGGAGAGAAACAACCAA
GCGAAAAAAATCACGCTTCATTGCGAGGGGGAGGATAGGGAGGAAGACGCCAACGCTCCAGTCCGGCACCGATATAAA
GCGGCAGGCAGTGATTGCTGACGAGATGGGACTCACACGCCCTCACAAATGCTGTGCCCTCGTGTGCCCTCTCGCCGACTC
CGCTTCCGCCGCCGCGCTCGCATGCTGATCGGCCGGCACGCCGGGATCGCGTAAGCTGCGGCGATCCGGGGCT
GGTGGATTACTACTTTGCTTTTTCTTCTGACTGATGGTCATAGTTGCAAGGGTGGCGGAATGTGCGCCTGAGTGTG
TTGTCTGTCAGTGAAGGCTGCCGGTCAGGGGTGCGGAAGGTAGATCTTCCCCAGATTAGAACACGTTGTTACGGACAAAT
GGAATTGGTAGTAGTTGGAGAGAGAAAAAAACTCTGGAATTGCTGAGGGCTCGCTCTCGCTTGGATTGGCTCTA
GTGCTTGTATCAGTAGTAATCATTACCAAGTCTAGGGATCTCAGATTCAACTGAAGTTGTTAAATTGGTGGTGG
TTTCTTCAGCCATCCTAATCATTATTACATAATAATTAGTTGAAATAAGTGTATATTGATATTCTGTTGCTGCAGC
AGCTAATTAGCTTCACTACATTTCACGTGTTAGCTCTATTGCTCGTGTAAATTCTGAATCTGGCTTAACGCACTGTGCAAGGT
CAAGAGCAAATGCCACTGCAGCTACTGTGCAAGAAGATAAAACTATGCAACTGCCAAAGGCATGTCGACCATCTCCCATA
TACGACCTGGACCCCAAGCTGGAGATATTCAAGGACCATTCAGTACCGGATGAAAAGATTCTAGAGCAGAAAGGATCAATT
GAAGAAAATGAGGGAGTCTGAAATCTTCTAAAGGTTAGGCTTAATACATTCAAATGCTAATACAAGGACCATTTACAAT
ATTTATAGCACCTGCCATGCCAAAATATTCTGCATCATCAACATTCCGGATTGTATTGCTGAAAC
TTGGGATTAATACAAATGAGGAGTGGAACTGTATATCGTAATGGCACCTGCTGCCAGTAAGTTCTAATGTCATGCAAAC
ATGATGTAATGGGGGTATCGTTTCCCATTGCTGTGAAGAGATATCGTGTGATAGTAACTATATTAAAAAAAGAA
CAGCTAAACACAGGGAGTAATCAATGTTGGAGTAGAAAACGTTGGATATTCTATTGCTGCAAGACTGTCATGTCTT
AGCTGAGGAGGCTATTCTGCTGTGATTACATAATGCTGTTCTTCTTATGACAATATACTTCCACTATTAAATAG
ATTGATGCAATTGACTGAGTTTTACTCATGGGTGAGGGAGGAGCTATTGGTCAATGACTGGAATGGTCAA
ACCATAAGATGGAGAAGGATAAATTGGTGTGATGAAACCTGCCATCCCTCACAATT
CCAAGGTTAAATTGCTTCTACATGGTGGAGTATGGGTTGATCGTATTCCAGCATTGATTGCTTATGCGACTGTTGATGCC
TAAATTGGAGCTCCCTATGATGGTGTGATTGGATCCTCCTGCTCTGAAAGGTCTTTACTGTCCTGGACCACATTGTA

AACTTAAGCAATAGACCTTAGCAGACAAAAATTATGACAAAATTATAGTACCTTTACCTCTGGTTGCAGGTACACATTAA
GCATCCTCGGCCTCAAAGCCTGCTGCCACGTATCTATGAAGCCCAGTGTAGGTATGAGTGGTAAAAGCCAGCAGTAAGCACA
TATAGGGATTTCAGACAATGTGTTGCCACGCATAACGAGCAAATAACTACAACACAGTCAGTGATGGCAGTTATGGAGCAT
TCGTACTATGCTTCTTCGGGTACCATGTCAGCAAATTCTTGCAGGTTAGCAGCAGATCAGGCACACCAGAGGACCTCAAATATC
TTGTTGATAAGGCACACAGTTGGGTTGCGAGTTCTGATGGATGTTGCCATAGCCATGCAAGTAATAATGTCACAGATGGTT
TAAATGGCTATGATGTTGGACAAAGCACCCAAAGAGTCCTATTTCATGCGGGAGATAGAGGTTATCATAAAACTTGGGATAGTC
GGCTGTTCAACTATGCTAATGGGAGGTATTAAGGTTCTTCTAACCTGAGATATTGGTTGGATGAATTCATGTTGATG
GCTTCCGATTTGATGGAGTTACATCAATGCTGTATCATCACCATGGTATCAATGTGGGTTACTGGAAACTACCAGGAATATTT
CAGTTGGACACAGCTGTGGATGCAGTTGTTACATGATGCTGCAAACCACTTTAATGCACAAACTCTGCCAGAAGCAACTGTT
GTTGCTGAAGATGTTCAAGGCATGCCGGCTTGCAGGCTGAACTGAGTGGTCATGGGTGAAATAGCGCATACTTGA
CTATCCCTGATAGATGGATTGACTACCTGAAGAATAAGATGACTCTGAGAGCCATGATCAGGTACCCCTGCATTATATAAACTTATAAGGAAG
ACAGGAGATATACTGAAAAATGCATCGCATATGCTGAGAGCCATGATCAGGTACCCCTGCATTATATAAACTTATAAGGAAG
TATAGTTGGATGCAGCAAAGTATTTATTCCTTGTGGGGTAGACAACACATGGGCAAGTATCTTTAATCAGACAGTACTAT
ATTTCATCACATTCTATCCTGATTGCTAGTAACGGATTAGTTATTCAAAAAATTAGGCCCTCCTAAGCATGTTAAGAATT
TGCAATCACATGACCTGTTATCTTAACTGGAAATTAAACATGCAAATTTCAGTCATTGTTGGCGACAAACTATTGC
ATTTCCTGATGGACAAGGAAATGTACACTGGCATGTCAGACTGCTGAGGCTGCTCACCTACAATTGATCGAGGGATTGCACTC
CAAAAGGTTCCATTCTCCTCAAGTTCTGGTTGAACCTGGTTTCAATAATTCTGAATGAGTTCCCTCAATATAACCTGCTTATT
GTGTTCTGTACACTCCAGATGATTCACTCACAATGCCCTGGAGGTGATGGCTACTTGAATTGAGGTTCAAGCATT
AATCTGGCTTTGAAAAATGTTCCATTAAATAAGCCTGCATAAACCTTTGTATTTTTCTATTGAGGTTCAAGCATT
AGAGTCGACCCCTCTATTCTCAGTAACGTAACGGCTTAATGGCTATTGAATGGTTAATGTTAATTCCGAGTAGCGCTCGTTGC
ACATGAAAATGTGGCTGTTATGGCTGCTAACCTTTGTGACTTGTCCAATATACTCGTACAACATGGGATACATGTAACCC
TCACTATTCAAGCATACTGCTTAAATGTCAAACATCATACAGAGATATTCAAGTCTTCTCCTGCACTATCCTGGAATGAAAA
AAAAGAGTTGTTCATATGCTACTTTACAAATGAGTGTGATCTTGGAGAAGTTAGTGACGGAATGGTCCACTGTA
TTTGTGTTATGTTCTCCTATTCAAGTGTATTCAATTGATGTGCAATTCTCTTAGTTGGTCACCCAGAATGGATT
GACTTCCAAGAGAAGGGAAACAACGGCTATGATAAAATGCAGACGACAGTGGAGCCTGAGCAGTCACTGATCACTGCGGTAC
AAGGTTATGTCTATGAATGCAATCCTTATAAGATTGTTCTGGCACCATTAGGCTCTCTTGCACCTTACCTCTTCCATT
ATCGCTGTCCTATACTAGCTAGATCTGCTCTGAGACTAGCTAGATGTCAGTTCTTACTACTATTACACTCTTGAGTTGAGC
TGGGTCCAGATATGCTTTCCACACTTGTGTTTGCTGCCCACTGCCCTACTATAGTAAATTGCACCAACCCGTACATGTTACTC
AATAAACAGGTTGGATTGGCTGTGCAAACCTAGTATTGTAAGTTGACCTGGCTTATGTATTGCCATTGTTGAATAAAAAT
AATTGATGCATTGATTGGTATGTCATTTCATAACTTGCAAGACCTAGGAATGACTTCTCAATGGTTGTTGATG

AGAAATTATTCTGTTACAGCATATGGTGGACTAAATATCCAAGTGAACGTTGTTGTCTGTTTTCTACCCCTCAAGT
 TTACAATTATCCCGCTAACATATTAATGTTTCTCCTGCTCTAATGCTGAACAGTACATGAATGCCGTTGACCAAGCGATGA
 ATGCGCTCGATGAGAGATTTCCCTTCGTCGTCAAAGCAAATCGTCAGCGACATGAACGATGAGGAAAAGGTAAGGATT
 CAGAATACTTGGTATGAGAGTGTGCGACGTTCTTCTTAGGAAGAGTGGTAACTCTAGCTTGTGCTGTATTGCG
 ATTAAAGGCGAGCTCAATTAGGAGTGGATGGTTGTCAGCATTATTTCTACTTCGTTCAGGTATTGCTTGAACGTGG
 AGATTTAGTTTGTGTTCAATTCCATCCAAGAAAACCTACGAGGGTAAGTCACCAGTTGAAACCTGCTTTCAGAGT
 CCCTTTGCCTGTTGATAATATAATAGTGTGCTTACTCCCCTCTGCTCTGCAACTTATATGCAAGTACAAAGTGGATGC
 GATTTGCCTGGAAATACAGAGTAGCCCTGGACTCTGATGCTCTGGTCTTCGGTGGACATGGAAGAGTAAGTAGTGACGGTAGA
 CGCTGAAAGATGTTTTTTAATTGGCCCTACTCCGTATTGGGCCACGACGTGGATCACTCACGTCGCCTGAAGGGTGCCAGGG
 GTGCCGAAACGAACCTCAACAACCGGCCAACTCGTTCAAAGTCCTTCTCCGCCCGCACCTGTGTTGAATGTTCACTTACTC
 TCAGCTGAACGTGATGAGCTAGAATGTATCCGCCGTGACAAACCGCCTGCTGCCAGGCTTATTACCGTAGACGAAGCAGGGC
 TGGACGACGTCTCACCGCAAAGCAGAGACAGGAAAGACGTCTCAGCAGAGAGCATCGACGTCAAAGCTCAGAGCTAGTAGC
 AAAGAAGACAAGGAGGCAACGGCTGGCAAGAAGGGATGGAAGTTGCGCCGCAGCCATCCGATCAAGATACAAATGAAGC
 CAGGAGTCCTGGTGGACTGGACTGGCTGCCGCCGTTAGTAGTCCTGCTACTGGACTAGCCGCCGCTGGCGCCCTTG
 GAACGGTCCTTCCTGTTAGCTGCAGGCAGTGGTCTCATACCGAGCAGGCAGGACTGCTGTATAGCTTCTAGAATAA
 TAATCAGGGATGGATGGATGGTGTATTGGCTATCTGGCTAGACGTGCATGTGCCAGTTGTATGTACAGGAGCAGTCCCGT
 CCAGAATAAAAAAAACTTGGTGGGGGTTTTCTTACTCTGTAGTCTGCTTAGGTTGACGAAGATGTTGATATTAG
 GATGCCATAGATCATGTAAGTTCTCGTTCCCTGTTCCAGTTCACATTGATTCCAGCTGTTCAGCAGGAGCAGGGC
 GTCAGCTCAGCTCCACACCGGGGCCAGGCCGGCTCACGCAGGCATTTCATGCGTCATAACACAAACACTTTGAT
 CTTTCGACAAAAAGATGGATCGCTAAC

>Neuta Sweet

GTCGACTGCCCTCTAGACCCCGATGAAGTCAAGGATAGTGAGCGCCCAACCAAGTTAGGCTCCCCAGCCAGATGATCATGTTA
 GGTGTTCCACTGCCATAAAAGAAAGCGTCCGTGATGTCGTACTTGGGGCGGTGAATACGTAAGGGACAGATGCTCATATACC
 TTCATCTGTTTACTCGAAATTACTAATGTTCCCTATGTCAGCTAAAGTGAATCTCACCCGACCAATCTGCAATTGAA
 TGACTTGAAGTTACCGTGAACCATGCTGTGGAACCCATCAATGAAAAGCTGCACATGATATCCGAGAACATCAAAAGCGTGA
 GAAGGGAAAGAGGAAAACGAATGATGATAGCTGCATCAGTTACCAACATCCTGACCGAGGTCATCAGTGGATTGATGATCC
 GCTCCTGAACGGAAGCTTGAGTGACAACAGCGGTCAAAGAAAGCACGGAGGCAGCGCAGGAAATCAGGCTATGCAAGCGCAGA

GAGCGGTGGGAGAGCAGCGACCATGGCCTAGGC GGTTT GAGATCCGAGGGAACAGATGGATTACTAGGGAGTGACAGCTAGG
AGCAATCTGTGGAGATACTATGTAATGTACAGGAGTTGGCCTGTGGTATGTGCGATAACCGGGCAGTGGTTCTGAGCGT
AAGACGAGGTCTCTAGCAATGATATGTTGAGCGTAAACTGAGATGAGCAATCAGGTTGTTGATTCTTCGGC
TGACCATTTCGGCTGCTGAGGCCTTGATCCTGTATTGAGATGTCAGGCCTACTTAGAGCAAATGCTGGAAGGAAGCAATGTGCC
TGTCTGAGGTCCCTCCAGCATCACTGTAATTGAAAGTACTCAAGTACAGACTAGAACTAGTCATGCATACCAAGAAGAATAG
ATAGATGTTCAAGAGTTGAGGCCTGAGATGCCGTGCCACTCTATTGCTCTGTTCATGCTTGCCATTATATACACTATT
TCACTGTTCAATTCAAGGCCGTTGTACACCGGGTACCAAGAAGAGCAGAACACCTTTACGTTCTTTGCTGCTATGGATGGAC
TTCGAGAGTTCTTGAGAAAGCACTCTCATCTATCTTCCAATTCTTGTGATCCTGATCACTGAAGATGCCATT
TGATTTCAGTTCAATTATATAAGTGAAGACGGTTGTCACGCAATATGTGAAGTGCAAGATGAGCTCTACACTGCA
AGGAACCCCAAGAAAAAACACAGGTAAGTTGTCATGACAACGGCTAGAGCTGTGACGATGCAGATGACTCCGCATGT
TCATTCACTTAATTGTTAGAAAAGCTACACAAAAAGCACATCAGAAAAAGAAGAAAAGCTATTAGTGGTACTACT
AGTGCAACTTGCAATAATGATGATGATAATCTGCACAAGCCATAGCTATGCTATATGCTATAGCTATGTACACAAA
AAATACATTGCTATTACCGCTAGTATAATATCCATGTCTGCTACAACACACAATCATATTAAACTACATTGATCG
TTCATCCTTTCGGTTAGTGAGGTGGACAGTGAGAGCGCTGCATCGTATTGGGTTGACTGGTTCTACGGCTCATCTGT
GTTGTAACGACCTATCTATGGTCAAACAAACTATTAGGATTATTGTTAGGCAGGGAGATAAAACCTATAAGCA
GGACACATGAAACATATGCTTAAACAGTAGAGATTAACAACATAAAATAAAAAGGCAAACCGGGAAAGCGTCAAGCCAAA
GGCAATCGGCCAGAACCGCTCCACGGTTGTCGCCCCACGTGGCACGCCGGCATTCCGGGCCACAGATCCGGCTC
AGGGTCATGTGCCACTGCCATGGCCCCCTCCTGTCGAGCGGAGATTGCGACGGGAAGAAAGGTGAGGAGAGAAACAACAA
GCGAAAAAAATCACGCTTCATTGCGAGGGGGAGGATAGGGAGGAAGACGCCAAGCCAGCTCCAGTCCGGCACCCGATATAAA
GCGGCAGGCACTTGGATTGCTGACGAGATGGACTCACACGCCGTACAATGCTGTCCTCGTGTGCCCTCTCGCCGACTC
CGCTTCCGCCGCCGCGCTCTCGCTCGATGCTGATGGCGACCGCCGGGATCGCGTAAGCTGCGGCGATCCGGGGCT
GGTGGATTACTACTTTGCTTTCTTCTGTACTGATGGTCATAGTTGCAAGGGTGGCGCAATGTGCCCTGAGTGTG
TTGTCTGTCAGTGCAGGCTCGCCGGTCAGGGTGCGGAAGGTAGATCTTCCCAGATTAGAACACGTTGTTACGGACAAAAT
GGAATTGGTAGTTGGAGAGAGAAAAAAACTCTGGAATTGAGATGGCTCGCTCGCTTGGATTGGCTCTCGCTCTGGATTTGGCTCTA
GTGCTTGTATCAGTAGTAATCATTTACCAAGTCTAGGGATCTCAGATTCAACTGAAGTTGTTAAATTGGTGGCT
TTTCTCAGCCATCTAATCATTTATTACATAATAATTAGTGAAGATAAGTGTCTATTGCTCGTAATTGCAATCTGGCTTAACGCACTGTGCAAGGT
AGCTAATTAGCTTCACTACATTTACGTGTTAGCTTCTATTGCTCGTAATTGCAATCTGGCTTAACGCACTGTGCAAGGT
CAAGAGCAAATTGCCACTGCAGCTACTGTGCAAGAAGATAAAACTATGGCAACTGCCAAAGGGCAGTCGACCATCTCCCCATA
TACGACCTGGACCCAAAGCTGGAGATATTCAAGGACCATTTCAGGTACCGGATGAAAAGATTCTAGAGCAGAAAGGATCAATT

GAAGAAAATGAGGGAAGTCTGAATCTTTCTAAAGGTTAGGCTTAATACATTCAAATGCTAATACAAGGACCATTCAACAT
ATTTATAGCACCTGCCCATGCCGAAAATATTATCTGCATCATCAACATTCCGGATTTGTATTTTTTCAGGCTATTGAAAT
TTGGGATTAATACAAATGAGGATGGAACGTGATATCGTGAATGGGCACCTGCTGCCAGTAAGTCTAATGTTGTCATGCCAAC
ATGATGTACTGGCGGGGTATCGTTTCCCATTGGCTGTGAAGAGATATCGTCTGATAGTAACTATATAAAAAAAAGAA
CAGCTAAAACACAGGAGAGTAATCAATGTTGGGAGTAGAAAACGTTGGATATTCAATTCTTGCAAGACTGTCATGCTT
AGCTGAGGAGGCTATTTCCTGCTGTGATTACATAATGCTGTTCTCTTATGACAATATACTTCCACTATTAAATAG
ATTGATGCATTGACTTGAGTTTACTCATGGGTGTAGGGAGGCAGAGCTTATTGGTGAATTCAATGACTGGAATGGTCAA
ACCATAAGATGGAGAAGGATAAATTGGTGTGATGGTCAATTGACCATGTCAGGGAAACCTGCCATCCCTCACAAATT
CCAAGGTTAAATTGCTTCTACATGGTGGAGTATGGGTGATCGTATTCCAGCATTGATTGTTATGCGACTGTTGATGCCCT
TAAATTGGAGCTCCATGATGGTGTTCATTGGATCCTCCTGCTCTGAAAGGCTCTTACTGTCCTGGACCACATTGTA
AACTTAAGCAATAGACCTTAGCAGACAAAATATGACAAAATTATAGTACCTTTACCTCTGGTTGCAGGTACACATTAA
GCATCCTCGGCCCTCAAAGCCTGCTGCTCACGTATCTGAAGCCCAGTCAGGTTAGTGGCAGGAAAGCCAGCAGTAAGCACA
TATAGGAATTGCAAGACAATGTGTTGCCACGCATACGAGCAAATAACTACAACACAGTTGATGGCAGTTATGGAGCAT
TCGTACTATGCTTCTTCGGTACCATGTGACAAATTCTTGCGGTTAGCAGCAGATCAGGCACACCAGAGGACCTCAAATATC
TTGTTGATAAGGCACACAGTTGGGTTGCGAGTTGATGGATGTTGTCATGCCATGCAAGTAATAATGTCACAGATGGTT
TAAATGGCTATGATGGACAAAGCACCCAAAGAGTCCTATTTCATGCCGGAGATAGAGGTTATCATAAACTTGGGATAGTC
GGCTGTTCAACTATGCTAACCTGGGAGGTATTAAGGTTCTTCTAACCTGAGATATTGGTGGATGAATTGATGTTGATG
GCTTCCGATTGATGGAGTTACATCAATGCTGTATCATCACCATGGTATCAATGTGGGTTACTGGAAACTACCAGGAATATT
CAGTTGGACACAGCTGTGGATGCAAGTTGATGCTTACATGATGCTGCCAAACCATTAAATGCACAAACTCTGCCAGAACACTGTT
GTTGCTGAAGATGTTCAGGCATGCCGCTTGTGCTGCCAGTTGATGAAGGTGGGTTGGGTTGACTATGCCCTGGCAATGG
CTATCCCTGATAGATGGATTGACTACCTGAAGAATAAGATGACTCTGAGTGGTCAGGGTACCTGCATTATATAACTTATAAGGAAG
ACAGGAGATATACTGAAAATGCATCGCATATGCTGAGAGCCATGATCAGGTACCTGCATTATATAACTTATAAGGAAG
TATAGTTGGATGCAGCAAAGTATTATTCCTGTGGGTTAGACAACACATGGGCAAGTATCTTTAATCAGACAGTACTAT
ATTTCATCACATTCTATCCTGATTGCTAGTAACTGGATTAGTTATTCAAAAAATTAGGCCCTCTAACATGTTAAGAATT
TGCAATCACATATGACCTGTTATCTTAACTGGAAATTAAAATCATGCAAATTTCAGTCTATTGTTGGCAGAAAACATTG
ATTTCCTGATGGACAAGGAAATGTACACTGGCATGTCAGACTGCAAGCCTGCTTCACCTACAATTGATCGAGGGATTGCACTC
CAAAAGGTTCCATTCTCCTCAAGTTGGTGAACCTGGTTCAATAATTGAAATGAGTTCCCTCAATATAACCTTGCTTATT
GTGTTCTGTACACTCCAGATGATTCACTCATACAATGCCCTGGAGGTGATGGCTACTTGAATTGTTATGGAAATGAGGTGA
AATCTCGGTCTTTGAAAAATGTTCCATTAAATAAGCCTGCATAAACCTTTGTATTTTTCTATTGAGGTTTCAGCATT
AGAGTCGACCCCTCTATTTCAGTAACTGAAGTTCTAACATGGCTATTGAATGGTTAATGTTAATTCCGAGTAGCGCTCGTTGC

ACATGAAAATGTGGTCTGTTATGGCTGCTAACCTTTGTGACTTGTCCAATATACTCGTACAACATGGGATACATGTAACCCT
TCACTATTCAAGCATACTGCTAAATGTCAAACATCATACAGAGATATTATCAAGTCTTCTCCTGCACTATCCTGGAATGAAAA
AAAAGAGTTGTTCATATGCTATCTGACTTTACAAATGAGTGTGATCTTGGAGAAGTTAGTTGACGGAATGGTCCACTGTA
TTTGTGTTATATGTTCTCCTTATTCAAGTGTATTCAATTGATGTGCAATTCTCTTAGTTGGTCACCCAGAATGGATT
GACTTCCAAGAGAAGGGAAACAACGGAGCTATGATAATGCAGACAGTGAGCCTTGTGGACACTGATCACTTGCGGTAC
AAGGTTATGTCTATGAATGCAATCCTTATAAGATTTGTTCTGGCACCATCTAGGCTCTTGTACCTTACCTCTTCCATT
ATCGCTGTCTCTATACTAGCTAGATCTGTCTGAGACTAGCTAGATGTCAGTTCTTACTACTATTACACTCTTGAGTTGAGC
TGGGTCCAGATATGCTTTCCACACTTGTGCTGCCCACTGCCCTACTATAGTAAATTGACCAACCCGTACATGTTACTC
AATAAACAGGTTGGATTGGCCTGTGCAAACCTAGTATTGTAAAGTTGACCTGGCTTATGTATTGCCATTGTTGAATAAAAAT
AATTTGATGCATTGATTGGTATGTCACTTCAACTTGCAGACCTAGGAATGTAATTCTCAATCATTGGTTGTTGTTGAT
AGAAATTATTCTGTTACAGCATATGGTGGACTAAATATCCAAGTGAACGTTGTTGCTGTTTTCTACCCCTCAAGT
TTACAATTATCCCGCTAACATATTAAATGTTTCTCCTGCTCTAATGCTGAACAGTACATGAATGCGTTGACCAAGCGATGA
ATGCGCTCGATGAGAGATTTCCCTTCGTCGTCAAAGCAGATCGTCAGCGACATGAACGATGAGGAAAAGGTAAGGATTT
AGAATACTGGTATGAGAGTGTGCGACGTTCTTCTTAGGAAGAGTGGTAACTCTAGCTGCTGCTGTTGCTGTTGCGA
TTAAGGCAGCTTCAATTAGGAGTGGATGGTTGTCAGCATTATTTCTACTTCGTTAGGTTATTGCTTGAACGTGGA
GATTAGTTTTGTTCAATTCCATCCCAGAAAACCTACGAGGGTAAGTCACCAGTTGTAACACCTGCTTCAAGTC
CCTTTGCCTGTGGTATAATATAATAGTGTGCTTACTCCCATTCTGCTCTGCAACTTATATGCAAGTACAAAGTGGGATGCG
ATTGCGCTGGAAATACAGAGTAGCCCTGGACTCTGATGCTCTGGCTTCCGGACATGGAAGAGTAAGTAGTGACGGTAGAC
GCTGAAAGATGTTTTTTTAATTGCCCCACTCCGTAGTTGGGGCCGGCCGCTGAGAATGATCATATCAGGCT
GTCGTGTTGCGAGACTCATGGATGCTGTGACCGCAGGTTGCCACGACGTGGATCACTCACGTCGCTGAAGGGTGCCAGGG
TGCCCCAAACGAACCTCAACAAACCGGGCAACTCGTCAAAGTCTTCTCCGCCCGCACCTGTGTTGAATGTTCACTTACTCT
CAGCTGAACGTGAGCTAGAATGTATCCGCCCTGACAAACCGTCTGCTGCCAGGCTTATTACCGTGTAGACGAAGCAGGGCT
GGACGACGTCTTCACCGAAAGCAGAGACAGGAAAGACGTCTCCAGCAGAGAGCATCGACGTCAAAGCTCCAGAGCTAGTAGC
AAAGAAGACAAGGAGGCAACGGCTGGCAAGAAGGGATGGAAGTTGCGCGGCAGCCATCCGATCAAGATACAAATGAAGC
CAGGAGTCCTGGTGAGGACTGGACTGGCTGCCGGCGCCCTGTTAGTAGTCCTGCTCTACTGGACTAGCCGCCGTGGGCCCTTG
GAACGGTCCTTCTGTAGCTGCAGGCAGTGGTGTCTCATACCGAGCAGGCAGGACTGCTTGTATAGCTTTCTAGAATAA
TAATCAGGGATGGATGGATGGTGTATTGGCTATCTGGCTAGACGTGATGTGCCAGTTGTATGTACAGGAGCAGTCCCGT
CCAGAATAAAAAAAACTTGTGTTGGGGGGTTTTCTTACTCTGTAAGTCTGCTAGGTTGACGAAGATGTTGATATT
GATGCCATAGATCATGTACTGTTAAGTTCTCGTTCCCTGTTCCAGTTCACATTGATTCCAGCTGTTCAGCAGGCCG

GTCAGCTCAGCTCCACACCGGGGCCAGGCCGTCACGCAGGCATTTCATGCGTCATAACACAAACACTTTGAT
CTTTCGACAAAAAAGATGGATCGCTAAC

>Parviglumis

GTCGACTGCCCTCTAGACCCGATGAAGTCAAGGATAGTGAGGCCAACCAAGTTAGGCTCCCCAGCCAGATGATCATGTTA
GGTGTTCACGCCATAAAAGAAAGCGTCCGTGATGTCGTACTTGGGGCGGTGAATACGTAAGGGACAGATGCTCATATACC
TTCATCTGTTTACTCTAAATTACTAATGTTCCCTATGTCAGCTAAAGTCAAATGAAAAGCTGCACATGATATCCGAGAACATCAAAAGCGCGA
GAAGGGAAAGAGGAAAACAAATGATGATAGCTGCATCAGTCACCAACATCCTGACCAGGGTCATCAGTGGATTGATGATGCC
GCTCCTGAACGGGAGCTTGAGTGACAACACGGTCCAAGAAAAGCACGGAGGCAGCGCAGGAAATCAGGCTATGCAAGCGCAGA
GAGCGGTGGGAGAGCAGCGACCATGGCCTAGCGGGTTGAGATCCGAGGGAACAGATGGATTACTAGGGAGTGACAGCTAAG
AGCAATCTGAGAGATACTATGTAATGTCACAGGAGTTGGCCTGTGGTATGTCGATAACCGGGCAGTGGTTCTGAGCGT
AAGACGAGGTCTCTAGCAATGATATGTTGAGCGCAGTAAATCGAGATGAGCAATCAGGTGTTGATTCTTCGGC
TGACCATTCGGCTGCTGAGGCCCTGATCCTGATTTGAGATGTCAGGCCTACTTAGAGCAAATGCTGGAAGGAAGCAATGTC
TGTTCTAGGTCCCTCAGCATCACTGTAATTGTAAGACTCAAGTACAGACTAGAACTAGTCATGCATACCAAGAAATAGA
TAGATGTTCAAGATTGAGGCCCTGAGATGCCACTCTATTGCTCTGTTCATGCTTGCCATTATATACACTATATT
TCACTGTTATTCTAAGGCCCTGTCACACGGTACCAAGAGCAGAACACCTTTACGTTCTTGTCTGATGGAC
TTCAAGAGTTCCCTGAGAAAGCACTCTCATCTATCTTCCAATTCTGTTGATCCTGATCACTGAAGATGCCATT
TGATTTTCACTTTCAAGTTATATAAGTGAAGACGGTTGTCAGCAGCAATATGTAAGTGCAAGATGAGCTACACTGCA
AGGAACCCCAAGAAAAAACACAGGTAAGTTGTCAGTACAACAAAAGCACATCAGAAAAAGAAGAAAAAGCTATTAGGTACTACT
AGTGCAACTTGCAATAATGATGATAAAATCTGCACAAGCCATAGCTATGCTATATGCTATAGCTATGTATATGACACAAA
AAATACATTGTCATTTTGTGCTATTGCTACCGCTAGTATAATATCCATGTCTGCTACAACACACAATCATATTAAACCTATAA
AAAATAATTAAATATAAAACATATGGTCACACCATAATTAAACTGCTAAAACAAATATTAACTCATTGATCG
TTCATCCTCTTCGGTTAGTGAGGTGGACAGTGAGAGCGCTGCATCGTATTGGTTGACTGGTTCTCACGGCTCATCTGT
GTTGTAAGGACCTATCTATGGTCAAACAAACTATTAGGATTATTGTTAGGCAAAAATGAGGGAGATAAATAACCTATAAGCA
GGACACATGAAACAGATGCTTAAACAGTAGAGATTAAACATAAAATAAAAAAGGCAAACCGGGAAAGCGTGCAAGCCAAA
GGCCAATCGGCCAGAACCGCTCCACGGCTGTCGTCCGCCACGTGGCACGCCGGCATTCCGGGCCACAGATCCGGCTC
AGGTGATGTGCCACTGCCATGGCCCTCTGTCGAGCGGAGATTGCGACGGGAAGAAAGGTGAGGAGAGAAACAACCAA

GCGAAAAAAATCACGCTTCATTGCAGGGGGAGGATAGGAGGAAGACGCCAAGCCAGCTCCAGTCGGCACCCGATATAAAG
CGGCAGGCACTTGGATTGCTGACGAGATGGACTCACACGCCGCCACAATGCTGCGCTCGCATGCTGATCGGGCGGCCACCGACGGGGATCGCGTAAGCTGCGGCATCCGGGGCTG
GTGGATTTACTACTTTGCTTTCTTCTGTACTGATGGTCATAGTTCGCAGGGTGGCGCAATGTGCGTCTGAGTGTGT
TGTCTGTCCAGTGCAAGGCTGCCGGTCAGGGTGCAGGAAAGTAGATCTTCCCCAGATTAGAACACGTTGTTACGGACAAAATG
GAATTGGTAGTAGTTGGAGAGAGAAAAAAACTCTGGAATTGGATTGGCTCGCTTGGATTGGCTTAGTGCTTT
GTTATCAGTAGTAATCATTACCAAGTCTAGCGGATCTCAGATTCAACTGAAGTTGTTAAATTGGTGGTTGGTTCTAGTGCTTT
AGCCATCCTAATCATTACATAATAATTAGTTGAAATAAGTGCTATATTGATATTCTGTGGTGCTGCAGCAGCTAAT
TAGCTTCACTACATTTCACGTGTTAGCTCTATTGCTCGTGAATTCTGAATCTGGCTTAACGCACTGTGCAAGGTCAAGAGC
AAATTGCCACTGCAAGCTACTGTGCAAGAAGATAAAACTATGCAACTGCCAAAGGCATGTCGACCCTCTCCCCATATACGACC
TGGACCCCAGCTGGAGATTCAAGGACCATTCAAGGTACCGGATGAAAAGATTCTAGAGCAGAAAGGATCAATTGAAGAAA
ATGAGGGAAGTCTGAAATCTTTCTAAAGGTTAGGCTTAATACATTCAAATGCTAATACAAGGACCATTCAAGGATATTGATATTATA
GCACCTGCCATGCCACAAATATTATCTGCATCATCAACATTCCGGATTATTTTCAAGGCTATTGAAATTGGGAT
TAATACAAATGAGGATGGAACGTATATCGTGAATGGCACCTGCTGTGAGTAAGTTCTAATGTTGTCATGCAAACATGATGT
ACTGGCGGGGTATCGTTTCCCATTGCTGTGAAGAGATATCGTCTGATAGTAACATTAAAAAAAGAACAGCTAA
AACACAGGAGAGTAATCAATGTTGGGTGAGAAAACGTGCTGATATTCTTGCAAGACTGTCTAGCTGAG
GAGGCTATTCTTGCTGTGATTACATAATGCTGTTCTTAAGACAATATACTTCACTATTAAATAGATTGATG
CATTGACTTGAGTTTACTCATGGGTGAGGAAAGCAGAGCTTATTGGTACCTCAATGACTGGAATGGTGCACAAACCATAA
GATGGAGAAGGATAAATTGGTGGTGCATCAAATTGACCATGTCAAAGGAAACCTGCCATCCCTCACAAATTCCAAGGT
TAAATTGCTTCTACATGGTGGAGTATGGGTTGATCGTATTGCTGCATGGATTGTTATGCGACTGTTGATGCCCTCAAATT
GGAGCTCCCTATGATGGTGTGATTGGGATCCTCCTGCTCTGAAAGGTCTTTCTACTGTCCTGGACCACTGTAAACCTAA
GCAATAGACCTTAGCAGACAAAAATATGACAAAATTATAGTACCTTCACCTCTGGTTGAGGTACACATTAAAGCATCCTC
GGCCTCAAAGCCTGCTGCCACGTATCTATGAAGCCATGTAGGTATGAGTGGTAAAAGCCAGCAGTAAGCACATATAGGGA
ATTGAGACAATGTGTTGCCACGCATACGAGCAAATAACTACAACACAGTTGAGTGGCAGTTATGGAGCATTGACTA
TGCTTCTTGGGTACCATGTGACAAATTCTTGCAGGTTAGCAGCAGATCAGGCACACCAGAGGACCTCAAATATCTGTTGAT
AAGGCACACAGTTGGGTTGCGAGTTCTGATGGATGTTGTCATGCCATAGCCATGCAAGTAATAATGTCACAGATGTTAAATGGC
TATGATGTTGGACAAAGCACCAAGAGTCCTATTTCATGCGGGAGATAGAGGTTATCATAAAACTTTGGGATAGTCGGCTGTT
AACTATGCTAACTGGGAGGTATTAAGGTTCTTCTAACCTGAGATATTGGTGGATGAATTGTTGATGGCTTCCGAT
TTGATGGAGTTACATCAATGCTGTATCATCACCAGGTATCAATGTTGAGGTTACTGGAAACTACCAGGAATATTCAAGTTGG
ACACAGCTGTGGATGCAGTTGTTACATGATGCTGCAAACCATTAAATGCACAAACTCTGCCAGAAGCAACTGTTGCTGA

AGATGTTCAAGCAGGCCCTTGCCGGCAGTTGATGAAGGTGGGTTGGTTGACTATCGTCTGGCAATGGCTATCCCT
GATAGATGGATTGACTACCTGAAGAATAAAAGATGACTCTGAGTGGTCAATGGGTGAAATAGCGCATACTTGACTAACAGGAGA
TATACTGAAAAATGCATCGCATATGCTGAGAGCCATGATCAGGTACCCCTGCATTATATTATAACTTATAAGGAAGTATAGTTG
GATGCAGCAAAGTATTTATTTCCTTGTGGGTAGACAACACATGGGGCAAGTATCTTTAATCAGACAGTGTCTATTTCAATC
ACATTCTATCCTGATTGCTAGTAACGGATTAGTTATTCAAAAAATTAGGCCCTCCTAAGCATGTCTAAGAATTGCAATCA
CATATGACCTGATTATCTTAACTGGAAATTAATATCATGCAAATTTCACTGAGCTTGGCAGACAAAACATTGCATTCTCC
TGATGGACAAGGAAATGTACACTGGCATGTCAGACTGCAGCCTGCTTCAACCTACAATTGACCGAGGGATTGCACTCCAAAAGGT
TCCATTCTCCTCAAGTTCTGGTTAACCTGGTTTATATAATTCTGAATGAGTTCCCTCAATATACCTTGCTTATTGTGTTCTG
TACACTCCAGATGATTCACTTCATCACAATGGCCCTTGGAGGTGATGGCTACTTGAAATTATGGGAAATGAGGTGAAATCTCGG
TCTTTGAAAAATGTTCCATTAAATAAGCCTGCATAAACCTTTGTATTTTCTATTGAGGTTTCAGCATTAGAGTCGA
CCCTCTATTTCAGTAACGAAAGTTCCCTAATGGCTATTGAATGGTTAATGTTAATTCCGAGTAGCGCTCGTGCACATGAAA
ATGTGGTCTGTTATGGCTGTAATCCTTTGTGACTTGTCCAATATACTCGTACAACATGGGATACATGTAACCCTCACTATT
CAAGCATACTGCTTAAATGTCAAACATCATACAGAGATATTATCAAGTCTTCTCCTGCACTATCCTGGAATGAAAAAAAAGAG
TTGTTCATATGCTATCTGTACTTTACAAATGAGTGTGATCTTGGAGAAGTTAGTTGACCGAATGGTCCACTGTATTGTT
TGTTATATGTTCTCCTTATTCAAGTGTATTCAATTGATGTGCAATTCTCTTAGTTGGTCACCCAGAATGGATTGACTTTC
CAAGAGAAGGGAACAACGGAGCTATGATAAAATGCAGACGACAGTGGAGCCTGTGGACACTGATCACTGCGGTACAAGGTTA
TGTCTATGAATGCAATCCTTATAAGATTGTTCTGGCACCATTCTAGGCTCTTTGACCTTACCTCTTACCTGCTG
TCTCTTATACTAGCTAGATCTGTCTGAGACTAGCTAGATGTCAGTCCTTACTACTATTACACTCTGAGTTGAGCTGGTCC
AGATATGCTTTCCACACTTGTGCTGCCCACTGCCCTACTATAGTAAATTGCAACCAACCCGTACATGTTACTCAATAAA
CAGGTTGGATTGGCCTGTGCAAACCTAGTATTGTAAGTTGACCTGGCTTATGTATTGCCATGGTGAATAAAAATAATTTC
GATGCATTGATTGGTATGTCATTTCCTTAACCTTGCAAGACCTAGGAATGTAACGTTGTTGCTGTTTTTCTACCGCTCAAGTTACAA
TATTTGTTACAGCATATGGTGGACTAAATATCCAAGTGAACGTTGTTGCTGTTTTTCTACCGCTCAAGTTACAA
TTTATCCCGCTAACATATTAAATGTTCTCCTTGCTCTAATGCTGAACAGTACATGAATGCCATTGACCAAGCGATGAATGCGC
TCGATGAGAGATTTCCTCCTTCTGCTGCAAAGCAGATCGTAAGCGACATGAACGATGAGGAAAAGGTAGGATTTCAGAAT
ACTTGGTATGAGAGTGTGCGACGTTGTTCTTTAGGAAGAGTGGTAACCTAGGTTGTTGCTGTTTTGCTGTTTTGCTGTT
GGCAGCTCAAATTAGGAGTGGATGGTTGTCAGCATTATTTCTACTTCGTTTCAGGTTATTGTCTTGAACGTTGAG
TTAGTTTGTGTTCAATTCCATCCAAAGAAAACCTACGAGGGTAAGTCACCCGTTGTAACCCCTGTCTTCAAGAGTCCT
TTGCTGTTGATAATATAATAGTGTGCTTACTCCCATCTGCTGCAACTTATATGCACTACAAAGTGGGATGCGATT
TGCCTGGAAATACAGAGTAGCCCTGGACTCTGATGCTCTGGTCTTGGTGGACATGGAAGAGTAAGTAGTGACGGTAGACGCT
GAAAGATGTTTTTTAATTGCCCCACTCCGTAGTTGGGCCGGCCGTCGAGAATCGATCATCAGGCTGTCGTG

TTTGCAGAGACTCATGGATGCTGTGACCGAGGTTGCCACGACGTGGATCACTCACGTCGCCTGAAGGGGTGCCAGGGGTGCCCG
 AACGAACCTCAACAACCGGCCGAACTCGTTCAAAGTCTTCTCCGCCCGCACCTGTGTGTAATGTTCACTTATTCTCAGCT
 GAACTGATGAGCTAGAATGTATCCGCCCTGACAAACCGCCTGCTGCCAGGTTATTACCGTGTAGACGAAGCAGGGCTGGACG
 ACGTCTCACCGGAAAGCAGAGACAGGAAAGACGTCTCCAGCAGAGAGCATCGACGTCAAAGCTTCCAGAGCTAGTAGCAAAGA
 AGACAAGGAGGCAACGGCTGGCAAGAAGGGATGGAAGTTGCGCGGCAGCCATCCGATCAAGATACCAAATGAAGCCAGGA
 GTCCTTGGTGAGGACTGGACTGGCTGCCGGCCCTGTTAGTAGTCCTGCTACTGGACTAGCCGCCCTGGCGCCCTTGGAACG
 GTCCTTCCCTGTAGCTCGCAGGCAGTGGTGTCTCATCACCGAGCAGGCAGGCACTGCTGTATAGCTTTCTAGAATAATAATC
 AGGGATGGATGGATGGTGTATTGGCTATCTGGCTAGACGTGCATGTGCCAGTTGTATGTACAgGAGCAGTTCCCGTCCAGA
 ATAAAAAAAACCTGTTGGGGGTTTCTTACTCTGTAGTCTGTTCTGCTAGGTTGACGAAGGTGTTGATATTAGATGC
 CATAGATCGTGTACTGTTAACGTTCTCGTTCCCTGTCAGTCAGGCACTTTCATGGTCATAACACAAACACTTTGATCTTTC
 GACAAAAAAAGATGGATCGCTAAC

>Ree Flint

GTCGACTGCCCTCTAGACCCGATGAAGTCAAGGATAGTGAGCGCCAACCAAGTTAGGCTCCCCAGCCAGATGATCATGTTA
 GGTGTTCCACTGCCATAAAAGAAAGCGTCCGTGATGTCGTACTTGGGGCGGTGAATACGTAAGGGACAGATGCTCATATACC
 TTCATCTGTTTACTCGAAATTACTAATGTTCCCTATGTCAGCTAAAGTGAATCTCACCCGACCAATCTGCAAGATTGTGAA
 TGACTTGAAGTTACCGTAACCATGCTGTGGAACCCATCAATGAAAAGCTGCACATGATATCCGAGAACATCAAAAGCGTGA
 GAAGGGAAAGAGGAAACGAATGATGATAGCTGCATCAGTCACCAACATCCTGACCAGGGTCATCAGTGGATTGATGATCC
 GCTCCTGAACCGAAGCTTGAGTGACAACACAGCGGTCAAAGAAAGCACGGAGGCAGCGCAGGAAATCAGGCTATGCAAGCGCAGA
 GAGCGGTGGGAGAGCAGCGACCATGGCCTAGCGGGTTGAGATCCGAGGGAACAGATGGATTACTAGGGAGTGACAGCTAGG
 AGCAATCTGAGGAGATACTATGTAATGTCACAGGAGTTGGCCTGTGGTATGTCAGGTTGATGCGATAACCGGGCAGTGGTTCTGAGCGT
 AAGACGAGGTCTCTAGCAATGATATGTTGAGCGTACTAAATCGAGATGAGCAATCAGGTTGTTGATGTTGATTCTTCGGC
 TGACCAATTGCGCTGCTGAGGCCTTGATCCTGTATTGAGATGTCAGGCCTACTTAGAGCAAATGCTGGAAGGAAGCAATGTGCC
 TGTCTGAGGTCCCTCCAGCATCACTGTAATTGAAAGTACTCAAGTACAGACTAGAACTAGTCATGCATACCAAGAAGAATAG
 ATAGATGTTTCAGAAGTTGAGGCCTGAGATGCCGTGCACTCTATTGCTCTGTTCATGCTTGCCTTATTATATCACTATTT
 TCACGTTCAATTCTAAGGCCGTTGACACAGGGTACCAAGAGAGCAGAACACCTTTACGTTCTTGTGCTATGGATGGAC
 TTGAGAGTTCCCTTGAGAAAGCACTCTCATCTATCTTCCAATTCTGTTGATCCTGATCACTGAAGATGGCCATT
 TGATTTTCACTTTCAAGTTATATAAGTGAAGACGGTTGTCACGCAATATGTGAAGTGCAAGATGAGCTACACTGCA

AGGAACCCCAAGAAAAAACACAGGTAAGTTGTCTGATTGACAACGGCTAGAGCTGTCTGACGATGCAGATGACTCCGCATGT
TCATTCACTCACTTAATTGTTAGAAAAGGTACACAAAAAGCACATCAGAAAAAAAGAAGAAAAAGCTATTAGTGGTACTACT
AGTGCAACTGCAATAATGATGATGATAAATCTGCACAAGCCATAGCTATGCTATATGCTATAGCTATGTATATGTACACAAA
AAATACATTTTGTGCTATTTCACCGCTAGTATAATATCCATGTCTGCTACAACACACAATCATATTAAATACCTATAA
AAAATAATTAAATATTAAAATAAACATATGGTCCACACCATAATTAAACTGCTAAAACAAATATTATAACTCATTGATCG
TTCATCCTTTCGGTTAGTGGAGCTGAGAGCGCTGCATCGTGTATTGGGTTGACTGGTTCTACGGCTCATCTGT
GTTGTAACGACCTATCTATGGTCAAACAAACTATTAGGATTATTGTTAGGCAGGGAGATAAATAACCTATAAGCA
GGACACATGAAACATATGCTTAAACAGTAGAGATTAACAACATAAAATAAAAAGGCAAACCGGGAAAGCGTCAAGCCC
GGCCAATCGGCCAGAACCGCTCCACGGTTGTCGTCCGCCACGTGGCACGCCGGCATTCCGGGCCACAGATCCGGCTC
AGGGTCATGTGCCACTGCCATGGCCCCCTCCTGTCGCAGCGGAGATTGCGACGGGAAGAAAGGTGAGGAGAGAAACAACCAA
GCGAAAAAAATCACGCTTCATTGCGAGGGGGAGGATAGGGAGGAAGACGCCAAGCCAGCTCCAGTCCGGCACCCGATATAAA
GCGGCAGGCACCTGGATTGCTGACGAGATGGACTCACACGCCGTACAATGCTGTGCCCTGTCGCCCTCTCGCCGACTC
CGCTTCCGCCGCCGCGCTCTCGCTCGATGCTGATGGCGGCCACGCCGGGATCGCGTAAGCTGGCGATCCGGGGCT
GGTGGATTACTACTTTGCTTTCTTCTGTACTGATGGTCATAGTTCGCAGGGTGGCGCAATGTGCCCTGAGTGTG
TTGTCGTCCAGTGAAGGCTGCCGGTCAGGGTGGAGAGAAAAACTCTGGAATTGCTGAGGTTGATCTTCCCCAGATTAGAACACGTTGTTACGGACAAAAT
GGAATTGTTGGTAGTGGAGAGAGAAAAAAACTCTGGAATTGCTGAGGTTGATCTTCCCCAGATTAGAACACGTTGTTACGGACAAAAT
GTGCTTGTAAACATCACCAATCATTACCAAGTCTAGGGATCCCAGATTCAACTGAAGTTGTTAAATTGTTGGTGGTGGT
TTTCTTCAGCCATCTTAATCATTATTACATAATAATTAGTTGAAATAAAGTGTATATTGATATTCTGTGGTGTGCA
GCTAATTAGCTTCACTACATTTCACGTGTTAGCTTCTATTGCTCGTGTAAATTGTAATCTGGCTTTAACGCACTGTGCAAGGTC
AAGAGCAAATTGCCACTGCAAGCTACTGTGCAAGAACATAAAACTATGGCAACTGCCAAAGGGATGTCGACCATCTCCCC
ACGACCTGGACCCCAAGCTGGAGATATTCAAGGACCATTCAGGTACCGGATGAAAAGATTCTAGAGCAGAAAGGATCAATTG
AAGAAAATGAGGAAGTCTGAATCTTTCTAAAGGTTAGGCTTAATACATTCAAATGCTAATACAAGGACCATTCACAATA
TTTATAGCACCTGCCCATGCCGAAATATTCTGCATCATCAACATTCCGGATTGTTGATTTTCAGGCTATTGAAATT
TGGGATTAATACAAATGAGGATGGAACGTGATATCGTGAATGGGCACCTGTCGCGAGTAAGTTCTAATGTTGATGCAA
TGATGTTAGCTGGCGGGTATCGTTTCCCATTGCTGTGAAGAGATATCGTGTGATAGTAACATTAAAGGAAAC
AGCTAAAACACAGGAGAGTAATCAATGTTGGAGTAGAAAAGTGTGATATTCTGCAAGACTGTGATGCTTA
GCTGAGGAGGCTATTCTGCTGTGATTACATAATGCTGTTCTTATGACAATATACTTCCACTATTAAATAGA
TTGATGCATTGACTTGAGTTTACTCATGGGTGAGGGAGGCAGAGCTTATTGGTACTCAATGACTGGAATGGTGC
CCATAAGATGGAGAAGGATAAATTGGTGGTGGATCAAAATTGACCATGTCAAAGGGAAACCTGCCATCCCTCACAATT
CAAGGTTAAATTGCTTCTACATGGTGGAGTATGGGTTGATCGTATTCCAGCATGGATTGACTGCGACTGTTGATGCCTCT

AAATTGGAGCTCCCTATGATGGTGTTCATTGGGATCCTCCTGCTTCTGAAAGGTCTTTCTACTGTCCTGGACCACATTGTAA
ACTTAAGCAATAGACCTTAGCAGACAAAAATATGACAAAATTATACTACCTTTACCTCTGGTTGCAGGTACACATTAAAG
CATCCTCGGCCTCAAAGCCTGCTGCTCACGTATCTATGAAGCCCAGTAGGTATGAGTGGTAAAAGCCAGCAGTAAGCACAT
ATAGGGAAATTGCAAGACAATGTGTTGCCACGCATACGAGCAAATAACTACAACACAGTTCACTGATGGCAGTTATGGAGCATT
CGTACTATGCTTCTTCGGGTACCATGTGACAAATTCTTGCAGGTTAGCAGCAGATCAGGCACACCAGAGGACCTCAAATATCT
TGTTGATAAGGCACACAGTTGGGTTGCGAGTTCTGATGGATGTTGTCATGCCATGCAAGTAATAATGTCACAGATGGTT
AAATGGCTATGATGTTGGACAAAGCACCCAAGAGTCCTATTTCATGCGGGAGATAGAGGTTATCATAAACTTGGGATAGTCG
GCTGTTCAACTATGCTAATGGAGGTATTAAGGTTCTTCTAACCTGAGATATTGGTTGGATGAATTCATGTTGATGGC
TTCCGATTGATGGAGTTACATCAATGCTGTATCATCACCATGGTATCAATGTGGGTTACTGGAAACTACCAGGAATATTC
GTTTGGACACAGCTGTGGATGCAGTTGTTACATGATGCTGCAAACCATTAAATGCACAAACTCTGCCAGAAGCAACTGTTGT
TGCTGAAGATGTTCAGGCATGCCGGCTTGCAGGTTGATGAAGGTGGGTTGGGTTGAATATGCCCTGGCAATGGCT
ATCCCTGATAGATGGATTGACTACCTGAAGAATAAAGATGACTCTGAGTGGTCGATGGGTGAAATAGCGCATACTTGACTAAC
AGGAGATATACTGAAAAATGCATGCATATGCTGAGAGCCATGATCAGGTACCCCTGCATTATATAACTTTATAAGGAAGTA
TAGTTGGATGCAGCAAAGTATTTATTCCTGTGGGAGACAACACATGGGGCAAGTATCTTTAATCAGACAGTACTATAT
TTCATCACATTCTATCCTGATTGCTAGTAACGGATTAGTTATTCAAAAAATTAGGCCCTCTAACATGTTAAGAATTG
CAATCACATATGACCTGTTATCTTACTGGAAATTAAATCATGCAAATTTCAGTCTATTGTTGGGACAAAATATTGCA
TTTCTCCTGATGGACAAGGAAATGTACACTGGCATGTCAGACTTGCAAGCCTGCTCACCTACAATTGATCGAGGGATTGCACTCC
AAAAGGTTCCATTCTCCTCAAGTTCTGGTTAACCTGGGTTCAATAATTCTGAATGAGTCCCTCAATATACCTGCTTATTG
TGTTCTGTACACTCCAGATGATTCACTCATCACAAATGGCCCTGGAGGTGATGGCTACTTGAATTTTATGGGAAATGAGGTGAA
ATCTCGGTCTTTGAAAATGTTCCATTAAATAAGCCTGCATAAACCTTTGTATTTTTCTATTGAGGTTTCAGCATT
GAGTCGACCCCTCTATTCTCAGTAACGAAAGTCTTAATGGCTATTGAATGGTTAATGTTAATTCCGAGTAGCGCTCGTTGCA
CATGAAAATGTGGTCTGTTATGGCTGTAATCCTTGTGACTTGTCCAATATACTCGTACAACATGGGATACATGTAACCCTT
CACTATTCAAGCATACTGCTAAATGTCACACATCACAGAGATATTATCAAGTCTTCTCCTGCACTATCCTGGAATGAAAAAA
AAAGAGTTGTTCATATGCTATCTGTACTTTACAAATGAGTGTGATCTTGGAGAAGTTAGTTGACGGAATGGTCACTGTAT
TTTGTGTTATGTTCTCCTTATTCAAGTGTATTCAATTGATGTGCAATTCTCTTCTAGTTGGTCACTGGTCA
ACTTTCCAAGAGAAGGAAACAACGGAGCTATGATAATGCAGACAGTGGAGCCTGAGGACACTGATCACTGCGGTACA
AGGTTATGTCTATGAATGCAATCCTATAAGATTTGTTCTGGCACCATTCTAGGCTCTTTGACCTTACCTCTTCA
TCGCTGTCTCCTATACTAGCTAGATCTGTCTGAGACTAGCTAGATGTCAGTTCTTACTACTATTACACTCTTGAGTTGAGCT
GGGTCCAGATATGCTTTCCACACTTGTGCTGCCCACTGCCACTATAGTAAATTGCACCAACCCGTACATGTTACTCA
ATAAACAGGTTGGATTGGCCTGTGCAAACCTAGTATTTGTAAGTTGACCTGGCTTATGTATTGCCATTGTTGAATAAAAATA

ATTTGATGCATTGGTATGTCATTTCATAACTTGCAGACCTAGGAATGTACTTCTCAATCATTGGTTTTGTTGATA
GAAATTATTCTGTTACAGCATATGGTGGACTAAATATCCAAGTGAACGTTGTTGCTGTTTTCTACCCCTCAAGTT
TACAATTATCCCGCTAACATATTAATGTTTCTCCTGCTCTAATGCTGAACAGTACATGAATGCCGTTGACCAAGCGATGAA
TGGCCTCGATGAGAGATTTCCTTCCTCGTCGTCAAAGCAGATCGTCAGCGACATGAACGATGAGGAAAAGGTAAGGATTCA
GAATACCTGGTATGAGAGTGTGCGACGTTCTTCTTAGGAAGAGTGGTAACTCTAGCTGTGCTGTATTGGCCGAT
TAAGGCAGCTTCAATTAGGAGTGGATGGTTGTCAGCATTATTTCTACTTCGTTCAAGTTATTGTCTTGACAGTGGAG
ATTAGTTTTGTTCAATTCCATCCAAGAAAACCTACGAGGGTAAGTCACCAGTTGTAACACCTGTCTTCAGAGTCC
CTTTGCCTGTGGTATAATATAATAGTGTGTTACTCCCATCTGCTCTGCAACTTATATGCAGCTACAAAGTGGATGCGA
TTGCCTGGAAATACAGAGTAGCCCTGGACTCTGATGCTCTGGCTTCGGACATGGAAGAGTAAGTAGTGACGGTAGACG
CTGAAAGATGTTTTTAATTGGCCCTACTCCGTAGTTGGGCCGGCCGGCGTCGAGAATCGATCATATCAGGCTGTGCG
TGTTGCGAGACTCATGGATGCTGTGACGCAGGTTGGCACGACGTGGATCACTCACGTGCCCTGAAGGGTGCCAGGGTGCC
CGAAACGAACCTCAACAACCGGCCGAACTCGTTCAAAGTCCTTCTCCGCCCGCACCTGTGTTGAGAATGTTCACTACTCTCAGC
TGAACGTGAGCTAGAATGTATCCGCCCTGACAAACCGTCCTGCTGCCAGGCTTATTACCGTGTAGACGAAGCAGGGCTGGAC
GACGTCTCACGCCAAAGCAGAGACAGGAAAGACGTCTCCAGCAGAGAGCATCGACGTCAAAGCTCAGAGCTAGTAGCAAAG
AAGACAAGGAGGCAACGGCTGGCAAGAAGGGATGGAAGTTGCGCAGGCAGCCATCCGATCAAGATAACAAATGAAGCCAGG
AGTCCTTGGTGAGGACTGGACTGGCTGCCGCCCTGTTAGTAGTCCTGCTACTGGACTAGCCGCCCTGGCAAC
GGTCCTTCTGTAGCTGCAGGCCACTGGTCTCATACCGAGCAGGCAGGCAGGACTGCTTAGTGTATAGCTTTCTAGAATAATAAT
CAGGGATGGATGGATGGTGTATTGGCTATCTGGCTAGACGTGCATGTGCCAGTTGTATGTACAGGAGCAGTTCCCGTCCAG
AATAAAAAAAACTGTTGGGGGTTTTCTTACTCTGTAGTCTGTTCTGCTAGGTTGACGAAGATGTTGATATTAGATG
CCATAGATCATGTACTGTTAAGTTCTCGTTCTGTCAGTCACGAGGCATTTCATGCGTCATAACACAAACACTTTGATCTT
TCGACAAAAAAGATGGATCGCTAAC

Appendix 3. ORF from seventeen varieties

>Ree_Flint

```

ATGCTGTGCCCTCGTGTGCCCTTCCTCGCCACTCCGCTTCCGCCGCCGCGCTCTCGCTCGCATGCTGATCGGGCGGCACC
GCCGGGGATCGCGGTGGCGCAATGTGCGCCTGAGTGTGTTCTGTCCAGTGCAAGGCTGCCGGTCAGGGTGCAGGAAGGTC
AAGAGCAAATTGCCACTGCAGCTACTGTGCAAGAACATAAAACTATGGCAACTGCCAAAGGGCATGTCGACCATCTCCCCATAT
ACGACCTGGACCCCAAGCTGGAGATATTCAAGGACCATTCAAGGTACCGGATGAAAAGATTCTAGAGCAGAAAGGATCAATTG
AAGAAAATGAGGAAGTCTTGAATCTTTCTAAAGGCTATTGAAATTGGGATTAATACAATGAGGATGAACTGTATATC
GTGAATGGGCACCTGCTGCGCAGGAGGCAGAGCTTATTGGTGAATTCAATGACTGGAATGGTCAAACCCATAAGATGGAGAAGG
ATAAAATTGGTGTGGTCGATCAAATTGACCATGTCAAAGGAAACCTGCCATCCCTCACAAATTCCAAGGTAAATTGCTT
TCTACATGGTGGAGTATGGGTGATCGTATTCCAGCATGGATTGCTATGCGACTGTTGATGCCCTCAAATTGGAGCTCCCTAT
GATGGTGTTCATTGGGATCCTCCTGCTTCTGAAAGGTACACATTAAAGCATCCTCGGCCCTCAAAGCCTGCTGCTCCACGTATCT
ATGAAGCCCAGTAGGTATGAGTGGTAAAAGCCAGCAGTAAGCACATATAGGAATTGCAAGACAATGTGTTGCCACGCATAC
GAGCAAATAACTACACACAGTTGATGGCAGTTATGGAGCATTGCTACTATGCTTCTTCGGTACCATGTAACAAATT
CTTGCAGGTTAGCAGCAGATCAGGCACACCAGAGGACCTCAAATATCTTGTGATAAGGCACACAGTTGGGTTGCGAGTTCTG
ATGGATGTTGTCCATGCCATGCAAGTAATAATGTCACAGATGGTTAAATGGCTATGATGTTGGACAAAGCACCAAGAGTCC
TATTTCATGCGGGAGATAGAGGTTATCATAAACTTGGGATAGTCGGCTGTTCAACTATGCTAAGTGGGAGGTATTAAGGTTT
CTTCTTCTAACCTGAGATATTGGTGGATGAATTGATGTTGATGGCTTCCGATTGATGGAGTTACATCAATGCTGATCATC
ACCATGGTATCAATGTGGGTTACTGGAAACTACCAGGAATATTCAAGTTGACTAACAGGAGATATACTGAAAAATGCATCGCATATGCTG
TGCTGCAAACCATTAAATGACAAACTCTGCCAGAACGCAACTGTTGCTGAAGATGTTCAAGGATGCCATGCCGCTTGC
GCCAGTTGATGAAGGTGGGTTGGGTTGAATATCGCCTGGCAATGGCTATCCCTGATAGATGGATTGACTACCTGAAGAATAA
AGATGACTCTGAGTGGTCGATGGTGAATAGCGCATATTGACTAACAGGAGATATACTGAAAAATGCATCGCATATGCTG
GAGCCATGATCAGTCTATTGTTGGCAGAAAACATTGCATTCTCCTGATGGACAAGGAAATGTACACTGGCATGTCAGACTTG
CAGCCTGCTTCACCTACAATTGATCGAGGGATTGCACTCCAAAAGATGATTCACTTCATCACAATGGCCCTGGAGGTGATGGCT
ACTTGAATTGTTGGAAATGAGTTGGTCACCCAGAATGGATTGACTTCCAAGAGAAGGAAACAACGGAGCTATGATAAAAT
GCAGACGACAGTGGAGCCTGTTGAGACTGATCACTTGGCTACAAGTACATGAATGCGTTGACCAAGCGATGAATGCGCTCGA
TGAGAGATTTCCTCCTTCGTCGTCAAAGCAGATCGCAGCGACATGAACGATGAGGAAAAGGTTATTGTCTTGAACGTGG
AGATTAGTTTTGTTCAATTCCATCCAAAGAAAACCTACGAGGGCTACAAAGTGGGATGCGATTGCCACGACGTGGATCA
CTCACGTCGCTGAAGGG

```

GTCAGGGGTGCCGAAACGAACCTCAACAACCAGGCCAACTCGTTCAAAGTCCTTCTCCGCCCGCACCTGTGTGGCTTATT
ACCGTAGACGAAGCAGGGCTGGACGACGTCTCACCGAAAGCAGAGACAGGAAAGACGTCTCCAGCAGAGAGCATCGACG
TCAAAGCTTCCAGAGCTAGTAGCAAAGAACAGGAGGCAACGGCTGGCAAGAAGGGATGGAAGTTGCGCGGCAGCCAT
CCGATCAAGATAACAAATGA—

>Parviglumis

ATGCTGTGCCCTCGTGTGCCCTTCCCTGCCGACTCCGCTTCCGCCGCCGCGCTCTCGCTCGCATGCTGATCGGCCGCACC
GACGGGGATCGCGGGTGGCGCAATGTGCGTCTGAGTGTGTTCTGTCCAGTGCAAGGCTGCCGGTCAGGGTGCAGGTC
AAGAGCAAATTGCCACTGCAAGCTACTGTCAAGAACGATAAAACTATGCCAACTGCCAAAGGGCATGTCGACCATCTCCCCATAT
ACGACCTGGACCCCCAAGCTGGAGATATTCAAGGACCATTTCAGGTACCGGATGAAAAGATTCTAGAGCAGAAAGGATCAATTG
AAGAAAATGAGGGAAGTCTTGAATCTTTCTAAAGGCTATTGAAATTGGGATTAATACAAATGAGGATGGAACGTATATC
GTGAATGGGCACCTGCTGTGAGGAAAGCAGAGCTATTGGTCAATGACTGGAATGGTCAAACCATAAGATGGAGAAGG
ATAAAATTGGTGTGGTCGATCAAATTGACCATGTCAAAGGAAACCTGCCATCCCTCACAAATTCAAGGTTAAATTGCTT
TCTACATGGTGGAGTATGGTTGATCGTATTCTGCATGGATTGTTATGCGACTGTTGATGCCTCTAAATTGGAGCTCCCTAT
GATGGTGTTCATTGGGATCCTCCTGCTTGAAAGGTACACATTAAAGCATCCTCGCCCTCAAAGCCTGCTGCTCACGTATCT
ATGAAGCCCAGTGTAGGTATGAGTGGAAAAGCCAGCAGTAAGCACATATAGGAATTGAGACAATGTGTTGCCACGCATAC
GAGCAAATAACTACAACACAGTTGATGGCAGTTGAGCATTGTTACTATGCTTCTTCGGGTACCATGTCAGAAATT
CTTGGCTTAGCAGCAGATCAGGCACACCAGAGGACCTCAAATATCTTGGTATAAGGCACACAGTTGGGTTGCGAGTTCTG
ATGGATGTTGTCATGCCATGCAAGTAATAATGTCACAGATGGTTAAATGGCTATGATGTTGGACAAAGCACCAAGAGTCC
TATTTTATGCGGGAGATAGAGGTTATCATAAAACTTGGGATAGTCGGCTGTTCAACTATGCTAAGGGAGGTATTAGGTT
CTTCTTCTAACCTGAGATATTGGTGGATGAATTGATGGCTCCGATTGATGGAGTTACATCAATGCTGTATCATG
ACCATGGTATCAATGTGGGTTACTGGAAACTACCAGGAATATTGAGTGGACACAGATGTGGATGCAGTTGGTTACATG
TGCTTGCAAACCATTAAATGCCACAAACTCTGCCAGAACGCAACTGTTGCTGAAGATGTTGAGTGGCTATCCCTGATAG
GCCAGTTGATGAAGGTGGGTTGGGTTGACTATCGTCTGGCAATGGCTATCCCTGATAGTGGATTGACTACCTGAAGAATAA
AGATGACTCTGAGTGGTCAATGGGTGAAATAGCGCATACTTGACTAACAGGAGATATACTGAAAAATGCATCGCATATGCTG
GAGCCATGATCAGTCTATTGTTGGCAGAAAACATTGCATTCTCCTGATGGACAAGGAAATGTACACTGGCATGTCAGACTTG
CAGCCTGCTTCACCTACAATTGACCGAGGGATTGCACTCCAAAAGATGATTCACTTCATCACAATGGCCCTGGAGGTGATGGCT
ACTTGAATTGTTATGGGAAATGAGTTGGTCACTTCAAGTACATGAATGCGTTGACCAAGCGATGAATGCGCTTGAACGTGG
GCAGACGACAGTGGAGCCTTGTGGACACTGATCACTTGCCTGACAAGTACATGAATGCGTTGACCAAGCGATGAATGCGCTCGA
TGAGAGATTTCCTTCCCGTCAAAGCAGATCGTAAGCGACATGAACGATGAGGAAAAGGTTATTGTCTTGAACGTGG

AGATTTAGTTTGTTCATTTCCAGAAAACCTACGAGGGCTACAAAGTGGATGCGATTGCCTGGAAATACAG
 AGTAGCCCTGGACTCTGATGCTCTGGTCTCGGTGGACATGGAAGAGTTGCCACGACGTGGATCACTCACGTCGCCTGAAGGG
 GTGCCAGGGTGCCCCAAACGAACCTCAACAACCAGGCGAACCTCGTTCAAAGTCCTTCTCCGCCCGCACCTGTGTGGCTTATT
 ACCGTGTAGACGAAGCAGGGCTGGACGACGTCTCACCGCAAAGCAGAGACAGGAAAGACGTCTCAGCAGAGAGCATCGACG
 TCAAAGCTTCCAGAGCTAGTAGCAAAGAAGACAAGGAGGCAACGGCTGGCAAGAAGGGATGGAAGTTGCCGGCAGCCAT
 CCGATCAAGATAACCAAATGA—

>Neuta_Sweet

ATGCTGTGCCTCGTGTGCCCTTCCCTCGCCACTCCGCTTCCGCCGCCGCGCTCTCGCTCGCATGCTGATCGGCCGACC
 GCCGGGGATCGCGGTGGCGCAATGTGCGCCTGAGTGTGTTGTCAGTGCAAGGCTCGCCGGTCAGGGTGGAAAGGTC
 AAGAGCAAATTGCCACTGCAAGCTACTGTGCAAGAAGATAAAACTATGGAACACTGCCAAAGGGCATGTCGACCATCTCCCCATAT
 ACGACCTGGACCCCCAAGCTGGAGATATTCAAGGACCATTTCAGGTACCGGATGAAAAGATTCTAGAGCAGAAAGGATCAATTG
 AAGAAAATGAGGAAGTCTTGAATCTTTCTAAAGGCTATTGAAATTGGGATTAATACAAATGAGGATGGAACGTATATC
 GTGAATGGGCACCTGCTGCGCAGGAGGCAGAGCTTATTGGTCAATGACTGGAATGGTCAAACCCATAAGATGGAGAAGG
 ATAAAATTGGTGTGGTCGATCAAATTGACCATGTCAAAGGAAACCTGCCATCCCTCAAATTCCAAGGTTAAATTGCTT
 TCTACATGGTGGAGTATGGTTGATCGTATTCCAGCATTGATTGTTATGCGACTGTTGATGCCCTCAAATTGGAGCTCCCTAT
 GATGGTGTTCATTGGGATCCTCCTGCTTGAAAGGTACACATTAAAGCATCCTCGCCCTCAAAGCCTGCTGCTCACGTATCT
 ATGAAGCCCAGTGTAGGTATGAGTGGTAAAAGCCAGCAGTAAGCACATATAGGAATTGAGACAATGTGTTGCCACGCATAC
 GAGCAAATAACTACAACACAGTTCAGTTGATGGCAGTTATGGAGCATTGCTACTATGCTTCTTCGGGTACCATGTGACAAATT
 CTTGCGGTTAGCAGCAGATCAGGCACACCAGAGGACCTCAAATATCTTGTGATAAGGCACACAGTTGGGTTGCGAGTTCTG
 ATGGATGTTGTCATGCCATGCAAGTAATAATGTCACAGATGGTTAAATGGCTATGATGTTGGACAAAGCACCAAGAGTCC
 TATTTTCAATGCCGGAGATAGAGGTTATCATAAAACTTGGGATAGTCGGCTGTTCAACTATGCTAAGGGAGGTATTAAGGTTT
 CTTCTTCTAACCTGAGATATTGGTTGGATGAATTGATGTTGATGGCTCCGATTGATGGAGTTACATCAATGCTGTATCATC
 ACCATGGTATCAATGTGGGTTACTGGAAACTACCAGGAATATTCAAGTTGATGGACACAGCTGTTGAGTGCAGTTGTTACATGA
 TGCTTGCAAACCATTAATGCCACAAACTCTGCCAGAACGCAACTGTTGCTGAAGATGTTGAGTGCAGTTGCTTACATGA
 GCCAGTTGATGAAGGTGGGTTGGGTTGACTATGCCCTGGCAATGGCTATCCCTGATAGATGGATTGACTACCTGAAGAATAA
 AGATGACTCTGAGTGGTCGATGGGTGAAATAGCGCATACTTGAACAGGAGATATACTGAAAAATGCATCGCATATGCTGA
 GAGCCATGATCAGTCTATTGTTGGCGACAAAACATTGCATTCTCCTGATGGACAAGGAAATGTACACTGGCATGTCAGACTTG
 CAGCCTGCTTCACCTACAATTGATCGAGGGATTGCACTCCAAAAGATGATTCACTCACAATGCCCTGGAGGTGATGGCT

ACTTGAATTATGGAAATGAGTTGGTCACCCAGAATGGATTGACTTCCAAGAGAACAACTGGAGCTATGATAAAT
 GCAGACGACAGTGGAGCCTGTGGACACTGATCACTTGCCTACAAGTACATGAATGCGTTGACCAAGCGATGAATGCCCTCGA
 TGAGAGATTTCTTCCTTCGTCGTCAGCAGATCGCAGCGACATGAACGATGAGGAAAAGGTTATTGTCTTGAAACGTGG
 AGATTTAGTTTGTTCATTTCCAAAGAAAACCTACGAGGGCTACAAAGTGGATGCGATTGCCCTGGAAATACAG
 AGTAGCCCTGGACTCTGATGCTCTGGCTTCGGTGGACATGGAAGAGTTGCCACGACGTGGATCACTCACGTCGCCCTGAAGGG
 GTGCCAGGGTCCCCAAACGAACCTCAACAACCAGGCGAACCTGTTCAAAGTCCTTCTCCGCCCCGACCTGTGTGGCTTATT
 ACCGTGTAGACGAAGCAGGGCTGGACGACGTCTCACCGAAAGCAGAGACAGGAAAGACGTCTCAGCAGAGAGCATCGACG
 TCAAAGCTCCAGAGCTAGTAGCAAAGAACAGGAGGCAACGGCTGGCAAGAAGGGATGGAAGTTGCCGGCAGCCAT
 CCGATCAAGATAACAAATGA—

>NC_358

ATGCTGTGCCCTCGTGTGCCCTTCCCTGCCGACTCCGCTTCCGCCGCCGCGCTCTCGCTCGCATGCTGATCGGCCGACC
 GCCGGGGATCGCGGTGGCGCAATGTGCCCTGAGTGTGTTGTCAGTGCAGGCTCGCCGGTCAGGGTGGAAAGGTC
 AAGAGCAAATTGCCACTGCAAGCTACTGTCAAGAAGATAAAACTATGCAACTGCCAAAGGCATGTCACCATCTCCCCATAT
 ACGACCTGGACCCCAAGCTGGAGATATTCAAGGACCATTTCAGGTACCGGATGAAAAGATTCTAGAGCAGAAAGGATCAATTG
 AAGAAAATGAGGAAGTCTTGAATCTTTCTAAAGGCTATTGAAATTGGGATTAATACAAATGAGGATGGAACGTATATC
 GTGAATGGCACCTGCTGCGCAGGAGGAGCTATTGGTCAATGACTGGAATGGTCAAACCATAAGATGGAGAAGG
 ATAAATTGGTGTGGATCAAATTGACCATGTCAAAGGAAACCTGCCATCCCTCACAAATTCAAGGTTAAATTGCTT
 TCTACATGGTGGAGTATGGTTGATCGTATTCCAGCATTGATTGTTGACTGCAATGACTGGAATGGTCAAACCATAAGGTT
 GATGGTGTTCATTGGGATCCTCCTGCTTGAAAGGTACACATTAAAGCATCCTCGCCCTCAAAGCCTGCTGCTCACGTATCT
 ATGAAGCCCAGTGTAGGTATGAGTGGAAAAGCCAGCAGTAAGCACATATAGGAATTGAGACAAATGTGTTGCCACGCATAC
 GAGCAAATAACTACAACACAGTTCAAGTGTGATGGCAGTTATGGAGCATTGACTATGCTTCTTCGGGTACCATGTCAGAAATT
 CTTGCGGTTAGCAGCAGATCAGGCACACCAGAGGACCTCAAATATCTTGTGATAAGGCACACAGTTGGGTTGCGAGTTCTG
 ATGGATGTTGTCATGCCATGCAAGTAATAATGTCACAGATGGTTAAATGGCTATGATGTTGGACAAAGCACCAAGAGTCC
 TATTTTCACTGCGGGAGATAGAGGTTATCATAAAACTTTGGGATAGTCGGCTGTTCAACTATGCTAAGTGGAGGTATTAAGGTTT
 CTTCTTCTAACCTGAGATATTGGTGGATGAATTGATGGCTCCGATTGATGGAGTTACATCAATGCTGTATCATC
 ACCATGGTATCAATGTGGGTTACTGGAAACTACCAGGAATATTCAAGTTGGACACAGCTGTGGATGAGTTACATGA
 TGCTTGCAAACCATTAAATGCCACAAACTCTGCCAGAACGCAACTGTTGCTGAAGATGTTCAAGGATGCCCTGCTTGC
 GCCAGTTGATGAAGGTGGGTTGGGTTGACTATGCCCTGGCAATGGCTATCCCTGATAGATGGATTGACTACCTGAAGAATAA

AGATGACTCTGAGTGGTCATGGGTGAAATAGCGCATACTTGACTAACAGGAGATATACTGAAAAATGCATCGCATATGCTGA
 GAGCCATGATCAGTCTATTGTTGGCGACAAAACATTGCATTCTCCTGATGGACAAGGAAATGTACACTGGCATGTCAGACTTG
 CAGCCTGCTTCACCTACAATTGATCGAGGGATTGCACTCCAAAAGATGATTCACTTCATCACAATGGCCCTTGGAGGTGATGGCT
 ACTTGAATTATGGGAAATGAGTTGGTCACCCAGAATGGATTGACTTCCAAGAGAAGGAAACAACGGAGCTATGATAAAT
 GCAGACGACAGTGGAGCCTTGTGGACACTGATCACTTGCCTGACAAGTACATGAATGCGTTGACCAAGCGATGAATGCGCTCGA
 TGAGAGATTTCTCCTTCTCGTCGTCAAAGCAAATCGTCAGCGACATGAACGATGAGGAAAAGGTTATTGTCTTGAAACGTGG
 AGATTTAGTTTGTGTTCAATTCCATCCCAGAAAACCTACGAGGGCTACAAAGTGGATGCGATTGCGCTGGAAATACAG
 AGTAGCCCTGGACTCTGATGCTCTGGTCTTCGGTGGACATGGAAGAGTTGCCACGACGTGGATCACTCACGTCGCCTGAAGGG
 GTGCCAGGGGTGCCGAAACGAACCTCAACAACCAGCGAACACTCGTTCAAAGTCCTTCTCCGCCCGCACCTGTGTGGCTTATT
 ACCGTGTAGACGAAGCAGGGCTGGACGACGTCTCACCGAAAGCAGAGACAGGAAAGACGTCTCAGCAGAGAGCATCGACG
 TCAAAGCTCCAGAGCTAGTAGCAAAGAAGACAAGGAGGCAACGGCTGGTGGCAAGAAGGGATGGAAGTTGCGCGGCAGCCAT
 CCGATCAAGATAACAAATGA—

>NC_350

ATGCTGTGCCCTCGTGTGCCCTTCCCTGCCGACTCCGCTTCCGCCGCCGCGCTCTCGCTCGCATGCTGATCGGCCGACC
 GACGGGGATCGCGGGTGGCGCAATGCGTCTGAGTGTGTTCTGTCAGTGCAGGCTCGCCGGTCAGGGTGCAGGTC
 AAGAGCAAATTGCCACTGCAACTGCAAGAAGATAAAACTATGCAACTGCCAAAGGCATGCGACCATCTCCCCATAT
 ACGACCTGGACCCCAAGCTGGAGATATTCAAGGACCATTCAGGTACCGGATGAAAAGATTCTAGAGCAGAAAGGATCAATTG
 AAGAAAATGAGGAAGTCTTGAATCTTTCTAAAGGCTATTGAAATTGGGATTAATACAAATGAGGATGAACTGTATATC
 GTGAATGGCACCTGCTGCGCAGGAAGCAGAGCTATTGGTCAATGACTGGAATGGTCAAACCATAAGATGGAGAAGG
 ATAAATTGGTGTGTCGATCAAATTGACCATGTCAAAGGAAACCTGCCATCCCTCACAAATTCAAGGTTAAATTGCTT
 TCTACATGGTGGAGTATGGTTGATCGTATTCTGCATGGATTGTTATGCGACTGTTGATGCCCTCTAAATTGGAGCTCCCTAT
 GATGGTGTTCATTGGATCCTCCTGCTTGAAAGGTACACATTAAAGCATCCTCGCCCTCAAAGCCTGCTGCCACGTATCT
 ATGAAGCCCATGTAGGTATGAGTGGTAAAAGCCAGCAGTAAGCACATATAGGAATTGAGACAATGTGTTGCCACGCATAC
 GAGCAAATAACTACAACACAGTTGATGGCAGTTATGGAGCATTGCTACTATGCTTCTTGGGTACCATGTCAGACAAATT
 CTTGCGGTTAGCAGCAGATCAGGCACACCAGAGGACCTCAAATATCTTGTGATAAGGCACACAGTTGGGTTGCGAGTTCTG
 ATGGATGTTGTCATGCCATGCAAGTAATAATGTCACAGATGGTTAAATGGCTATGATGTTGGACAAGCACCAAGAGTCC
 TATTTTCTGCGGGAGATAGAGGTTATCATAAACTTTGGGATAGTCGGCTGTTCAACTATGCTAACTGGGAGGTATTAGGTT
 CTTCTTCTAACCTGAGATATTGGCTGGATGAATTGATGTTGATGGCTCCGATTGAGTTACATCAATGCTGTATCATC

ACCATGGTATCAATGTGGATTACTGGAAACTACCAGGAATATTCAGTTGGACACAGATGTGGATGCAGTTGTTACATGA
 TGCTTGCAAACCATTAAATGCACAAACTCTGCCAGAAGCAACTGTTGCTGAAGATGTTCAGGCATGCCGTCCTTGC
 CGGCCAGTTGATGAAGGTGGGTTGGGTTGACTATCGTCTGGCAATGGCTATCCCTGATAGATGGATTGACTACCTGAAGAATAA
 AGATGACTCTGAGTGGTCAATGGGTGAAATAGCGCATACTTGACTAACAGGAGATATACTGAAAAATGCATCGCATATGCTGA
 GAGCCATGATCAGTCTATTGTTGGCGACAAAACATTGCATTCTCCTGATGGACAAGGAAATGTACACTGGCATGTCAGACTTG
 CAGCCTGCTTCACCTACAATTGACCGAGGGATTGCACTCCAAAAGATGATTCACTTCATCACAATGCCCTGGAGGTGATGGCT
 ACTTGAATTATGGGAAATGAGTTGGTCAACCCAGAATGGATTGACTTCCAAGAGAAGGAAACAACGGAGCTATGATAAAAT
 GCAGACGACAGTGGAGCCTGTGGACACTGATCACTTGCCTGACAAGTACATGAATGCGTTGACCAAGCGATGAATGCCCTCGA
 TGAGAGATTTCCTTCCCTCGTCAAAGCAGATCGTAAGCGACATGAACGATGAGGAAAAGGTTATTGTCTTGAAACGTGG
 AGATTTAGTTTTGTTTCAATTCCATCCCAGAAAACCTACGAGGGCTACAAAGTGGATGCGATTGCCCTGGAAATACAG
 AGTAGCCCTGGACTCTGATGCTCTGGCTTCGGTGGACATGGAAGAGTTGGCACGACGTGGATCACTCACGTCGCCCTGAAGGG
 GTGCCAGGGGTGCCGAAACGAACCTCAACAACCGGCCAACCTGTTCAAAGTCCTTCTCCGCCCGCACCTGTGGCTTATT
 ACCGTGTAGACGAAGCAGGGCTGGACGACGTCTTCACCGCAAAGCAGAGACAGGAAAGACGTCTCAGCAGAGAGCATCGACG
 TCAAAGCTCCAGAGCTAGTAGCAAAGAAGACAAGGAGGCAACGGCTGGCAAGAAGGGATGGAAGTTGCCCGGCAGCAAT
 CCGATCAAGATAACAAATGA—

>Mo18W

ATGCTGTGCCCTCGTGTGCCCTTCCCTGCCGACTCCGCTTCCGCCGCCGCGCTCTCGCTCGCATGCTGATCGGCCGACC
 GCCGGGGATCGCGGGTGGCGCAATGCGCCCTGAGTGTGTTGCTGCAAGGCTGCCGGTCAGGGTGGAAAGGTC
 AAGAGCAAATTGCCACTGCAACTGTGCAAGAAGATAAAACTATGCAACTGCCAAAGGCATGCGACCATCTCCCCATAT
 ACGACCTGGACCCCAAGCTGGAGATATTCAAGGACCATTCAGGTACCGGATGAAAAGATTCTAGAGCAGAAAGGATCAATTG
 AAGAAAATGAGGAAGTCTTGAATCTTTCTAAAGGCTATTGAAATTGGGATTAATACAAATGAGGATGGAACGTATATC
 GTGAATGGCACCTGCTGCGCAGGGAGCAGAGCTATTGGTCAATGACTGGAATGGTCAAACCCATAAGATGGAGAAGG
 ATAAAATTGGTGTGGTCAAAATTGACCATGTCAAAGGAAACCTGCCATCCCTCACAAATTCAAGGTTAAATTGCTT
 TCTACATGGTGGAGTATGGGTTGATCGTATTCCAGCATGGATTCACTATGCGACTGTTGATGCCCTCAAATTGGAGCTCC
 TATGATGGTGTTCATTGGGATCCTCCTGCTTGAAAGGTACACATTAAGCATCCTCGGCCCTCAAAGCCTGCTGCTCACGTATCT
 ATGAAGCCCAGTAGGTATGAGTGGTAAAAGCCAGCAGTAAGCACATATAGGAATTGAGCAGACATGTGTTGCCACGCATAC
 GAGCAAATAACTACAACACAGTTGATGGCAGTTATGGAGCATTGCTACTATGCTTCTTCGGGTACCATGTGACAAATT
 CTTGCGGTTAGCAGCAGATCAGGCACACCAGAGGACCTCAAATATCTTGTGATAAGGCACACAGTTGGGTTGCGAGTTCTG

ATGGATGTTGCCATGCCATGCAAGTAATAATGTCACAGATGGTTAAATGGCTATGATGTTGGACAAAGCACCCAAAGAGTCC
 TATTTTCAATGCCGGAGATAGAGGTTATCATAAAACTTGGGATAGTCGGCTGTTCAACTATGCTAAGTGGGAGGTATTAAGGTTT
 CTTCTTCTAACCTGAGATATTGGTGGATGAATTCATGTTGATGGCTTCCGATTGATGGAGTTACATCAATGCTGTATCATC
 ACCATGGTATCAATGTTGGGTTACTGGAAACTACCAGGAATATTCAGTTGGACACAGCTGTGGATGCAGTTGTTACATGA
 TGCTTGCAAACCATTAAATGCACAAACTCTGCCAGAAGCAACTGTTGCTGAAGATGTTCAGGCATGCCGTCTTGGCG
 GCCAGTTGATGAAGGTGGGGTGGGTTGACTATCGCCTGGCAATGGCTATCCCTGATAGATGGATTGACTACCTGAAGAATAA
 AGATGACTCTGAGTGGTCGATGGGTGAAATAGCGCATACTTGAACAGGAGATATACTGAAAAATGCATCGCATATGCTGA
 GAGCCATGATCAGTCTATCGTTGGCAGAAAACATTGCATTCTCCTGATGGACAAGGAAATGTACACTGGCATGTCAGACTTG
 CAGCCTGCTTCACCTACAATTGATCGAGGGATTGCACTCCAAAAGATGATTCACTTCATCACAATGCCCTGGAGGTGATGGCT
 ACTTGAATTATGGGAAATGAGTTGGTCAACCCAGAATGGATTGACTTCCAAGAGAAGGGAAACAACGGAGCTATGATAAAAT
 GCAGACGACAGTGGAGCCTGTGGACACTGATCACTTGCCTACAAGTACATGAATGCGTTGACCAAGCGATGAATGCCCTCGA
 TGAGAGATTTCTCCTTCGTCGTCAAAGCAGATCGCAGCGACATGAACGATGAGGAAAAGGTTATTGTCTTGAAACGTGG
 AGATTTAGTTTTGTTTCAATTTCATCCAAAGAAAACTTACGAGGGCTACAAAGTGGATGCGATTGCCCTGGAAATACAG
 AGTAGCCCTGGACTCTGATGCTCTGGCTTCGGTGGACATGGAAGAGTTGGCCACGACGTGGATCACTTCATGTCGCCCTGAAGGG
 GTGCCAGGGGTGCCGAAACGAACCTCAACAACCGGCCAACCTGTTCAAAGTCCTTCTCCGCCCGCACCTGTGGCTTATT
 ACCGTGTAGACGAAGCAGGGCTGGACGACGTCTTCACCGCAAAGCAGAGACAGGAAAGACGTCTCAGCAGAGAGCATCGACG
 TCAAAGCTCCAGAGCTAGTAGCAAAGAAGACAAGGAGGCAACGGCTGGTGGCAAGAAGGGATGGAAGTTGCCCGGCAGCCAT
 CCGATCAAGATAACAAATGA—

>M162W

ATGCTGTGCCCTCGTGTGCCCTTCCCTGCCGACTCCGCTTCCGCCGCCGCGCTCTCGCTCGCATGCTGATCGGCCGACC
 GCCGGGGATCGCGGGTGGCGCAATGTGCGCCTGAGTGTGTTCTGTCAGTGCAAGGCTGCCGGTCAGGGTGGCAAGGTC
 AAGAGCAAATTGCCACTGCAAGCTACTGTCAAGAAGATAAAACTATGCCAAAGGCATGTCGACCATCTCCCCATAT
 ACGACCTGGACCCCAAGCTGGAGATATTCAAGGACCATTTCAGGTACCGGATGAAAAGATTCTAGAGCAGAAAGGATCAATTG
 AAGAAAATGAGGGAAGTCTTGAATCTTTCTAAAGGCTATTGAAATTGGGATTAATACAAATGAGGATGGAACGTATATC
 GTGAATGGGCACCTGCTGCGCAGGGAGCAGACTTGGTCAATGACTGGAATGGTCAAACCCATAAGATGGAGAAGG
 ATAAATTGGTGGTGTGATCAAATTGACCATGTCAAAGGAAACCTGCCATCCCTCACAAATTCAAAGGTTAAATTGCTT
 TCTACATGGTGGAGTATGGGTTGATGTTATTCCAGCATTGATTGCTATGCGACTGTTGATGCCCTCAAATTGGAGCTCCCTAT
 GATGGTGTTCATTGGGATCCTCCTGCTTCTGAAAGGTACACATTAAAGCATCCTCGCCCAAAGCCTGCTGCTCACGTATCT

ATGAAGCCCATGTAGGTATGAGTGGTAAAAGCCAGCAGTAAGCACATATAGGAATTGCAGACAAATGTGTTGCCACGCATA
 GAGCAAATAACTACAACACAGTCAGTTGATGGCAGTTATGGAGCATTCTGACTATGCTTCTTCGGGTACCATGTGACAAATT
 CTTGCGGTTAGCAGCAGATCAGGCACACCAGAGGACCTCAAATATCTTGGTATAAGGCACACAGTTGGGTTGCGAGTTCTG
 ATGGATGTTGTCATAGCCATGCAAGTAATAATGTCACAGATGGTTAAATGGCTATGATGTTGGACAAAGCACCCAAGAGTCC
 TATTTTCACTGCGGGAGATAGAGGTTATCATAAAACTTGGGATAGTCGGCTGTTCAACTATGCTAAGTGGAGGTATTAAGGTT
 CTTCTTCTAACCTGAGATATTGGTGGATGAATTCATGTTGATGGCTTCCGATTGATGGAGTTACATCAATGCTGTATCATC
 ACCATGGTATCAATGTCAGGTTACTGGAAACTACCAGGAATATTCAGTTGGACACAGCTGTGGATGCAGTTGTTACATGA
 TGCTTGCAAACCATTAAATGCCACAAACTCTGCCAGAACAGCAACTGTTGCTGAAGATGTTCAGGCATGCCGTCCTTGCCG
 GCCAGTTGATGAAGGTGGGGTTGGGTTGACTATCGCCTGGCAATGGCTATCCCTGATAGATGGATTGACTACCTGAAGAATAA
 AGATGACTCTGAGTGGTCATGGGTGAAATAGCGCATACTTGACTAACAGGAGATATACTGAAAAATGCATCGCATATGCTGA
 GAGCCATGATCAGTCTATTGTTGGCAGAAAACATTGCATTCTCCTGATGGACAAGGAAATGTACACTGGCATGTCAGACTTG
 CAGCCTGCTTCACCTACAATTGATCGAGGGATTGCACTCCAAAAGATGATTCACTTCATCACAATGCCCTGGAGGTGATGGCT
 ACTTGAATTTTATGGGAAATGAGTTGGTCACTGGGACTACGATCAGTGGTACAAGTACATGAATGCGTTGACCAAGCGATGAATGCGCTCAA
 TGAGAGATTTCCTTCTCGTCAAAGCAGATCGTACAGCAGATGAACGATGAGGAAAAGGTTATTGTCTTGAAACGTGG
 AGATTAGTTTTGTTTCAATTCCATCCAAAGAAAACCTACGAGGGCTACAAAGTGGATGCGATTGCGCTGGAAATACAG
 AGTAGCCCTGGACTCTGATGCTCTGGCTTCGGTGGACATGGAAGAGTTGGCCACGACGTGGATCACTTCACGTCGCCCTGAAGGG
 GTGCCAGGGGTGCCGAAACGAACCTCAACAACCGGCCAAACTCGTTCAAAGTCCTTCTCCGCCCGCACCTGTGGCTTATT
 ACCGTGTAGACGAAGCAGGGCTGGACGACGTCTTCACCGAAGCAGAGACAGGAAAGACGTCTCAGCAGAGAGCATCGACG
 TCAAAGCTCCAGAGCTAGTAGCAAAGAAGACAAGGAGGCAACGGCTGGCAAGAAGGGATGGAAGTTGCCGGCAGCCAT
 CCGATCAAGATAACCAAATGA—

>Mandan_Yellow_Flour

ATGCTGTGCCCTCGTGTGCCCTCTCCTGCCGACTCCGCTTCCGCCGCCGCGCTCTCGCTCGCATGCTGATCGGCCGACC
 GCCGGGGATCGCGGGTGGCGCAATGTGCGCCTGAGTGTGTTGTCAGTGCAAGGCTGCCGGTCAGGGTGGGAAGGTC
 AAGAGCAAATTGCCACTGCAAGCTACTGTCAAGAAGATAAAACTATGCAACTGCCAAAGGCATGTCGACCATCTCCCCATAT
 ACGACCTGGACCCCAAGCTGGAGATATTCAAGGACCATTTCAGGTACCGGATGAAAAGATTCTAGAGCAGAAAGGATCAATTG
 AAGAAAATGAGGGAAGTCTTGAATCTTTCTAAAGGCTATTGAAATTGGGATTAATACAAATGAGGATGGAACGTGATATTC
 GTGAATGGGCACCTGCTGCGCAGGAGGCAAGAGCTTATTGGTGACTIONCAATGACTGGAATGGTCAAACCATAAGATGGAGAAGG

ATAAATTGGTGTGTCGATCAAATTGACCATGTCAAAAGGAAACCTGCCATCCCTACAATTCCAAGGTTAATTGCGTT
TCTACATGGTGGAGTATGGGTTGATCGTATTCCAGCATGGATTGTTATGCGACTGTTGATGCCTCTAAATTGGAGCTCCCTAT
GATGGTGTTCATGGGATCCTCCTGCTCTGAAAGGTACACATTAAAGCATCCTCGGCCTCAAAGCCTGCTGCTCACGTATCT
ATGAAGCCCAGTAGGTATGAGTGGTAAAAGCCAGCAGTAAGCACATATAGGAATTGAGACAAATGTGTTGCCACGCATAC
GAGCAAATAACTACAACACAGTTGATGGCAGTTATGGAGCATTGTTACTATGCTTCTTCGGGTACCATGTCAGAACAAATT
CTTGCAGGTTAGCAGCAGATCAGGCACACCAGAGGACCTCAAATATCTTGTGATAAGGCACACAGTTGGGTTGCGAGTTCTG
ATGGATGTTGTCCATGCCATGCAAGTAATAATGTCACAGATGGTTAAATGGCTATGATGTTGGACAAAGCACCCAAAGAGTCC
TATTTTCACTGCGGGAGATAGAGGTTATCATAAAACTTGGGATAGTCGGCTGTTCAACTATGCTAAGTGGGAGGTATTAAGGTTT
CTTCTTCTAACCTGAGATATTGGGATGAAATTGATGTTGATGGCTTCCGATTGATGGAGTTACATCAATGCTGTATCATC
ACCATGGTATCAATGTGGGTTACTGGAAACTACCAGGAATATTCAGTTGGACACAGCTGTGGATGCAAGTTGTTACATGA
TGCTTGCAAACCATTAAATGCCACAAACTCTGCCAGAACGCAACTGTTGCTGAAGATGTTCAAGGCATGCCGCTTGC
GCCAGTTGATGAAGGTGGGTTGGGTTGACTATGCCCTGGCAATGGCTATCCCTGATAGATGGATTGACTACCTGAAGAATAA
AGATGACTCTGAGTGGTCGATGGGTGAAATAGCGCATACTTGACTAACAGGAGATATACTGAAAAATGCATCGCATATGCTGA
GAGCCATGATCAGTCTATTGTTGGCAGAAAACATTGCATTCTCCTGATGGACAAGGAAATGTACACTGGCATGTCAGACTTG
CAGCCTGCTTCACCTACAATTGATCGAGGGATTGCACTCCAAAAGATGATTCACTTCATCACAATGCCCTGGAGGTGATGGCT
ACTTGAATTTTATGGGAAATGAGTTGGTCACTGGGACTGATCAGTCACTTGCGTACAAGTACATGAATGCGTTGACCAAGCGATGAATGCC
TGAGAGATTTCTCCTTCGTCGTCAGAACGATCGCAGCGACATGAACGATGAGGAAAAGGTTATTGTCTTGAACGTGG
AGATTTAGTTTTGTTTCAATTCCATCCAAAGAAAACATTACGAGGGCTACAAAGTGGATGCGATTGCCCTGGAAATACAG
AGTAGCCCTGGACTCTGATGCTCTGGCTTCGGTGGACATGGAAGAGTTGGCCACGACGTGGATCACTTCACGTCGCC
GTGCCAGGGGTGCCGAAACGAACCTCAACAACCGGCCAACCTGTTCAAAGTCCTTCTCCGCCCGCACCTGTGGCTTATT
ACCGTGTAGACGAAGCAGGGCTGGACGACGTCTCACCGAAAGCAGAGACAGGAAAGACGTCTCAGCAGAGAGCATCGACG
TCAAAGCTCCAGAGCTAGTAGCAAAGAAGACAAGGAGGCAACGGCTGGCAAGAAGGGATGGAAGTTGCCGGCAGCCAT
CCGATCAAGATAACAAATGA—

>Mandan_Yellow_Flint

ATGCTGTGCCCTCGTGTGCCCTTCCCTGCCGACTCCGCTTCCGCCGCCGCGCTCTCGCTCGCATGCTGATCGGCCG
GCCGGGGATCGCGGGTGGCGCAATGTGCGCTGAGTGTGTTGTCAGTGCAAGGCTGCCGGTCAGGGTGGCAAGGTC
AAGAGCAAATTGCCACTGCAGCTACTGTGCAAGAACATAAAACTATGCCAAAGGCATGTCGACCATCTCCCCATAT

ACGACCTGGACCCCAAGCTGGAGATATTCAAGGACCATTCAAGGTACCGGATGAAAAGATTCTAGAGCAGAAAGGATCAATTG
AAGAAAATGAGGGAAGTCTTGAATCTTTCTAAAGGCTATTGAAATTGGGATTAATACAATGAGGATGAACTGTATATC
GTGAATGGGCACCTGCTGCGCAGGAGGAGCTATTGGTCAATGACTGGAATGGTGCAAACCATAAGATGGAGAAGG
ATAAAATTGGTGTGGTCGATCAAATTGACCATGTCAAAGGAAACCTGCCATCCCTCACAAATTCCAAGGTTAAATTGCGCTT
TCTACATGGTGGAGTATGGGTTGATCGTATTCCAGCATGGATTGTTATGCGACTGTTGATGCCCTCAAATTGGAGCTCCCTAT
GATGGTGTTCATTGGGATCCTCCTGCTCTGAAAGGTACACATTAAGCATCCTCGGCCTCAAAGCCTGCTGCTCACGTATCT
ATGAAGCCCAGTAGGTATGAGTGGTAAAAGCCAGCAGTAAGCACATATAGGAATTGAGACAAATGTGTTGCCACGCATAC
GAGCAAATAACTACAACACAGTTGATGGCAGTTGAGCATTGCTACTATGCTTCTTCGGGTACCATGTCAGAAATT
CTTGCGGTTAGCAGCAGATCAGGCACACCAGAGGACCTCAAATATCTTGGTATAAGGCACACAGTTGGGTTGCGAGTTCTG
ATGGATGTTGTCATGCCATGCAAGTAATAATGTCACAGATGGTTAAATGGCTATGATGTTGGACAAAGCACCAAGAGTCC
TATTTTATGCGGGAGATAGAGGTTATCATAAAACTTGGGATAGTCGGCTGTTCAACTATGCTAACACTGGGAGGTATTAAGGTTT
CTTCTTCTAACCTGAGATATTGGTGGATGAATTGATGTTGATGGCTTCCGATTGATGGAGTTACATCAATGCTGTATCATC
ACCATGGTATCAATGTGGGTTACTGGAAACTACCAGGAATATTGAGTTGACAGCTGTGGATGCAAGTGTGTTACATGA
TGCTTGCAAACCATTAAATGCCACAAACTCTGCCAGAACGCAACTGTTGCTGAAGATGTTGAGGCTTGCAGGCATGCCGCTTGC
GCCAGTTGATGAAGGTGGGTTGGGTTGAATATGCCCTGGCAATGGCTATCCCTGATAGATGGATTGACTACCTGAAGAATAA
AGATGACTCTGAGTGGTCGATGGGTGAAATAGCGCATACTTGAACAGGAGATATACTGAAAAATGCATCGCATATGCTGA
GAGCCATGATCAGTCTATTGTTGGCACAAGAACTATTGCAATTCTCCTGATGGACAAGGAAATGTACACTGGCATGTCAGACTTG
CAGCCTGCTTCACCTACAATTGATCGAGGGATTGCACTCCAAAAGATGATTCACTTCATCACAATGCCCTGGAGGTGATGGCT
ACTTGAATTTATGGGAAATGAGTTGGTCACTGGACACTGATCACTTGGTACAAGTACATGAATGCGTTGACCAAGCGATGAATGCC
TGAGAGATTTCTTCTCGTCAAAGCAGATCGCAGCGACATGAACGATGAGGAAAAGGTTATTGTCTTGAACGTGG
AGATTTAGTTTGTGTTCAATTCCATCCAAAGAAAACCTACGAGGGCTACAAAGTGGATGCGATTGCTGGAAATACAG
AGTAGCCCTGGACTCTGATGCTCTGGCTTCGGACATGGAAGAGTTGGCCACGACGTGGATCACTTCACGTCGCCCTGAAGGG
GTGCCAGGGGTGCCGAAACGAACCTCAACAACCGGCCAACCTGTTCAAAGTCCTTCTCCGCCCGCACCTGTTGGCTTATT
ACCGTGTAGACGAAGCAGGGCTGGACGACGTCTCACCGCAAAGCAGAGACAGGAAAGACGTCTCAGCAGAGAGCATCGACG
TCAAAGCTCCAGAGCTAGTAGCAAAGAAGACAAGGAGGCAACGGCTGGCAAGAAGGGATGGAAGTTGCCGGCAGCCAT
CCGATCAAGATAACCAAATGA—

>Mandan_Red_Clay

ATGCTGTGCCCTCGTGTGCCCTCTTCCTGCCGACTCCGCTTCCGCCGCCGCGCTCTCGCTCGCATGCTGATCAGGGCGGCACC
GCCGGGGATCGGGGTGGCGCAATGTGCGCCTGAGTGTGTTCTGTCAGTGCAAGGCTCGCCGGTCAGGGTGCAGGAAGGTC
AAGAGCAAATTGCCACTGCAGCTACTGTGCAAGAAGATAAAACTATGGCAACTGCCAAAGGCGATGTCGACCATCTCCCCATAT
ACGACCTGGACCCAAGCTGGAGATATTCAAGGACCATTCAAGGTACCGGATGAAAAGATTCCCTAGAGCAGAAAGGATCAATTG
AAGAAAATGAGGGAAAGTCTTGAATCTTTCTAAAGGCTATTGAAATTGGGATTAATAACAAATGAGGATGGAACGTATATC
GTGAATGGGCACCTGCTGCGCAGGAGGCAGAGCTTATTGGTGAATTCAATGACTGGAATGGTGCACAAACCATAAAGATGGAGAAGG
ATAAATTTGGTGTGTTGGTCGATCAAATTGACCATGTCAAAGGAAACCTGCCATCCCTCACAAATTCAAGGTTAAATTGCGTT
TCTACATGGTGGAGTATGGGTTGATCGTATTCCAGCATGGATTGTTATGCGACTGTTGATGCCCTCAAATTGGAGGCTCCCTAT
GATGGTGTTCATTGGGATCCTCCTGCTTCTGAAAGGTACACATTAAAGCATCCTCGGCCTCAAAGCCTGCTGCTCACGTATCT
ATGAAGCCCATGTAGGTATGAGTGGTAAAAGCCAGCAGTAAGCACATATAGGAATTGAGACAATGTGTTGCCACGCATAC
GAGCAAATAACTACAACACAGTCAGTTGATGGCAGTTATGGAGCATTCTACATATGCTTCTTTGGTACCATGTCACAAATT
TCTTGCGGTTAGCAGCAGATCAGGCACACCAGAGGACCTCAAATATCTTGTGATAAGGCACACAGTTGGGTTGCGAGTTCT
GATGGATGTTGTCATGCCATGCAAGTAATAATGTCACAGATGGTTAAATGGCTATGATGTTGACAAAGCACCAAGAGTC
CTATTTCATGCGGGAGATAGAGGTTATCATAAACTTGGGATAGTCGGCTGTTCAACTATGCTAACACTGGGAGGTATTAAGGTT
TCTTCTTCTAACCTGAGATATTGGCTGGATGAATTCATGTTGATGGCTTCCGATTGATGGAGTTACATCAATGCTGTATCAT
CACCATGGTATCAATGTGGGTTACTGGAAACTACCAGGAATATTCAAGTTGACACAGCTGGATGCAGTTGTTACATG
ATGCTTGCAAAACCATTAATGCACAAACTCTTGCCAGAAGCAACTGTTGCTGAAGATGTTCAGGCATGCCGGCTTGGCC
GGCCAGTTGATGAAGGTTGGGTTGGGTTGACTATCGCCTGGCAATGGCTATCCCTGATAGATGGATTGACTACCTGAAGAATA
AAGATGACTCTGAGTGGCGATGGGTGAAATAGCGCATACTTGACTAACAGGAGATATACTGAAAAATGCATGCCATATGCTG
AGAGCCATGATCAGTCTATTGTTGGCACAACATTGCACTGGGATTGCACTCCAAAAGATGATTCACTTCATCACAAATGGCC
TACTTGAAATTGAGGAAATGAGTTGGTCACTGGGATTGCACTGGGACTACAGTCACTTGCTGAGGAGCTATGATAAA
TGCAGACGACAGTGGAGCCTGTTGACACTGATCACTTGCGGTACAAGTACATGAATGCGTTGACCAAGCGATGAATGCGCTCG
ATGAGAGATTTCCTTCCGTCAAAGCAGATCGTCAGCGACATGAACGATGAGGAAAAGGTTATTGCTTGAACGTG
GAGATTAGTTTGTGTTCAATTCCATCCAAAGAAAACCTACGAGGGCTACAAAGTGGGATGCGATTGCTGGAAATACA
GAGTAGCCCTGGACTCTGATGCTCTGGTCTCGGTGGACATGGAAGAGTTGGCAGCAGTGGATCACTCACGTGCGCTGAAGG
GGTGCAGGGGTGCCAAACGAACCTCAACAACCGCCGAACCTGTTCAAAGTCCTTCTCCGCCCCGACCTGTTGCGCTTATT
ACCGTGTAGACGAAGCAGGGCTGGACGACGTCTCACGCGAAAGCAGAGACAGGAAAGACGTCTCCAGCAGAGACATCGACG

TCAAAGCTTCCAGAGCTAGTAGCAAAGAAGACAAGGAGGCAACGGCTGGCAAGAAGGGATGGAAGTTGCGCGGCAGCCAT
CCGATCAAGATAACCAAATGA—

>Mandan_Black

ATGCTGTGCCCTCGTCGCCCTTCCCTGCCACTCCGCTTCCGCCGCCGGCGCTCGCTCGCATGCTGATCGGGCGGCACC
GCCGGGGATCGCGGGTGGCGCAATGTGCGCCTGAGTGTGTTCTGTCAGTGCAAGGCTGCCGGTCAGGGGTGCGGAAGGTC
AAGAGCAAATTGCCACTGCAGCTACTGTGCAAGAAGATAAAACTATGCCAACTGCCAAAGGCCATGTCGACCATCTCCCCATAT
ACGACCTGGACCCCAAGCTGGAGATATTCAAGGACCATTCAGGTACCGGATGAAAAGATTCTAGAGCAGAAAGGATCAATTG
AAGAAAATGAGGAAGTCTTGAATCTTTCTAAAGGCTATTGAAATTGGGATTAATACAAATGAGGATGGAACGTGATATC
GTGAATGGCACCTGCTGCCAGGAGGCAGAGCTTATTGGTACTTCAATGACTGGAATGGTCAAACCATAAAGATGGAGAAGG
ATAAATTGGTGTGGTCGATCAAATTGACCATGTCAAAGGAAACCTGCCATCCCTACAATTCCAAGGTTAAATTGCGTT
TCTACATGGTGGAGTATGGGTGATCGTATTCCAGCATTGATTGTTATGCGACTGTTGATGCCCTAAATTGGAGCTCCCTAT
GATGGTGTTCATTGGGATCCTCCTGCTTCTGAAAGGTACACATTAAAGCATCCTGCCCTCAAAGCCTGCTGCCACGTATCT
ATGAAGCCCAGTGTAGGTATGAGTGGTAAAAGCCAGCAGTAAGCACATATAGGAATTGAGACAATGTGTTGCCACGCATAC
GAGCAAATAACTACAACACAGTTCAGTTGATGGCAGTTATGGAGCATTGTTACTATGCTTCTTGGGTACCATGTCACAAATT
CTTGCGGTTAGCAGCAGATCAGGCACACCAGAGGACCTCAAATATCTTGGTATAAGGCACACAGTTGGGTTGCGAGTTCTG
ATGGATGTTGTCATAGCCATGCAAGTAATAATGTCACAGATGGTTAAATGGCTATGATGTTGGACAAAGCACCAAGAGTCC
TATTTTATGCGGGAGATAGAGGTTATCATAAACTTGGGATAGTGGCTGTTCAACTATGCTAAGTGGAGGTATTAAGGTT
CTTCTTCTAACCTGAGATATTGGTGGATGAATTGATGGCTTCCGATTGATGGAGTTACATCAATGCTGATCATC
ACCATGGTATCAATGTGGGTTACTGGAAACTACCAGGAATATTCAGTTGGACACAGCTGTGGATGCAGTTGTTACATGA
TGCTTGCAAACCATTAATGCACAAACTCTTGGCAGAACGCAACTGTTGCTGAAGATGTTGAGGATGCTGCGGTCCTTGCG
GCCAGTTGATGAAGGTGGGTTGGGTTGACTATGCCCTGGCAATGGCTATCCCTGATAGATGGACTACCTGAAGAATAA
AGATGACTCTGAGTGGTCGATGGGTGAAATAGCGCATACTTGACTAACAGGAGATATACTGAAAAATGCATCGCATATGCTGA
GAGCCATGATCAGTCTATTGTTGGCGACAAAACATTGCATTCTCCTGATGGACAAGGAAATGTACACTGGCATGTCAGACTTG
CAGCCTGCTTCACCTACAATTGATCGAGGGATTGCACTCCAAAAGATGATTCACTTCATCACAATGCCCTGGAGGTGATGGCT
ACTTGAATTGTTGGGAAATGAGTTGGTCACCCAGAATGGATTGACTTCCAAGAGAAGGAAACAACGGAGCTATGATAAAAT
GCAGACGACAGTGGAGCCTGTTGACACTGATCACTTGGCTACAAGTACATGAATGCGTTGACCAAGCGATGAATGCGCTCGA
TGAGAGATTTCCTTCCCTTGTCAAAGCAGATCGTCAGCGACATGAACGATGAGGAAAAGGTTATTGTCTTGAACGTGG
AGATTAGTTTGTGTTCAATTCCATCCAAGAAAACCTACGAGGGCTACAAAGTGGGATGCGATTGCGCTGGAAATACAG

AGTAGCCCTGGACTCTGATGCTCTGGTCTTCGGTGGACATGGAAGAGTTGCCACGACGTGGATCACTCACGTGCCTGAAGGG
GTGCCAGGGGTGCCCGAAACGAACCTCAACAACCGGCCAACCTGTTCAAAGTCCTTCTCCGCCCGCACCTGTGTGGCTTATT
ACCGTGTAGACGAAGCAGGGCTGGACGACGTCTCACCGAAGCAGAGACAGGAAAGACGTCTCAGCAGAGAGCATCGACG
TCAAAGCTTCCAGAGCTAGTAGCAAAGAACAGGAGGCAACGGCTGGCAAGAAGGGATGGAAGTTGCGCGGCAGCCAT
CCGATCAAGATAACCAAATGA—

>GEMS-0067

ATGCTGTGCCCTCGTCGCCCTTCCCTGCCACTCCGCTTCCGCCGCCGGCTCTCGCTCGATGCTGATCGGCCACC
GACGGGGATCGCGGGTGGCGCAATGTGCGTCTGAGTGTGTCTGCAAGGCTGCCGGTCAGGGTGCAGGAAGGTC
AAGAGCAAATTGCCACTGCAGCTACTGTCAAGAAGATAAAACTATGCCAACTGCCAAAGGCCATGTCGACCATCTCCCCATAT
ACGACCTGGACCCCAAGCTGGAGATATTCAAGGACCATTCAGGTACCGGATGAAAAGATTCTAGAGCAGAAAGGATCAATTG
AAGAAAATGAGGAAGTCTTGAATCTTTCTAAAGGCTATTGAAATTGGGATTAATACAAATGAGGATGAAACTGTATATC
GTGAATGGGCACCTGCTGTGCAGGAAGCAGAGCTTATTGGTACTTCATGACTGGAATGGTCAAACCATAAAGATGGAGAAGG
ATAAAATTGGTGTGGTCGATCAAATTGACCATGTCAAAGGAAACCTGCCATCCCTCACAATTCCAAGGTTAAATTGCGTT
TCTACATGGTGGAGTATGGTTGATCGTATTCCCTGCATGGATTGTTATGCGACTGTTGATGCCCTAAATTGGAGCTCCCTAT
GATGGTGTTCATTGGATCCTCCTGCTTCTGAAAGGTACACATTAAAGCATCCTCGGCCCTCAAAGCCTGCTGCCACGTATCT
ATGAAGCCCATGTAGGTATGAGTGGTAAAAGCCAGCAGTAAGCACATATAGGAATTGAGACAATGTGTTGCCACGCATAC
GAGCAAATAACTACAACACAGTCAGTTGATGGCAGTTATGGAGCATTGCTACTATGCTTCTTCGGGTACCATGTCAGAAATT
CTTGCGGTTAGCAGCAGATCAGGCACACCAGAGGACCTCAAATATCTTGTGATAAGGCACACAGTTGGGTTGCGAGTTCTG
ATGGATGTTGTCATGCCATGCAAGTAATAATGTCACAGATGGTTAAATGGCTATGATGTTGGACAAAGCACCAAGAGTCC
TATTTTCTGCGGGAGATAGAGGTTATCATAAACTTGGGATAGTCGGCTGTTCAACTATGCTAAGTGGAGGTATTAAGGTT
CTTCTTCTAACCTGAGATATTGGTGGATGAATCCATGTTGATGGCTCCGATTGATGGAGTTACATCAATGCTGTATCATC
ACCATGGTATCAATGTGGATTACTGGAAACTACCAGGAATATTCAAGTTGACAGATGTGGATGCAAGTGTGTTACATGA
TGCTTGCAAACCACTTAATGCACAAACTCTGCCAGAACGCAACTGTTGCTGAAGATGTTCAAGGCATGCCGGCTTGC
GCCAGTTGATGAAGGTGGGTTGGGTTGACTATCGTCTGGCAATGGCTATCCCTGATAGATGGATTGACTACCTGAAGAATAA
AGATGACTCTGAGTGGTCAATGGGTGAAATAGCGCATACTTGACTAACAGGAGATATACTGAAAAATGCATCGCATATGCTGA
GAGCCATGATCAGTCTATTGTTGGCGACAAAACATTGCATTCTCCTGATGGACAAGGAAATGTACACTGGCATGTCAGACTTG
CAGCCTGCTTCACCTACAATTGACCGAGGGATTGCACTCCAAAAGATGATTCACTTCATCACAATGGCCCTGGAGGTGATGGCT
ACTTGAATTATGGGAAATGAGTTGGTCACCCAGAATGGATTGACTTCCAAGAGAACAACTGGAGCTATGATAAAT

GCAGACGACAGTGGAGCCTGTGGACACTGATCACTTGCCTACAAGTACATGAATGCCTTGACCAAGCGATGAATGCGCTCGA
 TGAGAGATTTCCTTCCTTCGTCAAAAGCAGATCGTAAGCGACATGAACGATGAGGAAAAGGTATTGTCTTGACCGTGG
 AGATTAGTTTGTTCATCCAAAGAAAACCTACGAGGGCTACAAAGTGGATGCGATTGCCTGGAAATACAG
 AGTAGCCCTGGACTCTGATGCTCTGGTCTCGGTGGACATGGAAGAGTTGCCACGACGTGGATCACTCACGTCGCCTGAAGGG
 GTGCCAGGGTGCCGAAACGAACCTCAACAACCGGCCAACCGTCAAAGTCCTTCTCCGCCCGCACCTGTGTGGCTTATT
 ACCGTGTAGACGAAGCAGGGCTGGACGACGTCTCACCGCAAAGCAGAGACAGGAAAGACGTCTCAGCAGAGAGCATCGACG
 TCAAAGCTTCCAGAGCTAGTAGCAAAGAACAGGAGGCAACGGCTGGCAAGAAGGGATGGAAGTTGCGCGGCAGCCAT
 CCGATCAAGATAACCAAATGA—

>Diploperennis

ATGCTGTGCCCTCGTGTGCCCTTCCCTGCCACTCCGCTTCCGCCGCCGCGCTCTGCTCGATGCTGATCGGCCACC
 GACGGGGATCGCGGGTGGCGCAATGTGCGTCTGAGTGTGTTCTGCAAGGCTGCCGCTCAGGGTGCAGGTC
 AAGAGCAAATTGCCACTGCAGCTACTGTCAAGAAGATAAAACTATGCCAACTGCCAAAGGCCATGCGACCATCTCCCCATAT
 ACCACCTGGACCCAAAGCTGGAGATATTCAAGGACCATTCAGGTACCGGATGAAAAGATTCTAGAGCAGAAAGGATCAATTG
 AAGAAAATGAGGAAGTCTTGAATCTTTCTAAAGGCTATTGAAATTGGGATTAATACAATGAGGATGGAACGTATATC
 GTGAATGGCACCTGCTGTGCAGGAGGCAGAGCTTATTGGTACTCAATGACTGGAATGGCAAACCATAAAGATGGAGAAGG
 ATAAAATTGGTGTGGTCGATCAAATTGACCATGTCAAAGGAAACCTGCCATCCCTCACAAATTCCAAGGTTAAATTGCGCTT
 TCTGCATGGTGGAGTATGGTTGATCGTATTCCCTGCATGGATTGTTATGCGACTGTTGATGCCCTAAATTGGAGCTCCCTAT
 GATGGTGTTCATTGGATCCTCCTGCTCTGAAAGGTACACATTAAAGCATCCTCGCCCTCAAAGCCTGCTGCCACGTATCT
 ATGAAGCCCATGTAGGTATGAGTGGTAAAAGCCAGCAGTAAGCACATATAGGAATTGAGACAAATGTGTTGCCACGCATAC
 GAGCAAATAACTACAACACAGTCAGTTGATGGCAGTTATGGAGCATTGTTACTATGCTTCTTGGTACCATGTGACAAATT
 CTTGCGGTTAGCAGCAGATCAGGCACACCAGAGGACCTCAAATATCTTGTGATAAGGCACACAGTTGGTTGCGAGTTCTG
 ATGGATGTTGTCATGCCATGCAAGTAATAATGTCACAGATGGTTAAATGGCTATGATGTTGGACAAAGCACCAAGAGTCC
 TATTTTCTGCGGGAGATAGAGGTTATCATAAAACTTGGGATAGTCGGCTGTTCAACTATGCTAAGTGGAGGTATTAAGGTT
 CTTCTTCTAACCTGAGATATTGGCTGGATGAATTGATGTTGATGGCTCCGATTGATGGAGTTACATCAATGCTGTATCATC
 ACCATGGTATCAATGTAGGGTTACTGGAAACTACCAGGAATATTCAGTTGGACACAGATGTGGATGCAAGTGTGTTACATGA
 TGCTTGCAAAACCATTAATGCACAAACTCTTGCCTGGCAAGCAACTGTTGCTGAAGATGTTCAAGGCATGCCGTCCTTGCAG
 GCCAGTTGATGAAGGTGGGTTGGGTTGACTATGCCCTGGCAATGGCTATCCCTGATAGATGGATTGACTACCTGAAGAATAA
 AGATGACTCTGAGTGGTCGATGGGTGAAATAGCGCATACTTGAACAGGAGATATACTGAAAAATGCATCGCATATGCTGA

GAGCCATGATCAGTCTATTGTTGGCGACAAAACATTGCATTCCTGATGGACAAGGAAATGTACACTGGCATGTCAGACTTG
 CAGCCTGCTTCACCTACAATTGATCGAGGGATGCACCTCCAAAAGATGATTCACTTCATCACAATGGCCCTGGAGGTGATGGCT
 ACTTGAATTTCATGGGAAATGAGTTGGTCACCCAGAATGGATTGACTTCCAAGAGAAGGAAACAACGGAGCTATGATAAAT
 GCAGACGACAGTGGAGCCTGTGGACACTGATCACTTGGGTACAAGTACATGAATGGTTGACCAAGCGATGAATGCGCTCGA
 TGAGAGATTTCCCTTCCTTCGTATCAAAGCAGATAGTAAGCGACATGAATGATGAGGAAAAGGTATTGTCTTGAAACGTGG
 AGATTAGTTTGTGTTCAATTCCATCCAAAGAAAACCTACGAGGGCTACAAAGTGGATGCGATTGCGCTGGAAATACAG
 AGTAGCCCTGGACTCTGATGCTCTGGTCTCGGTGGACATGGAAGAGTTGCCACGACGTGGATCACTCACGTCGCTGAAGGG
 GTGCCAGGGTGCCGAAACGAACCTCAACAACCGGCCAACCTGTTCAAAGTCCTTCTCCGCCACCTGTGTGGCTTATT
 ACCGTGTAGACGAAGCAGGGCTGGACGAGGTCTTCACGCCAAAGCAGAGACAGGAAAGACGTCTCAGCAGAGAGCATCGACG
 TCAAAGCTTCCAGAGCTAGTAGCAAAGAACAGGAGGCAACGGCTGGCAAGAAGGGATGGAAGTTGCGCGGCAGCCAT
 CCGATCAAGATAACCAAATGA—

>CML_277

ATGCTGTGCCCTCGTGTGCCCTTCCCTGCCACTCCGCTTCCGCCGCCGCGCTCTGCTCGATGCTGATCGGGCGGCACC
 GCCGGGATCGCGGGTGGCGCAATGTGCGCTGAGTGTGTTCTGTCAGTGCAAGGCTGCCGGTCAGGGTGCAGGTC
 AAGAGCAAATTGCCACTGCAAGTACTGTCAAGAAGATAAAACTATGCCAACTGCCAAAGGCGATGCGACCATCTCCCCATAT
 ACGACCTGGACCCCAAGCTGGAGATATTCAAGGACCATTCAGGTACCGGATGAAAAGATTCTAGAGCAGAAAGGATCAATTG
 AAGAAAATGAGGAAGTCTTGAATCTTTCTAAAGGCTATTGAAATTGGGATTAATACAATGAGGATGGAACGTGATATATC
 GTGAATGGGCACCTGCTGCCAGGAGGCAGAGCTTATTGGTACTTCAGCATGGATTCAATGACTGGAATGGTGCACACCATAAGATGGAAAAGG
 ATAAATTGGTGTGGTCGATCAAATTGACCATGTCAAAGGAAACCTGCCATCCCTACAATTCAAAGGTTAAATTGAGCTCCCTAT
 TCTACATGGTGGAGTATGGTTGATCGTATTCCAGCATGGATTCAATGCACTGTTGATGCCCTAAATTGGAGCTCC
 GATGGTGTTCATTGGGATCCTCCTGCTCTGAAAGGTACACATTAAAGCATCCTGCCCTCAAAGCCTGCTCCACGTATCT
 ATGAAGCCCATGTAGGTATGAGTGGTAAAAGCCAGCAGTAAGCACATATAGGAATTGAGACAAATGTGTTGCCACGCATAC
 GAGCAAATAACTACAACACAGTTCAGTTGATGGCAGTTATGGAGCATTGCTACTATGCTTCTTGGGTACCATGTGACAAATT
 CTTGCGGTTAGCAGCAGATCAGGCACACCAGAGGACCTCAAATATCTTGGTATAAGGCACACAGTTGGGTTGCGAGTTCTG
 ATGGATGTTGTCATGCCATGCAAGTAATAATGTCACAGATGGTTAAATGGCTATGATGTTGGACAAAGCACCCAAGAGTCC
 TATTTTCTAGCGGGAGATAGAGGTTATCATAAACTTGGGATAGTCGGCTGTTCAACTATGCTAAGTGGAGGTATTAAGGTT
 CTTCTTCTAACCTGAGATATTGGTTGGATGAATTCATGTTGATGGCTCCGATTGATGGAGTTACATCAATGCTGTATCATC
 ACCATGGTATCAATGTGGGTTACTGGAAACTACCAGGAATATTCAAGTTGGACACAGCTGTGGATGCAAGTTACATGA

TGCTTGAAACCATTAAATGCACAAACTCTGCCAGAACGCAACTGTTGCTGAAGATGTTCAGGCATGCCGTCTTGCCG
 GCCAGTTGATGAAGGTGGGTTGGGTTGACTATCGCCTGGCAATGGCTATCCCTGATAGATGGATTGACTACCTGAAGAATAA
 AGATGACTCTGAGTGGTCATGGGTGAAATAGCGCATACCTTGACTAACAGGAGATATACTGAAAAATGCATCGCATATGCTGA
 GAGCCATGATCAGTCTATTGTTGGCGACAAAACATTGCATTCTCCTGATGGACAAGGAAATGTACACTGGCATGTCAGACTTG
 CAGCCTGCTTCACCTACAATTGATCGAGGGATTGCACTCCAAAAGATGATTCACTTCATCACAATGGCCCTGGAGGTGATGGCT
 ACTTGAATTTCATGGGAAATGAGTTGGTCACCCAGAAATGGATTGACTTCCAAGAGAAGGAAACAACGGAGCTATGATAAAAT
 GCAGACGACAGTGGAGCCTGTTGGACACTGATCACTTGCCTGACAAGTACATGAATGCGTTGACCAAGCGATGAATGCGCTCGA
 TGAGAGATTTCCCTTCGTCAAAGCAGATCGTCAGCGACATGAACGATGAGGAAAAGGTTATTGTCTTGAAACGTGG
 AGATTTAGTTTGTGTTCAATTCCATCCAAAGAAAACCTACGAGGGCTACAAAGTGGATGCGATTGCTGGAAATACAG
 AGTAGCCCTGGACTCTGATGCTCTGGCTTCGGTGGACATGGAAGAGTTGCCACGACGTGGATCACTCACGTCGCTGAAGGG
 GTGCCAGGGTGCCGAAACGAACCTCAACAACCGGCCAACCTGTTCAAAGTCCTTCTCCGCCCGCACCTGTTGGCTTATT
 ACCGTGTAGACGAAGCAGGGCTGGACGACGTCTCACCGCAAAGCAGAGACAGGAAAGACGTCTCAGCAGAGAGCATCGACG
 TCAAAGCTTCCAGAGCTAGTAGCAAAGAACAGGAGGCAACGGCTGGCAAGAAGGGATGGAAGTTGCGCGGCAGCCAT
 CCGATCAAGATAACAAATGA—

>CML_247

ATGCTGTGCCCTCGTGTGCCCTTCCCTGCCACTCCGCTTCCGCCGCCGGCGCTCGCTCGATGCTGATCGGGCGGCACC
 GCCGGGATCGCGGGTGGCGCAATGTGCGCCTGAGTGTGTTGCTGCAAGGCTGCCGGTCAGGGTGCAGGGTC
 AAGAGCAAATTGCCACTGCAGCTACTGCAAGAACGATAAAACTATGCCAAAGGCCATGTCGACCATCTCCCCATAT
 ACCACCTGGACCCCAAGCTGGAGATATTCAAGGACCATTCAGGTACCGGATGAAAAGATTCTAGAGCAGAAAGGATCAATTG
 AAGAAAATGAGGAAGTCTTGAATCTTTCTAAAGGCTATTGAAATTGGGATTAATACAAATGAGGATGGAACGTGATATATC
 GTGAATGGCACCTGCTGCCAGGAGCAGAGCTTATTGGTCAATGACTGGAATGGTCAAACCATAGATGGAGAAGG
 ATAAATTGGTGTGGTCATCAAATTGACCATGTCAAAGGAAACCTGCCATCCCTCACAAATTCAAAGGTTAAATTGAGCTCCCTAT
 TCTACATGGTGGAGTATGGTTGATCGTATTCCAGCATTGATTGTTATGCGACTGTTGATGCCCTAAATTGGAGCTCCCTAT
 GATGGTGTTCATTGGATCCTCCTGCTTGAAAGGTACACATTAAAGCATCCTGCCCTCAAAGCCTGCTGCCACGTATCT
 ATGAAGCCCATGTAGGTATGAGTGGTAAAAGCCAGCAGTAAGCACATATAGGAATTGCAAGACATGTGTTGCCACGCATAC
 GAGCAAATAACTACAAACACAGTTCAGTTGATGGCAGTTATGGAGCATTGTTACTATGCTTCTTGGGTACCATGTGACAAATT
 CTTGCCGGTTAGCAGCAGATCAGGCACACCAGAGGACCTCAAATATCTTGTGATAAGGCACACAGTTGGGTTGCGAGTTCTG
 ATGGATGTTGTCCATGCCATGCAAGTAATAATGTCACAGATGGTTAAATGGCTATGATGTTGGACAAAGCACCAAGAGTCC

TATTTCATGCGGGAGATAGAGGTTATCATAAACTTGGGATAGTCGGCTGTTCAACTATGCTAAGTGGGAGGTATTAAGGTT
 CTTCTTCTAACCTGAGATATTGGTTGGATGAATTCATGTTGATGGCTTCCGATTGATGGAGTTACATCAATGCTGTATCATC
 ACCATGGTATCAATGTGGGGTTACTGGAAACTACCAGGAATATTCAGTTGGACACAGCTGTGGATGCAGTTGTTACATGA
 TGCTTGCAAACCAATTAAATGCACAAACTCTTGGCAGAACGCAACTGTTGCTGAAGATGTTCAGGCATGCCGGTCCTTGCCG
 GCCAGTTGATGAAGGTGGGGTTGGGTTGACTATCGCCTGGCAATGGCTATCCCTGATAGATGGATTGACTACCTGAAGAATAA
 AGATGACTCTGAGTGGTCATGGGTGAAATAGCGCATACTTGACTAACAGGAGATATACTGAAAAATGCATCGCATATGCTGA
 GAGCCATGATCAGTCTATTGTTGGCGACAAAACATTGCATTCTCCTGATGGACAAGGAAATGTACACTGGCATGTCAGACTTG
 CAGCCTGCTTCACCTACAATTGATCGAGGGATTGCACTCCAAAAGATGATTCACTTCATCACAATGCCCTGGAGGTGATGGCT
 ACTTGAATTATGGAAATGAGTTGGTCACCCAGAACATGGATTGACTTCCAAGAGAACAGTGGAGCTATGATAAAAT
 GCAGACGACAGTGGAGCCTGTGGACACTGATCACTTGGGTACAAGTACATGAATGGTTGACCAAGCGATGAATGCGCTCGA
 TGAGAGATTTCCCTTCCTCGTCAAAGCAGATCGTCAGCGACATGAACGATGAGGAAAAGGTTATTGTCTTGAAACGTGG
 AGATTAGTTTGTGTTCAATTCCATCCAAAGAAAACCTACGAGGGCTACAAAGTGGATGCGATTGCTGGAAATACAG
 AGTAGCCCTGGACTCTGATGCTCTGGCTTCGGTGGACATGGAAGAGTTGCCACGACGTGGATCACTCACGTCGCTGAAGGG
 GTGCCAGGGGTGCCCGAAACGAACCTCAACAACCGGCCAACCTGTTCAAAGTCCTTCTCCGCCCGCACCTGTTGGCTTATT
 ACCGTGTAGACGAAGCAGGGCTGGACGACGTCTCACCGCAAAGCAGAGACAGGAAAGACGTCTCAGCAGAGAGCATCGACG
 TCAAAGCTTCCAGAGCTAGTAGCAAAGAACAGGAGGCAACGGCTGGCAAGAAGGGATGGAAGTTGCGCGGCAGCCAT
 CCGATCAAGATACCAAATGA—

>Bear_Island

ATGCTGTGCCCTCGTCGCCCTTCCCTGCCGACTCCGCTTCCGCCGCCGGCGCTCGCTCGATGCTGATCGGGCGGCACC
 GCCGGGATCGCGGGTGGCGCAATGTGCGCTGAGTGTGTTCTGTCAGTGCAAGGCTGCCGGTCAGGGGTGCGGAAGGTC
 AAGAGCAAATTGCCACTGCAACTGCAAGAACGATAAAACTATGCCAACTGCCAAAGCGATGTCGACCATCTCCCCATAT
 ACGACCTGGACCCCAAGCTGGAGATATTCAAGGACCATTCAGGTACCGGATGAAAAGATTCTAGAGCAGAAAGGATCAATTG
 AAGAAAATGAGGAAGTCTTGAATCTTTCTAAAGGCTATTGAAATTGGGATTAATACAAATGAGGATGGAAGTGTATATC
 GTGAATGGCACCTGCTGCCAGGAGGCAGAGCTTATTGGTGAATTCAATGACTGGAATGGTGCACCGATAAGATGGAGAAGG
 ATAAATTGGTGGTGTGATCAAAGGAAACCTGCCATCCCTCACAATTCAAAGGTTAAATTGGAGCTCCCTAT
 TCTACATGGTGGAGTATGGGTGATCGTATTCCAGCATGGATTGTTATGCACTGTTGATGCCCTAAATTGGAGCTCCCTAT
 GATGGTGTTCATTGGGATCCTCCTGCTTCTGAAAGGTACACATTAAAGCATCCTGCCCTCAAAGCCTGCTGCCACGTATCT
 ATGAAGCCCATGTAGGTATGAGTGGTAAAAGCCAGCAGTAAGCACATAGGAAATTGCAAGACAATGTGTTGCCACGCATAC

GAGCAAATAACTACAACACAGTTGATGGCAGTTATGGAGCATTGCTACTATGCTTCTTCGGGTACCATGTGACAAATT
 CTTGCGGTTAGCAGCAGATCAGGCACACCAGAGGACCTCAAATATCTTGTTGATAAGGCACACAGTTGGGTTGCGAGTTCTG
 ATGGATGTTGTCATGCCATGCAAGTAATAATGTCACAGATGGTTAAATGGCTATGATGTTGGACAAAGCACCCAAGAGTCC
 TATTTTCAATGCGGGAGATAGAGGTTATCATAAACTTGGGATAGTCGGCTGTTCAACTATGCTAATGCTGGAGGTATTAAGGTT
 CTTCTTCTAACCTGAGATATTGGTGGATGAATTGATGTTGATGGCTTCCGATTGATGGAGTTACATCAATGCTGTATCATC
 ACCATGGTATCAATGTGGGTTACTGGAAACTACCAGGAATATTCAGTTGGACACAGCTGTGGATGCAGTTGTTACATGA
 TGCTTGCAAACCAATTAAATGCACAAACTCTTGGCAGAACGCAACTGTTGCTGAAGATGTTCAGGCATGCCGGTCCTTGCG
 GCCAGTTGATGAAGGTGGGTTGGGTTGACTATGCCCTGGCAATGGCTATCCCTGATAGATGGATTGACTACCTGAAGAATAA
 AGATGACTCTGAGTGGTCATGGGTGAAATAGCGCATACTTGACTAACAGGAGATATACTGAAAAATGCATCGCATATGCTGA
 GAGCCATGATCAGTCTATTGTTGGCACA AAAACTATTGCATTCTCCTGATGGACAAGGAAATGTACACTGGCATGTCAGACTTG
 CAGCCTGCTTCACCTACAATTGATCGAGGGATTGCACTCCAAAAGATGATTCACTTCATCACAATGCCCTGGAGGTGATGGCT
 ACTTGAATTTATGGAAATGAGTTGGTCACCCAGAATGGATTGACTTCCAAGAGAAGGAAACTGGAGCTATGATAAAAT
 GCAGACGACAGTGGAGCCTGTGGACACTGATCACTTGGGTACAAGTACATGAATGGCTTGACCAAGCGATGAATGCCCTG
 TGAGAGATTTCCTTCCTCGTCAAAGCAGATCGTCAGCGACATGAACGATGAGGAAAAGGTTATTGTCTTGAAACGTGG
 AGATTAGTTTTGTTTCAATTCCATCCAAAAGAAAACTTACGAGGGCTACAAAGTGGATGCGATTGCTGGAAATACAG
 AGTAGCCCTGGACTCTGATGCTCTGGCTTCGGTGGACATGGAAGAGTTGCCACGACGTGGATCACTCACGTCGCCCTGAAGGG
 GTGCCAGGGGTGCCGAAACGAACTTCAACAACCGGCCAACCGTCAAAGTCCATTCTCCGCCACCTGTGTGGCTTATT
 ACCGTGTAGACGAAGCAGGGCTGGACGACGTCTCACCGCAAAGCAGAGACAGGAAAGACGTCTCAGCAGAGAGCATCGACG
 TCAAAGCTTCCAGAGCTAGCAAAGAACAGAGCAACGGCTGGCAAGAACGGATGGAAGTTGCCGGCAGCCAT
 CCGATCAAGATAACCAAATGA—

>B73

ATGCTGTGCCCTCGTGTGCCCTTCCCTGCCACTCCGCTTCCGCCGCCGGCTCTGCTCGATGCTGATCGGGCGGCACC
 GCCGGGATCGCGGGTGGCGCAATGTGCGCCTGAGTGTGTTCTGTCAGTGCAAGGCTGCCGGTCAGGGGTGCGGAAGGTC
 AAGAGCAAATTGCCACTGCAAGTAAAGATAAAACTATGCCAACTGCCAAAGGCGATGCGACCATCTCCCCATAT
 ACCACCTGGACCCCAAGCTGGAGATATTCAAGGACCATTCAGGTACCGGATGAAAAGATTCTTAGAGCAGAAAGGATCAATTG
 AAGAAAATGAGGAAGTCTTGAATCTTTCTAAAGGCTATTGAAATTGGGATTAATACAAATGAGGATGGAACGTGATATATC
 GTGAATGGGCACCTGCTGCCAGGAGGCAGAGCTTATTGGTGAATTCAATGACTGGAATGGTGCACAAACCATAAGATGGAGAAGG
 ATAAATTGGTGTGGTCATCAAATTGACCATGTCAAAGGAAACCTGCCATCCCTACAATTCCAAGGTTAAATTGCTT

TCTACATGGTGGAGTATGGGTTGATCGTATTCCAGCATTGATTGCTATGCGACTGTTGATGCCTCTAAATTGGAGCTCCCTAT
GATGGTGTTCATGGGATCCTCCTGCTTCTGAAAGGTACACATTAAAGCATCCTCGGCCTCAAAGCCTGCTGCCACGTATCT
ATGAAGCCCAGTAGGTATGAGTGGTAAAAGCCAGCAGTAAGCACATATAGGAATTGAGCAGACATGTGTTGCCACGCATAC
GAGCAAATAACTACAACACAGTCAGTTGATGGCAGTTATGGAGCATTGCTACTATGCTTCTTCGGGTACCATGTGACAAATT
CTTGCGGTTAGCAGCAGATCAGGCACACCAGAGGACCTCAAATATCTTGTTGATAAGGCACACAGTTGGGTTGCGAGTTCTG
ATGGATGTTGTCATAGCCATGCAAGTAATAATGTCACAGATGGTTAAATGGCTATGATGTTGGACAAAGCACCCAAGAGTCC
TATTTCATGCGGGAGATAGAGGTTATCATAAACTTGGGATAGTCGGCTGTTCAACTATGCTAAGTGGAGGTATTAAGGTT
CTTCTTCTAACCTGAGATATTGGTGGATGAATTCATGTTGATGGCTTCCGATTGATGGAGTTACATCAATGCTGTATCATC
ACCATGGTATCAATGTGGGTTACTGGAAACTACCAGGAATATTCAGTTGGACACAGCTGTGGATGCAGTTGTTACATGA
TGCTTGCAAACCAATTAAATGCACAAACTCTTGCAGAACGCAACTGTTGCTGAAGATGTTCAGGCATGCCGGTCCTTGCG
GCCAGTTGATGAAGGTGGGTTGGGTTGACTATCGCCTGGCAATGGCTATCCCTGATAGATGGATTGACTACCTGAAGAATAA
AGATGACTCTGAGTGGTCGATGGGTGAAATAGCGCATACTTGACTAACAGGAGATATACTGAAAAATGCATCGCATATGCTGA
GAGCCATGATCAGTCTATTGTTGGCGACAAAACTATTGCATTTCTCCTGATGGACAAGGAAATGTACACTGGCATGTCAGACTTG
CAGCCTGCTTCACCTACAATTGATCGAGGGATTGCACTCCAAAAGATGATTCACTTCATCACAATGCCCTGGAGGTGATGGCT
ACTTGAATTATGGAAATGAGTTGGTCACCCAGAATGGATTGACTTCCAAGAGAAGGAAACAACGGCTATGATAAAAT
GCAGACGACAGTGGAGCCTGTCGACACTGATCACTTGGGTACAAGTACATGAATGGTTGACCAAGCGATGAATGCCCTCGA
TGAGAGATTTCTCCTTCGTCAAAGCAGATCGTCAAGGAAACTTACGAGGGCTACAAAGTGGATTGCGATTTGCCCTGGAAATACAG
AGATTAGTTTTGTTCAATTCCATCCAAGAAAACTACGAGGGCTACAAAGTGGATTGCGATTTGCCCTGGAAATACAG
AGTAGCCCTGGACTCTGATGCTCTGGCTTCGGTGGACATGGAAGAGTTGCCACGACGTGGATCACTTCACGTCGCCCTGAAGGG
GTGCCAGGGGTGCCCGAAACGAACCTCAACAAACCGGCCAACCTGTTCAAAGTCCTTCTCCGCCCGCACCTGTTGGCTTATT
ACCGTGTAGACGAAGCAGGGCTGGACGACGTCTCACCGCAAAGCAGAGACAGGAAAGACGTCTCCAGCAGAGAGCATCGACG
TCAAAGCTTCCAGAGCTAGTAGCAAAGAACAGAAGGAGGCAACGGCTGGCAAGAAGGGATGGAAGTTGCCGGCAGCCAT
CCGATCAAGATAACCAAATGA--