LOCUS Cinnamomum 152570 bp DNA circular 16-MAY-2017

DEFINITION Cinnamomum camphora chloroplast, complete genome.

ACCESSION

VERSION

KEYWORDS .

SOURCE chloroplast Cinnamomum camphora

 ORGANISM Cinnamomum camphora

 Eukaryota; Viridiplantae; Streptophyta; Embryophyta;

 Tracheophyta;Spermatophyta; Magnoliophyta; Magnoliidae; Laurales;

 Lauraceae;Cinnamomum.

REFERENCE 1 (bases 1 to 152570)

 AUTHORS Chen,C.

 TITLE direct submission

 JOURNAL Unpublished

REFERENCE 2 (bases 1 to 152570)

 AUTHORS Chen,C.

 TITLE Direct Submission

 JOURNAL Submitted (16-MAY-2017) Nanjing Forestry University, Co-Innovation

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FEATURES Location/Qualifiers

 source 1..152570

 /organism="Cinnamomum camphora"

 /organelle="plastid:chloroplast"

 /mol\_type="genomic DNA"

 CDS complement(join(100931..100957,101494..101724,

 73307..73420))

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 misc\_feature 1..93705

 /note="LSC"

 gene complement(30..104)

 /gene="trnH-GUG"

 tRNA complement(30..104)

 /gene="trnH-GUG"

 /product="tRNA-His"

 /note="anticodon:GUG"

 gene complement(499..1560)

 /gene="psbA"

 CDS complement(499..1560)

 /gene="psbA"

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 DEWLYNGGPYELIVLHFLLGVACYMGREWELSFRLGMRPWIAVAYSAPVAAATAVFLI

 YPIGQGSFSDGMPLGISGTFNFMIVFQAEHNILMHPFHMLGVAGVFGGSLFSAMHGSL

 VTSSLIRETTENESANAGYRFGQEEETYNIVAAHGYFGRLIFQYASFNNSRSLHFFLA

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 VVVEIPFSLRLVSSLEEKEIAKSHNLRSIHSIFPFFEDKLSHLNHVSDILIPHPIHLE

 ILVQTLHSWIQDTPSLHLLRFSLYEYWNSNSLITPKNSISLFSKENQRFFLFLSNSHV

 YECEFIFIFLRKQPFHLRSKSFGSFLERTHFYAKIEYLVVVLCNDFQKTLWLFKDPFM

 HYVRYQGKSILASRGARLLIKKWKSHLVNFWQCHFYLWSQPARIHIKQLYNHPFYFLG

 YLSSVRLNSSVIRSQMLENSFRIDTAIKKFETVVPIIPLIGSLAKAKFCNVSGHPISK

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 gene complement(4344..4380)

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 /note="anticodon:UUU"

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 exon complement(6274..6314)

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 gene complement(8207..8279)

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 tRNA complement(8207..8279)

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 /product="tRNA-Gln"

 /note="anticodon:UUG"

 gene 8615..8794

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 CDS 8615..8794

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 FFLLALVWQAAVSFR"

 gene 9178..9288

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 CDS 9178..9288

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 tRNA complement(9427..9514)

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 /product="tRNA-Ser"

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 gene 11116..11152

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 gene 11278..11349

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 /note="anticodon:UCU"

 gene complement(11462..12985)

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 CDS complement(11462..12985)

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 /product="ATP synthase CF1 alpha subunit"

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 AYLGRVINALAKPIDGRGEISASESRLIESPAPGIISRRSVYEPLQTGLIAIDSMIPI

 GRGQRELIIGDRQTGKTAVATDTILNQKGQNVICVYVAIGQKASSVAQVVTTFQERGA

 MEYTIVVAETADSPATLQYLAPYTGAALAEYFMYRERHTSIIYDDLSKQAQAYRQMSL

 LLRRPPGREAYPGDVFYLHSRLLERAAKSSSRLGEGSMTALPIVETQSGDVSAYIPTN

 VISITDGQIFLSADLFNAGIRPAINVGISVSRVGSAAQIKAMKQVAGKSKLELAQFAE

 LEAFAQFASDLDKATQNQLARGQRLRELLKQSQSAPLTVEEQIVTIYTGANGYLDPLE

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 gene complement(13055..14335)

 /gene="atpF"

 CDS complement(join(13055..13465,14192..14335))

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 /product="ATP synthase CF0 subunit I"

 /translation="MRDVTDSFVSFGHWPSAGSFGFNTDILATNLINLSVVLGVLIFF

 GKGVLSDLLDNRKQRILSTIRNSEELREGAIEQLEEARARLRKVEIEADEFRVNGYSE

 IEREKWNLINATYENLERLENYKNETIHFEQQRAINQVRQRVFQQALQGALGTLNSCS

 NSELHLRTIGANIGMLGAMKEVTD"

 exon complement(13055..13465)

 /gene="atpF"

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 gene complement(14788..15033)

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 CDS complement(14788..15033)

 /gene="atpH"

 /codon\_start=1

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 /product="ATP synthase CF0 subunit III"

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 AEGKIRGTLLLSLAFMEALTIYGLVVALALLFANPFV"

 gene complement(15698..16441)

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 CDS complement(15698..16441)

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 /product="ATP synthaseCF0 subunit IV"

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 VVIAILLGSATIAVRNPQTIPTDGQNFFEYVLEFIRDLSKTQIGEEYGPWVPFIGTMF

 LFIFVSNWSGALLPRKIIQLPHGELAAPTNDINTTVALALPTSVAYFYAGLTKKGLGY

 FGKYIQPTPILLPINILEDFTKPLSLSFRLFGNILADELVVVVLVSLVPSVVPIPVMF

 LGLFTSGIQALIFATLAAAYIGESMEGHH"

 gene complement(16649..17368)

 /gene="rps2"

 CDS complement(16658..17368)

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 TNLTRTARFLSEACDLVFDAASIGKHFLIVGTKNKAANLVASAAIRARCHYVNKKWLG

 GMLTNWSTTEMRLHRFRNLRSEQNTGKLNCLPKRDVAMLKRQLSHLQTYLGGIKYMTG

 LPDIVIIVGQQEEYTALRECLTLRIPTICLIDTNCDPDLANIPIPANDDAMASIRWIL

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 gene complement(17541..21707)

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 CDS complement(17541..21698)

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 IWYATSEYLRQEMHPNFRMTDPSNSVHIMSFSGARGNASQVHQLVGMRGLMSDPQGQM

 IDLPIQSNLREGLSLTEYIISCYGARKGVVDTAVRTSDAGYLTRRLVEVVQHIVVRRT

 DCGTTRGISVSPRNGMTERIWVQTLIGRVLAYNIYMGPRCIAAQNKDIGVGLVTRFIT

 FRTQPIYIRTPFLCRSISWICRLCYGQSPTHGDLVELGEAVGIIAGQSIGEPGTQLTL

 RTFHTGGVFTGGTAEHVRAPFKGKIKFNEDLVHPTRTRHGHPAFLCYIDLYVTIESHD

 ILHNVNIPPKSFLLVQNDQYVESEQVIAEIRAGTSTFNFNKVKEKVRKHIYSDSEGEM

 HWSTDVYHAPEYKYGNVHLLPKTSHLWILSGALCRSSIVPFSLHKDQDQMNVHSVERR

 SISDLSVTNDQVRHKLFSSNPYGKKGGVLDYSGPDRIISNGHWNFIYPTILHENSDLL

 AKRRRNRFIIPFQSDQEREKELMPRSGISIEIPINGVLPRNSILAYFDDPLYRRSSSG

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 NSIIGVDTRIALNTRSQVGGLVRVERKKKRIELKIFSGDIYFPGATDKISRHCGILIP

 PGTGKKNSKESKKLKNWIYVQRITPTKKKYFVSVRPVVTYEIADGINLATLFPQDPLQ

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 RANDLIRDFIRIDLVKSSIFYIGKRNDMASSGLIANNGSDRTNINPFYFKARIQSFTQ

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 PLGIVPQITNFYSFYYFYLITHNQILLKKYFLLDNFKHTFQGLKYYLMDENGRIYNPD

 SCSNIIFNPFDLNWCFLPHDYCEETSTIISLGQFICENVCISKCGPHIKSSQVLIVHV

 DSLVIRSAKPHLATPGATVHGHCGEILYEGDTLVTFIYEKSRSGDITQGLPKVEQVLE

 ARSIDSISMNLEKRVEGWNERITRILGIPWGFLIGAELTIAQSRISLVNKIQKVYRSQ

 GVQIHNRHIEIIVRQITSKVLVSEDGMSNVFSPGELIGLLRAERTGRALEEAICYRAI

 LLGITRASLNTQSFISEASFQETARVLAKAALRGRIDWLKGLKENVVLGGMMPVGTGF

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 gene complement(21860..24630)

 /gene="rpoC1"

 CDS complement(join(21860..23479,24199..24630))

 /gene="rpoC1"

 /codon\_start=1

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 /product="RNA polymerase beta"

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 QMGYIKLACPATHVWYLKRLPSYIANLLDKPLKELEGLVYCDFSFARPIAKKPTFLRL

 RGSFESEIQSRKYSIPLFFTTPGFDTFRNREISTGAGAIREQLADPDLRIIIDHSSVE

 WKELGEEGFTGNEWEDRKIGRRKDFLVRRMELAKHFIRTNVEPERMVLCLLPVLPPEL

 RPIIQIDGGKLMSSDINELYRRVIYRNNTLTDSLTTSRSTPGELVMCQEKLVQEAVDT

 LLDNGIRGQPMRDGHNKVYKSFSDVIEGKEGRFRETLLGKRVDYSGRSVIVVGPSLSL

 HRCGLPREIAIELFQTFVIRGLIRRHIASNIGIAKSQIREKEPIVWEILQEVMQGHPV

 LLNRAPTLHRLGIQAFQPILGGGRAICLHPLVRKGFNADFDGDQMAVHVPLSLEAQAE

 ARLLMFSHMNLFSPAIGDPISVPTQDMLIGLYVLTIGNRRGICANRYNPWNRINYQNE

 TVNDYKYKYTTKEKEPYFCSSYDVLIVYQQKRINLDSPLWLRWRLDQRVIASREVPVE

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 exon complement(21860..23488)

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 /number=2

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 GTSLVSGIYRIVINQILQSPGIYYRSELDHSGISVYTGTIISDWGGRSELEIDRKARI

 WARVSRKQKISILVPSSAMGSNLREILDNVCYPEIFLSFPNHKEKKKIGSRENAILEF

 YQQFACVGGDPVFSESLCKELQKKFFQQRCELGRIGRRNMNRRLNLDIPPNNTFLLPQ

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 LTGRTASFRIRDIHPSHYGRICPIDTSEGINVGLIGSLAIHARIGHWGSIESPFYEIS

 ERSKKMVYLSPSRDEYYMVAAGNSLALNRGIQEEQVVPAGYRQEFLTIAWEQIHLRSI

 FPFQYFSIGASLIPFIEHNDANRALMSSNMQRQAVPLSRSEKCIVGTGLECQAALDSG

 VSAIAEHEGKIIYTDTDKIVLSGNGDTISIPLVMYQRSNKNTCMHQKPQAPRGKCIKK

 GQILADGAATVGGELTLGKNVLVAHMSWEGYNSEDAVLISERLVYGDIYTSFHIRKYE

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 FECSLGLAGYLLDRHYRIAPFDERYEQGASRKLVFPELYSASKQTANPWVFEPEYPGK

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 QRVGEMEVWALEGFGVAHISQEMLTYKSDHIRARQEVLGTTIIGGTILKPEDAPESFR

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 gene 28984..29064

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 tRNA 28984..29064

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 gene 30111..30200

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 CDS 30111..30200

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 /product="cytochrome b6/f complex subunit VIII"

 /translation="MDIVSLAWAALMVVFTFSLSLVVWGRSGL"

 gene complement(31265..31369)

 /gene="psbM"

 CDS complement(31265..31369)

 /gene="psbM"

 /codon\_start=1

 /transl\_table=11

 /product="photosystem II protein M"

 /translation="MEVNILAFIAIALFILVPTAFLLIIYVKTVSQSD"

 gene complement(32329..32402)

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 tRNA complement(32329..32402)

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 /product="tRNA-Asp"

 /note="anticodon:GUC"

 gene complement(32716..32799)

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 tRNA complement(32716..32799)

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 /product="tRNA-Tyr"

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 tRNA complement(32854..32926)

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 /product="tRNA-Glu"

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 gene 33650..33721

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 tRNA 33650..33721

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 gene 35168..36229

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 CDS 35168..36229

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 TRWCQLGGLWTFVALHGAFGLIGFMLRQFELARSVQLRPYNAIAFSAPIAVFVSVFLI

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 VENTLFEDGDGANTFRAFNPTQAEETYSMVTANRFWSQIFGVAFSNKRWLHFFMLFVP

 VTGLWMSAIGVVGLALNLRAYDFVSQEIRAAEDPEFETFYTKNILLNEGIRAWMAAQD

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 gene 36177..37598

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 CDS 36177..37598

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 /codon\_start=1

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 /product="photosystemII CP43 chlorophyll apoprotein"

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 LSGKLLGAHVAHAGLIVFWAGAMNLFEVAHFVPEKPMYEQGLILLPHLATLGWGVGPG

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 LGIHLILLGIGAFLLVLKALYFGGVYDTWAPGGGDVRKISNLTLSPSVIFGYLLKSPF

 GGEGWIVSVDDLEDIIGGHVWLGSICILGGIWHILTKPFAWARRAFVWSGEAYLSYSL

 GALSVFGFIACCFVWFNNTAYPSEFYGPTGPEASQAQAFTFLVRDQRLGANVGSAQGP

 TGLGKYLMRSPTGEVIFGGETMRFWDLRAPWLEPLRGPNGLDLSRLKKDIQPWQERRS

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 AAAGFEKGIDRDFEPVLSMTPLN"

 gene complement(37813..37905)

 /gene="trnS-UGA"

 tRNA complement(37813..37905)

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 /product="tRNA-Ser"

 /note="anticodon:UGA"

 gene 38227..38415

 /gene="psbZ"

 CDS 38227..38415

 /gene="psbZ"

 /codon\_start=1

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 /product="photosystem II protein Z"

 /translation="MTIAFQLAVFALIATSSILLISVPVVFASSDGWSSNKNVVFSGT

 SLWIGLVFLVAILNSLIS"

 gene 38691..38761

 /gene="trnG-UCC"

 tRNA 38691..38761

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 /product="tRNA-Gly"

 /note="anticodon:UCC"

 gene complement(38921..38994)

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 gene complement(39149..39451)

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 CDS complement(39149..39451)

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 /product="ribosomal protein S14"

 /translation="MARKSLIQRERKKQKLEQKYHLIRRSSKKEIGKVSSLSDKWEIH

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 CDS complement(39582..41786)

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 /translation="MALRFPKFSQGLAQDPTTRRIWFGIATAHDFESHDDITEERLYQ

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 PQGLGPLFTGQWNLYAQNPDSSRHLFGTSQGAGTAILTLLGGFHPQTQSLWLTDIAHH

 HLAIAFIFLVAGHMYRTNFGIGHSMKDLLEAHIPPGGRLGRGHKGLYDTINNSIHFQL

 GLALASLGVITSLVAQHMYSLPAYAFIAQDFTTQAALYTHHQYIAGFIMTGAFAHGAI

 FFIRDYNPEQNEDNVLARMLDHKEAIKSHLSWASLFLGFHTLGLYVHNDVMLAFGTPE

 KQILIEPIFAQWIQSAHGKTSYGFDVLLSSTNGPAFNAGRSIWLPGWLNAVNENSNSL

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 TCDISAWDAFYLAVFWMLNTIGWVTFYWHWKHITLWQGNVSQFNESSTYLMGWLRDYL

 WLNSSQLINGYNPFGMNSLSVWAWMFLFGHLVWAIGFMFLISWRGYWQELIETLAWAH

 ERTPLANLIRWRDKPVALSIVQARLVGLAHFSVGYIFTYAAFLIASTSGKFG"

 gene complement(41812..44064)

 /gene="psaA"

 CDS complement(41812..44064)

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 IGALVFAALMLFAGWFHYHKAAPKLAWFQDVESMLNHHLAGLLGLGSLSWAGHQVHVS

 LPINQFLDAGVDPKEIPLPHEFILNRDLLAQLYPSFAEGSTPFFTLNWSKYAEFLSFR

 GGLDPVTGGLWLTDIAHHHLAIAILFLVAGHMYRTNWGIGHGLKDILEAHKGPFTGQG

 HKGLYEILTTSWHAQLSLNLAMLGSSTIVVAHHMYSMPPYPYLAIDYGTQLSLFTHHM

 WIGGFLIVGAAAHAAIFMVRDYDPTTRYNDLLDRVLRHRDAIISHLNWVCIFLGFHSF

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 GGDLVAVGGKVALLPIPLGTADFLVHHIHAFTIHVTVLILLKGVLFARSSRLIPDKAN

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 VVTHITGGNFAQSSITINGWLRDFLWAQASQVIQSYGSSLSAYGLFFLGAHFVWAFSL

 MFLFSGRGYWQELIESIVWAHNKLKVAPATQPRALSIVQGRAVGVTHYLLGGIATTWA

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 gene complement(44705..46677)

 /gene="ycf3"

 CDS complement(join(44705..44857,45589..45816,46552..46677))

 /gene="ycf3"

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 /product="photosystem I assembly protein ycf3"

 /translation="MPRSRINGNFIDKTSSIVANILLRIIPTTSGEKEAFTYYRDGMS

 AQSEGNYAEALQNYYEATRLEIDPYDRSYILYNIGLIHTSNGEHTKALEYYFRAIERN

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 exon complement(44708..44857)

 /gene="ycf3"

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 exon complement(45589..45816)

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 /number=2

 exon complement(46552..46677)

 /gene="ycf3"

 /number=1

 gene 47488..47574

 /gene="trnS-GGA"

 tRNA 47488..47574

 /gene="trnS-GGA"

 /product="tRNA-Ser"

 /note="anticodon:GGA"

 gene complement(47854..48459)

 /gene="rps4"

 CDS complement(47854..48459)

 /gene="rps4"

 /codon\_start=1

 /transl\_table=11

 /product="ribosomal protein S4"

 /translation="MSRYRGPRFKKIRCLGALPGLTSKRPRSGSDLRNQSRFGKRSQY

 RIRLEEKQKLRFHYGLTERQLLRYVRIAGKAKGSTGQVLLQLLEMRLDNILFRLGMAS

 TIPGARQLVNHRHILVNGRVVDIPSYRCKPRDIITARDEQRSRALIQNYLDSSPREDL

 AKHLTFDSSQYKGLVNQIIDIKWIGLKINEFLVVEYYSRQT"

 gene complement(48799..48871)

 /gene="trnT-UGU"

 tRNA complement(48799..48871)

 /gene="trnT-UGU"

 /product="tRNA-Thr"

 /note="anticodon:UGU"

 gene 49420..49454

 /gene="trnL-UAA"

 tRNA 49420..49454

 /gene="trnL-UAA"

 /product="tRNA-Leu"

 /note="anticodon:UAA"

 gene 49934..49983

 /gene="trnL-UAA"

 tRNA 49934..49983

 /gene="trnL-UAA"

 /product="tRNA-Leu"

 /note="anticodon:UAA"

 gene 50331..50403

 /gene="trnF-GAA"

 tRNA 50331..50403

 /gene="trnF-GAA"

 /product="tRNA-Phe"

 /note="anticodon:GAA"

 gene complement(50935..51411)

 /gene="ndhJ"

 CDS complement(50935..51411)

 /gene="ndhJ"

 /codon\_start=1

 /transl\_table=11

 /product="NADH-plastoquinone oxidoreductase subunit J"

 /translation="MQGRSSAWLVKHELVHRSLGFDYQGRETLQIKPEDWYSIAVISY

 VYGYNYLRFQCAYDVAPGGFLASVYHLTRIQYGVDQPEEVCIKVFVPRRNPRIPSVFW

 IWKSADFQERESYDMLGISYENHPRLKRILMPESWVGWPLRKDYIAPNFYEIQDAH"

 gene 51511..52368

 /gene="ndhK"

 CDS complement(51511..52368)

 /codon\_start=1

 /transl\_table=11

 /product="NADH-plastoquinone oxidoreductase subunit K"

 /translation="MGNEFRCIGCICVYRSFNFRAYPNCWFSLCMAKRSIGMVLAPEY

 SDNQNQKEGKDYIETVMNSIEFPLLDRTAQNSVISTTSNDLSNWSRLSSLWPLLYGTS

 CCFIEFASLIGSRFDFDRYGLVPRSSPRQADLILTAGTVTMKMAPSLVRLYEQMPEPK

 YVIAMGACTITGGMFSTDSYSTVRGVDKLIPVDVYLPGCPPKPEAVIDAITKLRKKVS

 REIYEDRIGSQQENRYFTTNHKFHVGHSTHTGNYDQGLLYQSPSTSEIPSETFFKYKS

 SVSSPKLMN"

 gene complement(52248..52610)

 /gene="ndhC"

 CDS complement(52248..52610)

 /gene="ndhC"

 /codon\_start=1

 /transl\_table=11

 /product="NADH-plastoquinone oxidoreductase subunit 3"

 /translation="MFLLHEYDIFWAFLIISSVIPILAFLISGVLAPISEGPEKLSSY

 ESGIEPMGDAWLQFRIRYYMFALVFVVFDVETVFLYPWAMSFDVLGVSVFIEALIFVL

 IPIVGSVYAWRKGALEWS"

 gene complement(52256..52257)

 CDS complement(52261..52275)

 /gene="ndhC"

 /pseudo

 /codon\_start=1

 /transl\_table=11

 /product="noproductstringinfile"

 gene complement(54463..54499)

 /gene="trnV-UAC"

 tRNA complement(54463..54499)

 /gene="trnV-UAC"

 /product="tRNA-Val"

 /note="anticodon:UAC"

 gene complement(55087..55125)

 /gene="trnV-UAC"

 tRNA complement(55087..55125)

 /gene="trnV-UAC"

 /product="tRNA-Val"

 /note="anticodon:UAC"

 gene 55305..55376

 /gene="trnM-CAU"

 tRNA 55305..55376

 /gene="trnM-CAU"

 /product="tRNA-Met"

 /note="anticodon:CAU; tRNA-Met2"

 gene complement(55605..56009)

 /gene="atpE"

 CDS complement(55605..56009)

 /gene="atpE"

 /codon\_start=1

 /transl\_table=11

 /product="ATP synthase CF1 epsilon subunit"

 /translation="MTLNLCVLTPNRIIWDSEVKEIILSTNSGQIGVLPNHAPIATAV

 DIGILRIRLNDQWLTMAVMGGFARIGNNEITILVNDAEKGSDIDPQEAQRTLEIAEAN

 LSRAEGKRQAIEANLALRRARTRVEAINVISY"

 gene complement(56006..57502)

 /gene="atpB"

 CDS complement(56006..57502)

 /gene="atpB"

 /codon\_start=1

 /transl\_table=11

 /product="ATP synthase CF1 beta subunit"

 /translation="MRINPTNSGPGVSTLEEKNLGRIAQIIGPVLDVAFPPGKMPNIY

 NALVVKGRDTVGQQINVTCEVQQLLGNNRVRAVAMSATDGLMRGMEVIDTGAPLSVPV

 GGATLGRIFNVLGEPVDNLGPVDTRTTSPIHRSAPAFIQLDTKLSIFETGIKVVDLLA

 PYRRGGKIGLFGGAGVGKTVLIMELINNIAKAHGGVSVFGGVGERTREGNDLYMEMKE

 SGVINEQNIAESKVALVHGQMNEPPGARMRVGLTALTMAEYFRDVNEQDVLLFIDNIF

 RFVQAGSEVSALLGRMPSAVGYQPTLSTEMGSLQERITSTKEGSITSIQAVYVPADDL

 TDPAPATTFAHLDATTVLSRGLAAKGIYPAVDPLDSTSTMLQPRIVGEEHYETAQRVK

 QTSQRYKELQDIIAILGLDELSEEDRLTVARARKIERFLSQPFFVAEVFTGSPGKYVG

 LTETIRGFQLILSGELDGLPEQAFYLVGNIDEATAKAMNLEVESKLKK"

 gene 58257..59684

 /gene="rbcL"

 CDS 58257..59684

 /gene="rbcL"

 /codon\_start=1

 /transl\_table=11

 /product="ribulose-15-bisphosphate carboxylase/oxygenase

 large subunit"

 /translation="MSPKTETKASVGFKAGVKDYKLTYYTPDYETKDTDILAAFRVTP

 QPGVPPEEAGAAVAAESSTGTWTTVWTDGLTSLDRYKGRCYHIEPVPGEETQFIAYVA

 YPLDLFEEGSVTNMFTSIVGNVFGFKALRALRLEDLRIPPAYSKTFQGPPHGIQVERD

 KLNKYGRPLLGCTIKPKLGLSAKNYGRAVYECLRGGLDFTKDDENVNSQPFMRWRDRF

 VFCAEAIYKAQAETGEIKGHYLNATAGTCEEMIKRAVFARELGVPIVMHDYLTGGFTA

 NTTLAHYCRDNGLLLHIHRAMHAVIDRQKNHGMHFRVLAKALRMSGGDHVHAGTVVGK

 LEGERDITLGFVDLLRDDFIEKDRSRGIYFTQDWVSMPGVLPVASGGIHVWHMPALTE

 IFGDDSVLQFGGGTLGHPWGNAPGAVANRVAVEACVQARNEGRDLAREGNEIIREAAK

 WSPELAAACEVWKEIKFEFAAMDTL"

 gene 60368..61879

 /gene="accD"

 CDS 60368..61879

 /gene="accD"

 /codon\_start=1

 /transl\_table=11

 /product="Acetyl-CoA carboxylase carboxyltransferase beta

 subunit"

 /translation="MGKWWFNSMLSNEELEHRCGLGKSMDSLGRPVGNTSGSEDPILN

 DTNKNNHNHGWRESNSCSNVDHFFGVRDIWSFISDDTFLVRDSNGNSYSVYFDIENRV

 FEIDNDSSFLSELETAFSSYLNSGSKSDNRYYDHYMYDTTYSWNNHINSCIDSYLRSE

 ISINKYISSGSDNPIYSYIYSYICSGESVSDSDRGSSSIRTGGNGSDFNIRGRSNDFD

 GNKKYRHLWVQCENCYGLNYKKFFRSKMNICEQCGYHLKMGSSDRIELSVDSGTWDPM

 DEDMVSIDPIEFHSEEEPYRDRINSYQRKTGLTEAVQTGIGQLNGIPIAIGVMDFQFM

 GGSMGSVVGEKITRLIEYAANRSLPVIMVCASGGARMQEGSLSLMQMAKISSALYDYQ

 FNKKLFYVSILTSPTTGGVTASFGMLGDIIIAEPNAYIAFAGKRVIEQTLNKTVPDGS

 QAAEYLFHKGLFDPIVPRNPLKGVLSELFQLHGFFPLNQNSSRALGSVICSEL"

 gene 62465..62575

 /gene="psaI"

 CDS 62465..62575

 /gene="psaI"

 /codon\_start=1

 /transl\_table=11

 /product="photosystem I subunit VIII"

 /translation="MTDFNLPSIFVPLVGLVFPAIAMASLSLHVQKNKIV"

 gene 63013..63567

 /gene="ycf4"

 CDS 63013..63567

 /gene="ycf4"

 /codon\_start=1

 /transl\_table=11

 /product="photosystem I assembly protein ycf4"

 /translation="MNYRSERIWIELITGSRKTSNFCWACILFLGSLGFLLVGTSSYL

 GRNLISLFPSQQIIFFPQGIVMSFYGIAGLFISSYLWCTISWNVGSGYDRFDRKEGIV

 CIFRWGFPGINRRIFLRFLMREIQSIRMEVKEGLYPRRVLYMEIRGQGAIPLTRTDEN

 LTPREIEQKAAELAYFLRVPIEVF"

 gene 64478..65167

 /gene="cemA"

 CDS 64478..65167

 /gene="cemA"

 /codon\_start=1

 /transl\_table=11

 /product="chloroplast envelope membrane protein"

 /translation="MSKKKALTPLPYLASIVFLPWWISLSFNKSLEPWVTNWWNTGQS

 ETFLNDIQEKNVLERFVELEQLFLLDEMIKEYPETQIQKLRIGIHKETMQLVKMHNED

 HIHIILDFSTNIICFAILSGYSILGNEELVILNSWVQEFLYNLSDTIKAFSILLLTDL

 CIGFHSPRGWELMIGSVYKDFGFAHNDQIISGLVSTFPVILDTILKYWIFHYLNRVSP

 SLVVIYHSMNE"

 gene 65390..66352

 /gene="petA"

 CDS 65390..66352

 /gene="petA"

 /codon\_start=1

 /transl\_table=11

 /product="cytochrome f"

 /translation="MQNRNTFSWVKKEMTRFISVLIMIYVITRTSISNAYPIFAQQGY

 ENPREATGRIVCANCHLANKPVDIEVPQAVLPDTVFEAVVRIPYDMQMKQVLANGKKG

 ALNVGAVLILPEGFELAPPDRISPELKEKMGNLSFQSYRPTKRNILVVGPVPGQKYSE

 IVFPILSPDPSTKKDVHFLKYPIYVGGNRGRGQIYPDGSKSNNTVYNATAAGIVSRIV

 RKEKGGYEISIADASDGHQVVDIIPPGPELLVSEGESIKLDQPLTSNPNVGGFGQGDA

 EIVLQDPLRVQGLLFFLASVILAQIFLVLKKKQFEKVQLSEMNF"

 gene complement(67516..67638)

 /gene="psbJ"

 CDS complement(67516..67638)

 /gene="psbJ"

 /codon\_start=1

 /transl\_table=11

 /product="photosystem II protein J"

 /translation="MADTTGRIPLWLIGTVTGIPVIGSIGIFFYGSYSGLGSSL"

 gene complement(67765..67881)

 /gene="psbL"

 CDS complement(67765..67881)

 /gene="psbL"

 /exception="RNA editing"

 /codon\_start=1

 /transl\_except=(pos:complement(67879..67881),aa:Met)

 /transl\_table=11

 /product="photosystem II protein L"

 /translation="MTQSNPNEQNVELNRTSLYWGLLLIFVLAVLFSNYFFN"

 gene complement(67904..68023)

 /gene="psbF"

 CDS complement(67904..68023)

 /gene="psbF"

 /codon\_start=1

 /transl\_table=11

 /product="photosystem II cytochrome b559 beta subunit"

 /translation="MTIDRTYPIFTVRWLAVHGLAVPTVSFLGSISAMQFIQR"

 gene complement(68033..68284)

 /gene="psbE"

 CDS complement(68033..68284)

 /gene="psbE"

 /codon\_start=1

 /transl\_table=11

 /product="photosystem II cytochrome b559 alpha subunit"

 /translation="MSGSTGERSFADIITSIRYWVIHSITIPSLFIAGWLFVSTGLAY

 DVFGSPRPNEYFTESRQGIPLITGRFDPLAQLDEFSRSF"

 gene 69552..69647

 /gene="petL"

 CDS 69552..69647

 /gene="petL"

 /codon\_start=1

 /transl\_table=11

 /product="cytochrome b6/f complex subunit VI"

 /translation="MTTITSYFGFLLAASTITPALLISLSKIRLI"

 gene 69822..69935

 /gene="petG"

 CDS 69822..69935

 /gene="petG"

 /codon\_start=1

 /transl\_table=11

 /product="cytochrome b6/f complex subunit V"

 /translation="MIEVFLFGIVLGLIPITLAGLFVTAYLQYRRGDQLDL"

 gene complement(70055..70128)

 /gene="trnW-CCA"

 tRNA complement(70055..70128)

 /gene="trnW-CCA"

 /product="tRNA-Trp"

 /note="anticodon:CCA"

 gene complement(70282..70355)

 /gene="trnP-UGG"

 tRNA complement(70282..70355)

 /gene="trnP-UGG"

 /product="tRNA-Pro"

 /note="anticodon:UGG"

 gene complement(70284..70354)

 /gene="trnP-GGG"

 tRNA complement(70284..70354)

 /gene="trnP-GGG"

 /product="tRNA-Pro"

 /note="anticodon:GGG"

 gene 70731..70865

 /gene="psaJ"

 CDS 70731..70865

 /gene="psaJ"

 /codon\_start=1

 /transl\_table=11

 /product="photosystem I subunit IX"

 /translation="MRDIKTYLSTAPVLTTLWFGSLAGLLIEINRLFPDALTFPFFSF

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 gene 71292..71492

 /gene="rpl33"

 CDS 71292..71492

 /gene="rpl33"

 /codon\_start=1

 /transl\_table=11

 /product="ribosomal protein L33"

 /translation="MAKGKDVRVVVILECTSCVRNGLNKESRGISRYITQKNRHNTPS

 QLDLKKFCPYCYKHTIHGEIKK"

 gene 71633..71938

 /gene="rps18"

 CDS 71633..71938

 /gene="rps18"

 /codon\_start=1

 /transl\_table=11

 /product="ribosomal protein S18"

 /translation="MDKSKRPFHKSKRSFHRRLPPIGSGDRIDYRNMSLINQFISEQG

 KILSRRVNRLTLKQQRLITIAIKQARILSSLPFLNNEKQFERTGSIPRTTGPRTRNK"

 gene complement(72196..72549)

 /gene="rpl20"

 CDS complement(72196..72549)

 /gene="rpl20"

 /codon\_start=1

 /transl\_table=11

 /product="ribosomal protein L20"

 /translation="MTRVRRRYIARRRRTKIRLFAATFRGAHSRLTRTTTQQKMRALV

 STHRDRGRRKRSFRRLWITRINAVTRENRGSHSYSRLILDLYKRQLLLNRKIPAQIAI

 SNRNCLDTISNAIIK"

 CDS join(complement(73307..73420),144824..145035,

 145534..145564)

 /trans\_splicing

 /codon\_start=1

 /transl\_table=11

 /product="ribosomal protein S12"

 /translation="MPTIKQLIRNTRQPIRNVTKSPALRGCPQRRGTCTRVYTITPKK

 PNSALRKVARVRLTSGFEITAYIPGIGHNSQEHSVVLVRGGRVKDLPGVRYHIVRGTL

 DAVGVKDNMGSKSQNK"

 misc\_feature join(complement(73307..73420),144824..145035,

 145534..145564)

 /note="trans-splicing"

 gene complement(73307..145560)

 /gene="rps12"

 gene complement(73557..75592)

 /gene="clpP"

 CDS complement(join(73557..73802,74458..74748,75524..75592))

 /gene="clpP"

 /codon\_start=1

 /transl\_table=11

 /product="clp protease proteolytic subunit"

 /translation="MPIGVPKVPFRSPGEEDAVWVDVNRLHRERLLFLGQEVDSEISN

 QLVGLMVYLSIEDDTRDLYLFINSPGGWVIPGIAIYDTMQFVPPDVHTICMGLAASMG

 SFILVGGEITKRLAFPHARVMIHQPASSFYEAPTGEFILEAEELLKLRETLTRVYVQR

 TGNPLWVVSEDMERDVFMSATEAQDYGIVDLVAIENTGDFA"

 exon complement(73557..73802)

 /gene="clpP"

 /number=3

 exon complement(74458..74748)

 /gene="clpP"

 /number=2

 exon complement(75524..75592)

 /gene="clpP"

 /number=1

 gene 76021..77547

 /gene="psbB"

 CDS 76021..77547

 /gene="psbB"

 /codon\_start=1

 /transl\_table=11

 /product="photosystem II CP47 chlorophyll apoprotein"

 /translation="MGLPWYRVHTVVLNDPGRLLSVHIMHTALVSGWAGSMALYELAV

 FDPSDPVLDPMWRQGMFVIPFMTRLGINNSWGGWSITGGTITNPGIWSYEGVAGAHIV

 FSGLCFLAAIWHWVYWDLEIFCDERTGKPSLDLPKIFGIHLFLSGVACFGFGAFHVTG

 LYGPGIWVSDPYGLTGKVQSVNPAWGAEGFDPFVPGGIASHHIAAGTLGILAGLFHLS

 VRPPQRLYKGLRMGNIETVLSSSIAAVFFAAFVVAGTMWYGSATTPIELFGPTRYQWD

 QGYFQQEIYRRVGASLAENLSLSEAWSKIPEKLAFYDYIGNNPAKGGLFRAGSMDNGD

 GIAVGWLGHPIFRDKEGHELFVRRMPTFFETFPVVLVDGDGIVRADVPFRRAESKYSV

 EQVGVTVEFYGGELNGVSYSDPATVKKYARRAQLGEIFELDRATLKSDGVFRSSPRGW

 FTFGHATFALLFFFGHIWHGARTLFRDVFAGIDPDLDAQVEFGAFQKLGDPTTRRQVV

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 gene 77725..77832

 /gene="psbT"

 CDS 77725..77832

 /gene="psbT"

 /codon\_start=1

 /transl\_table=11

 /product="photosystem II protein T"

 /translation="MEALVYTFLLVSTLGIIFFAIFFRDPPKVPTKKTK"

 gene complement(77891..78022)

 /gene="psbN"

 CDS complement(77891..78022)

 /gene="psbN"

 /codon\_start=1

 /transl\_table=11

 /product="photosystem II protein N"

 /translation="METATLVAISISGSLVSFTGYALYTAFGQPSQQLRDPFEEHGD"

 gene 78130..78351

 /gene="psbH"

 CDS 78130..78351

 /gene="psbH"

 /codon\_start=1

 /transl\_table=11

 /product="photosystemIIphosphoprotein"

 /translation="MATQTVEGSARSGPRRTITGDLLKPLNSEYGKVAPGWGTTPFMG

 VAMALFAIFLSIILEIYNSSVLLDGISMN"

 gene 79257..79904

 /gene="petB"

 CDS 79257..79904

 /gene="petB"

 /codon\_start=1

 /transl\_table=11

 /product="cytochrome b6"

 /translation="MSKVYDWFEERLEIQAIADDITSKYVPPHVNIFYCLGGITLTCF

 LVQVATGFAMTFYYRPTVTEAFASVQYIMTEANFGWLIRSVHRWSASMMVLMMILHVF

 RVYLTGGFKKPRELTWVTGVVLAVLTASFGVTGYSLPRDQIGYWAVKIVTGVPEAIPV

 IGSPLVELLRGSASVGQSTLTRFYSLHTFVLPLLTAVFMLMHFPMIRKQGISGPL"

 gene 80102..81300

 /gene="petD"

 CDS join(80102..80108,80819..81300)

 /gene="petD"

 /codon\_start=1

 /transl\_table=11

 /product="cytochromeb 6/f complex subunit IV"

 /translation="MGVPITKKPDLNDPVLRAKLAKGMGHNYYGEPAWPNDLLYIFPV

 VILGTIACNVGLAVLEPSMIGEPADPFATPLEILPEWYFFPVFQILRTVPNKLLGVLL

 MVLVPTGLLTVPFLENVNKFQNPFRRPVATTVFLIGTAAALWLGIGATLPIDKSLTLG

 LF"

 exon 80102..80108

 /gene="petD"

 /number=1

 exon 80819..81300

 /gene="petD"

 /number=2

 gene complement(81488..82507)

 /gene="rpoA"

 CDS complement(81488..82507)

 /gene="rpoA"

 /codon\_start=1

 /transl\_table=11

 /product="RNA polymerase alpha subunit"

 /translation="MVREEVAVSTRTLQWKCVESRTDSKRLYYGRFVLSPLMKGQADT

 IGIAMRKALLGEIEGTCITRAKSEKVSHEYSTIVGIEESVHEILMNLKEIVLRSNLYG

 TRDASICVRGPKYVTAQDIISPPSVELVDTTQHIANLTEPIHLCIEFKIERDRGYRMK

 SPNNYQDGSYPIDAVSMPVRNANHSIHSYGSENEKQEILFLEIWTNGSLTPKEALREA

 SRTLIDLFIPFLHAEEEDIHFYLEDNQNRFTVSFFTFHDRLANIRKNKKGIALKCIFI

 DQSELPSRTYNCLKRSNIHTLLDLLNNSQEDLMRIEHLRIEDVKQILDILQKHFAIYL

 PKNKF"

 gene complement(82576..82968)

 /gene="rps11"

 CDS complement(82576..82968)

 /gene="rps11"

 /codon\_start=1

 /transl\_table=11

 /product="ribosomal protein S11"

 /translation="MTKAIPRIGSRKNGRRIQKGVIHVQASFNNTIVTVTDVIGRVVS

 WSSAGTCGFRGTRRGTPFAAQTAAGNAIRKAVDQGLQRAEVMIKGPGLGRDAALRAIR

 RSGILLSFVRDVTPMPHNGCRPPKKRRV"

 gene complement(83081..83194)

 /gene="rpl36"

 CDS complement(83081..83194)

 /gene="rpl36"

 /codon\_start=1

 /transl\_table=11

 /product="ribosomal protein L36"

 /translation="MKIRASIRKICEKCRLIRRRGRIIVICSNPKHKQRQG"

 gene complement(83310..83543)

 /gene="infA"

 CDS complement(83310..83543)

 /gene="infA"

 /codon\_start=1

 /transl\_table=11

 /product="translational initiation factor 1"

 /translation="MKEQKLIHEGLITESLPNGMFRVRLDNEDLILGYVSGRIRRSFI

 RILPGDRVKIEVSRYDSTRGRIIYRLRNKESND"

 gene complement(83660..84058)

 /gene="rps8"

 CDS complement(83660..84058)

 /gene="rps8"

 /codon\_start=1

 /transl\_table=11

 /product="ribosomal protein S8"

 /translation="MGRDTIADIITSIRNANMDKKGTVRVASTNIAENIVKILLQEGF

 IENVRKHRENNKYFLVSTLRHRRNRKGTYRNILKRISRPGLRIYSNHQRIPRILGGMG

 VVILSTSRGIMTDREARLERIGGEILYYIW"

 gene complement(84238..84606)

 /gene="rpl14"

 CDS complement(84238..84606)

 /gene="rpl14"

 /codon\_start=1

 /transl\_table=11

 /product="ribosomal protein L14"

 /translation="MIQPQTHLNVADNSGARELMCIRIIGASNQRYAHIGDVIVAVIK

 EAVPNMPLERSEVIRAVIVRTCKELKRDNGMIIRYDDNAAVVIDQEGNPKGTRVFGAI

 ARELRQLNFTKIVSLAPEVL"

 gene complement(84736..85140)

 /gene="rpl16"

 CDS complement(84736..85140)

 /gene="rpl16"

 /codon\_start=1

 /transl\_table=11

 /product="ribosomal protein L16"

 /translation="MLSPKRTRFRKQHRGRMKGISYRGNHICFGRYALQALEPAWITS

 RQIEAGRRAMTRYARRGGKIWVRIFPDKPVTVRPTETRMGSGKGSPEYWVSVVKPGRI

 LYEMGGVSETVARAAISIAACKMPIRTQFIIA"

 gene complement(86264..86926)

 /gene="rps3"

 CDS complement(86264..86926)

 /gene="rps3"

 /codon\_start=1

 /transl\_table=11

 /product="ribosomal protein S3"

 /translation="MGQKINPLGFRLGENQSHRSLWFAQPKSYYIGLQEDEKIRDWIK

 IYVQKNIRVSSSFEGIGIAHIEIQKKMDLIQVIIYIGFPNLLIEGQTRGIEELQINVQ

 KGLHSVNRRLNIAITRVAKPYGQPNILAEYIALQLKNRVSFRKAMKKAIELTEQADTK

 GIQVEIAGRIDGKEIARVEWIREGRVPLQTIRAKIDHCSYTVRTAYGALGIKIWIFVD

 EQ"

 gene complement(86817..87380)

 /gene="rpl22"

 CDS complement(86817..87380)

 /gene="rpl22"

 /codon\_start=1

 /transl\_table=11

 /product="ribosomal protein L22"

 /translation="MKRSSSTQVQALAQRICMSAHKARRVIDQIRGHSYEKTLMLLEL

 MPYRAFYPIFKLVYSAAANASHNKSFNEADSVISKAEVNGGTIVKKLKPRARGRSYPI

 ERPACHIIIVLKDSSKKKTDQDIFLETKNVWRDPIIERYIEKEREREKKDGSKNKSTW

 FPPWRKPKSSFPLVRTTKKLLHRSPGR"

 gene complement(87482..87760)

 /gene="rps19"

 CDS complement(87482..87760)

 /gene="rps19"

 /codon\_start=1

 /transl\_table=11

 /product="ribosomal protein S19"

 /translation="MTRSLKKNPFVANHLLEKIKKLNMREEKEIIVTWSRASTIIPTM

 IGNTIAIHNGKAHLPIYITDRMVGQKLGEFAPTLTFQGHARNDTRSLR"

 gene complement(87835..89329)

 /gene="rpl2"

 CDS complement(join(87835..88266,88940..89329))

 /gene="rpl2"

 /exception="RNA editing"

 /codon\_start=1

 /transl\_except=(pos:complement(89327..89329),aa:Met)

 /transl\_table=11

 /product="ribosomal protein L2"

 /translation="MIHLYKTSTPSIRKGSIDSQAKSNPRNNLIYGQHRCGKGRNSRG

 IITAGHRGGGHKRLYRKIDFRRNEKDISARIVTIEYDPNRNAYICLIHYGDGEKRYIL

 HPRGAIIGDTIVSGTEVPISMGNALPLSTHMPLGTAVHNIEITLGKGGQLTRAAGAVA

 KLIAKEGKSVTLRFPSGEVRLISKNCSATVGQVGNVGANQKSLGRAGSKCWLGRRPVV

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 exon complement(87835..88266)

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 /gene="rpl23"

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 /product="similar to ribosomal protein L23"

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 MGHTMHYRRMIITLQPGYSILPLIEKRKEFK"

 gene complement(89738..89811)

 /gene="trnI-CAU"

 tRNA complement(89738..89811)

 /gene="trnI-CAU"

 /product="tRNA-Ile"

 /note="anticodon:CAU"

 gene 89895..96866

 /gene="ycf2"

 CDS 89895..96866

 /gene="ycf2"

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 LPKPLRSIGPPNYTLKESFWSSNLNRLIVSLLYLPKGKNIYESCFMDPKESTWVLPIT

 KKCIMSESNWGSQRWRNAIVKKRNSSCKISNEIAAGIEISFKEKDIKYLEFFFVSYTN

 DPIRKDHDWKLFDRLSPSKKRNIINLNSGQLFEILVKHLICYLMSAFREKRPIDEGGF

 FKQQGAEATIQSNEIEHVSHLLSRNKGGIFLKNCAQFHMWQFRQDLFVIGGKNRHKSD

 FLRNVSRENLIWLDNAWLVNRNRVFSKVRNVSSNIQYDSIRSIFFQVTDSSQSKGFSD

 QSIDPFNSISNEGSEYHTLINQTEIQQLKKRSILLDTSFLQTERTEIKSDRFSKYLSG

 YSSMARLFPEREKQMNNHLLPEEIEEFLGNPTRSIRSFFSDRWSELHLGLNPTERSTI

 DQKLLKKQQGVSFVPSRRSENKEIVDIFKIITYLQNTSSVHSIAADPGWDMVPKDEPD

 MDSSNKISFLNENAFFDLFHLFHDRNKGGYRLHHEFELEETFQEMADLFTLSITEPGL

 AYHNKEFGLSIDSYGKLLNEVFNSGDESKKKSLLVLPSIFYDLFLLVLSSIFYDLFLL

 VLLSIFYDLFLLVLLSIFYEENESFYRKIKKKSVRISCGNDLEDPKPKIAVFAHNNIM

 EAIHQYRLIRNQIQIQYSTYGYIRNVLNRFFLMNRPDCNFAYGIQKHPIGIQKHPIGN

 DILNHLTIIIDKINQHLSNLKKIKKKWFDPLISRTERSTNLDPNVYRYKCSNGSKNFQ

 EHLEHFVSEQKHRFQVMFDRLRINQYSIDWSEVIDKQDLSKSLRFFLSKSLLLLSKSL

 LFLSKSLPFFVVSLGNISIHRAEIHIYELKGLNDQPGNQLLESIGVQIVYLNKLKPFL

 LYDHDTSQRSKFLINTGTILPFLFNKIQKCMIDSFRTRKNRKKSFENTDSYFSMISHD

 RNNWLNPQKSSLISSFYRANRLQFLNHPHCFWFYCNKGFHFYGEKTRIHNYDFTYAQF

 PNILCIRNKKFSLCFGKKKHVLGERETISPIESQVSGIFIPNNVSQSGNKTYNLYKSF

 HFSIGSDPSVPIYSIADISGTPVIEEQIVNFERTYCQLLSDMNLSDSEGKNLHHYLRF

 NSNMGLIHTPCFEKYVPSGKRKELSLCLKKNVEKGEVGRTLQRDSAFSNLSKWNLFQT

 YMPWFLTWTGCKYLYFTLKNNIYLILNIPFQYSLSGSQNFVSVFHDMMHGSDISWPIP

 QKKWWSILPQRNLISESSSKCLQNLLLSEEMIHRNNESPIPLIWTHLRSPNAWEFLYS

 ILFLLLVAGYLVRTHLLFVFRASSELQTELEKIKSLMIPSYMIELRKLLDRYPTSELN

 SFWLKNLFLVALEQLGDSLEEIRDSASGGNMLLGGGPAYGVKSIRSKKKYLNINLIDL

 ISIIPNPINRITFSRNTRHLSRTSKEIYSLIRKRKNVNGDWIDDKIESWVANSDSIDD

 EEREFLVQFSTLTTEKRIDQILLSLTHSDRLSKNDSGYQMIEQPGSIYLRYLVDIHKK

 YLMNYEFNRSCLAERRIFLAHYQTITYSQTSCGANSSHFPSHGKPFSLRLALSPSRGI

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 SDDIDDDLDTELLTMTNVLTMYMTPKIDRFDTTLQLELAKAMSPCIIWIPNIHDLYVN

 ESNYLSLGLLVNYLSRDSERCSTRNILVIASTHIPQKVDPTLIAPNKLKKCMKIRRLL

 IPQQRKHFFILSYTRGFNLEKKMFHTNSNRFGSITMGSNARDLVALTNEALSISITQK

 KSIIDTNTIRSALHRQTWDLRSQVRSVQDHGILFYQIGRAVAQNVLLSNCPIDPISIY

 MKKKSCKEGDSYLYKWYFELGTSMKKLTILLYLLSCSAGSVAQDLWSPPGPDEKNWIT

 SYGFVENDSDLVHGLLEVEGALLGSSRTEKDCSQFDNDRVTLLLRSEPRNQLDMMQNG

 SCSIVDQRFLYEKYESEFEEGEREGALDPQQIEEDLFNHIVWAPRIWRPCGNLFDCIE

 RTNELGFPYWARSFRGKRIIYHKEDELQENDSEFLQSGTMQYQTRDRSSKEQGFFRIS

 QFIWDPADPFFFLFKDQPFVSVFSRREFFADEEMSKGLITSQTNPPTSIYKRWFIKNT

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 repeat\_region 93706..113784

 /rpt\_type=inverted

 gene complement(97206..97286)

 /gene="trnL-CAA"

 tRNA complement(97206..97286)

 /gene="trnL-CAA"

 /product="tRNA-Leu"

 /note="anticodon:CAA"

 gene complement(97847..100078)

 /gene="ndhB"

 CDS complement(join(97847..98602,99305..100078))

 /gene="ndhB"

 /codon\_start=1

 /transl\_table=11

 /product="NADH-plastoquinone oxidoreductase subunit 2"

 /translation="MWHVQNENFILDSTRIFMKAFHLLLFHGSFIFPECILIFGLILL

 LMIDSTSDQKDIPWLYFISSTSLVMSITALLFRWREEPMISFSGNFQTNNFNEIFQFL

 ILLCSTLCIPLSVEYIECTEMAITEFLLFVLTATLGGMFLCGANDLITIFVAPESFSL

 CSYLLSGYTKRDVRSNEATTKYLLMGGASSSILVHGFSWLYGSSGGEIELQEIVNGLI

 NTQMYNSPGISIALISITVGIGFKLSPAPSHQWTPDVYEGSPTPVVAFLSVTSKVAAS

 ASATRIFDIPFYFSSNEWHLLLEILAILSMILGNLIAITQTSMKRMLAYSSIGQIGYV

 IIGIIVGDSNDGYASMITYMLFYISMNLGTFARIVSFGLRTGTDNIRDYAGLYTKDPF

 LALSSALCLLSLGGLPPLAGFFGKLHLFWCGWQAGLYFLVSIGLLTSVVSIYYYLKII

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 exon complement(97847..98602)

 /gene="ndhB"

 /number=2

 exon complement(99305..100078)

 /gene="ndhB"

 /number=1

 gene complement(100405..100872)

 /gene="rps7"

 CDS complement(100405..100872)

 /gene="rps7"

 /codon\_start=1

 /transl\_table=11

 /product="ribosomal protein S7"

 /translation="MSRRGTAEEKTAKSDPIYRNRLVNMLVNRILKHGKKSLAYQIIY

 QAVKKIQQKTETNPLSVLRQAIRGVTPDIAVKARRVGGSTHQVPIEIESTQGKALAIR

 WLLGASRKRPGRNMAFKLSSELVDAAKGSGDAIRKKEETHRMAEANRAFAHFR"

 gene complement(100927..100956)

 /gene="rps12"

 /pseudogene="unknown"

 gene complement(101482..101724)

 /gene="rps12"

 gene 103559..103630

 /gene="trnV-GAC"

 tRNA 103559..103630

 /gene="trnV-GAC"

 /product="tRNA-Val"

 /note="anticodon:GAC"

 gene 103859..105349

 /gene="rrn16"

 rRNA 103859..105349

 /gene="rrn16"

 /product="16S ribosomal RNA"

 gene 105599..105640

 /gene="trnI-GAU"

 tRNA 105599..105640

 /gene="trnI-GAU"

 /product="tRNA-Ile"

 /note="anticodon:GAU"

 gene 105740..106118

 /gene="ycf68"

 CDS join(105740..105781,105810..106118)

 /gene="ycf68"

 /codon\_start=1

 /transl\_table=11

 /product="hypothetical chloroplast RF68"

 /translation="MAYSSCSNRSLKPNSGEIQCRSNFLFTRGIRAVRGGPPWLLSSR

 ESIHPLSVYGQLSLEHRFRFGLNGKMEHLTTHLHRPRTTRSPLSFWGDGGIVPFEPFF

 FMLFPRRSGESSNQ"

 exon 105740..105781

 /gene="ycf68"

 /number=1

 exon 105810..106118

 /gene="ycf68"

 /number=2

 gene 106580..106614

 /gene="trnI-GAU"

 tRNA 106580..106614

 /gene="trnI-GAU"

 /product="tRNA-Ile"

 /note="anticodon:GAU"

 gene 106679..106716

 /gene="trnA-UGC"

 tRNA 106679..106716

 /gene="trnA-UGC"

 /product="tRNA-Ala"

 /note="anticodon:UGC"

 gene 107702..110505

 /gene="rrn23"

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 /product="23S ribosomal RNA"

 gene 110624..110726

 /gene="rrn4.5"

 rRNA 110624..110726

 /gene="rrn4.5"

 /product="4.5S ribosomal RNA"

 gene 110947..111067

 /gene="rrn5"

 rRNA 110947..111067

 /gene="rrn5"

 /product="5S ribosomal RNA"

 gene 111300..111373

 /gene="trnR-ACG"

 tRNA 111300..111373

 /gene="trnR-ACG"

 /product="tRNA-Arg"

 /note="anticodon:ACG"

 gene complement(111965..112036)

 /gene="trnN-GUU"

 tRNA complement(111965..112036)

 /gene="trnN-GUU"

 /product="tRNA-Asn"

 /note="anticodon:GUU"

 gene 112414..118035

 /gene="ycf1"

 CDS 112414..118035

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 /translation="MILKSFLLGNLLSLYMKIINSVVVVGLYYGFLTTFSIGPSYLFL

 LRARIMEEGTEKEVSATTGFITGQLMMFISIYYAPLHLALGRPHTITVLVLPYLLFHF

 FWNNHKHFLDYGSTTRNSMRNLSIQCVFLNNLIFQLFNHFILPSSTLVRLVNIYMFRC

 NNKMLFVTSSFVGWLIGHIFFMKWVGLVLFWIRQNHSIRSNVLIRSNKYLVSELRNSM

 ARIFTILLFITCVYYLGRIPSPIVTKKLKETSKTEERGESEEETDVEIEKTSETKGTK

 QEQEGSTEEDPSLCSEEREDPKKLHEKKKRQEILKLEILKEKEDKDLFWFEKPLVNLL

 FDYKRCNRPLRYIKKNLFQNAVRNEMSQYFFHVCPVDGKQIISFTYPPSLSIFLEMMQ

 RKMSLCTTEKLSPEDLYNHWVYTNEQKRYSLSNEFINRIEVLNKGSLTMDVLEKRTRL

 YNDKNNQEDKNNQEDKNNQEDKNNQEDKNNQECLPRVYDPFLNGPYRGTIKKVYSRSM

 VDDSITSTEDSIGTEDSIGMVWINKIHDRLPTDYQKLEHKTDTFNGEPLSTDIGPFLT

 SISELARKSTTGFSLNFKKLVLISEQRRFDSENKKKCLKFLFDVITTDQNNQTIQNKS

 IGIEEIGKKIPRRSYKLINSFEEREEENEEESEESTENHGIRSRKAKRVVIYTDKADP

 DQNTNTHTSTSTNSDQAEELALVRYSQQSDFRRDIVKGSIRAQRRKMVIWEMFQANAH

 SLLFLDRIDKTFFFSFDISRTMNLIFRNWIDTGPKLKTSDSEEEEAKEEAKKMEDKKN

 ENERIAIAETWDTFIFAQAIRGTMLVTQSILRKYIILPSLIIAKNLGRMLLFQFPEWY

 EDLKEWNREMHVKCTYNGVQLSETEFPKNWLTDGIQIKILFPFCLKPWRKSKLRSHHR

 DPIQKKGKTENFCFLTIWGKETELPFGSARQQPSFFEPIYNEFEKKKIKVKKKCFLVL

 RVFKKKTKQFRKVSKEKTRWIIKTILFLKRKIKEFANVNPIFLFVLKKVYEPNENGKD

 SIIISSNKIVPKSTSTIRIRFMDWANYSLTEKKKKDLSDRTTLIRNQIERGAKDKRKI

 FLTPDINISPNDTSCGDKRSESQKHIWQISKGKSNRFIFIRKWHYFLTFLDERIYIHI

 FLYTVNVSRVNVQLFLESTKKIIDKYIHKEGIDEINQKKMHFISTIKKSISNISKNKS

 KISGDLYSFSQASVFYKLSQIQAINKKYHLRSLLQYREAYLILKDRIRNFFGTRRILD

 SKSRHKKLPNSGMNEWKNWLRGHYQYNLSQARWSKLVPQKWRTRVNWRRTIQNKDSKK

 NSYEKAQFIHYEKKNDYEVNSLTIKKAKLKKNYRYDLFSYKYINYGDRKDSYIYPSSL

 QVNEDREIPYNYNTPKIEPFYVLGDICISDYLGEESIIGTGKSTDRKYLEWKIFDLFL

 RKNIDIESWTDTDTGTNINKMTKTETDYYQMIDKKDLFYLTIHQEINPPNQKKKFFLM

 GMNKEMLYRPILNTKSWFFSEFVPLYDAYKIKPWIIPIKLLLLIFNGNENISENKNIN

 ENQKKDLRISSNQKEYLELKNRNQEEKEQLGHGNIGSDARKRQKDFEKDYTESDIQKR

 EKKGQPESNKKAKQELFLKKYLLFQLRWDDLLNNRIFNNVKVYCFLLRLINAKEIAIS

 SIQGGEMHLDVMLIQTNPTLPELIKKGILILEPVRLSIKWDRQFIMYQTIGISLVHNN

 KCQTNGRYREKRYVDENYFNGSIVQHKKMLVNRDENHYDLLVPENILSPRRRRELRIL

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 misc\_feature 113785..132877

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 gene 118362..118628

 /gene="rps15"

 CDS 118362..118628

 /gene="rps15"

 /codon\_start=1

 /transl\_table=11

 /product="ribosomal protein S15"

 /translation="MVKNSFISVIPKEEKNKGSVEFQVISFTNKIQRLTSHFELHRKD

 YLSQIGLRKILGKRQRLLAYLSKKNRVRYKKLIDQLDIREPKTR"

 gene 118736..119917

 /gene="ndhH"

 CDS 118736..119917

 /gene="ndhH"

 /codon\_start=1

 /transl\_table=11

 /product="NADH-plastoquinone oxidoreductase subunit 7"

 /translation="MNVPATRKDLMIVNMGPHHPSMHGVLRLIVTLDGEDVIDCEPVL

 GYLHRGMEKIAENRTIIQYLPYVTRWDYLATMFTEAITVNAPEQLGNIQVPKRASYIR

 VIMLELSRIASHLLWLGPFMADIGSQTPFFYIFRERELLYDLFEAATGMRMMHNYFRI

 GGVAADLPHGWIDKCLDFCDYSLTGIVEYQKLITQNPIFLERVEGVGIIGGEEAINWG

 LSGPMLRASGIQWDLRKVDHYECYDEFDWEVQWQKEGDSLARYLVRINEMTESIKIIQ

 QALEGIPGGPYENLEVRRFDRASDSEWNGFEYRFISKKPSPTFELSKQELYVRVEAPK

 GELGIFLIGDNSVFPWRWKIRPPGFINLQILPQLVKRMKLADIMTILGSIDIIMGEVD

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 gene 119919..122137

 /gene="ndhA"

 CDS join(119919..120482,121598..122137)

 /gene="ndhA"

 /codon\_start=1

 /transl\_table=11

 /product="NADH-plastoquinone oxidoreductase subunit 1"

 /translation="MIIDTTEVQAINSFSRSESLKEVYDLLWLLVPIFTPVSGITIGV

 LVIVWLEREISAGIQQRIGPEYAGPLGILQALADGTKLLLKEDLLPSRGDVRLFSMGP

 SIAVISILLSYLVIPFGYRLVLADLSIGVFLWIAISSIAPIGLLMSGYGSNNKYSFSG

 GLRAAAQSISYEIPLTPCVLSISLRVIRLSNSSSTVDIVEAQSKYGFWGWNLWRQPIG

 FIVFLISSLAECERLPFDLPEAEEELVAGYQTEYSGIKSGLFYVASYLNLLVSSLFVT

 VLYLGGWNFSIPYIFISEPFGINKTGGVFGMTIGILITLAKAYLFLFIPITTRWTLPR

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 exon 119919..120482

 /gene="ndhA"

 /number=1

 exon 121598..122137

 /gene="ndhA"

 /number=2

 gene 122216..122758

 /gene="ndhI"

 CDS 122216..122758

 /gene="ndhI"

 /codon\_start=1

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 /product="NADH-plastoquinone oxidoreductase subunit I"

 /translation="MFPMVTGFMNYGQQTIRAARYIGQSFMITLSHVNRLPVTIQYPY

 EKSITSERFRGRIHFEFDKCIACEVCVRVCPIDLPVVHWRLETDIRKKRLLNYSIDFG

 ICIFCGNCVEYCPTNCLSMTEEYELSTYDRHELNYNQIALGRLPMSVIGDYTIRTITN

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 gene 123090..123620

 /gene="ndhG"

 CDS 123090..123620

 /gene="ndhG"

 /codon\_start=1

 /transl\_table=11

 /product="NADH-plastoquinone oxidoreductase subunit 6"

 /translation="MDLPGPIHDILLVFLGSGLILGGLGVVLLTNPIYSAFSLGLVLV

 CISLFHIPSNSYFVAAAQLLIYVGAVNVLILFAVMFMNGSEYYKDFYLWTVGDGVTSL

 VCTSILFSLITTISDTSWYGIVWTTRSNQIIEQDLTSNVQQIGIHLSTDFYLPFELIS

 IILLVALIGAIAMARQ"

 gene 123868..124173

 /gene="ndhE"

 CDS 123868..124173

 /gene="ndhE"

 /codon\_start=1

 /transl\_table=11

 /product="NADH-plastoquinone oxidoreductase subunit 4L"

 /translation="MMTEHVLILSAYLFSIGIYGLITSRNMVRALMCLELILNAVNIN

 LVTFSDLFDSRQLKGDIFSIFVIAIAAAEAAIGPAIVSSIHRNRKSTRINQSNLLNK"

 gene 124441..124686

 /gene="psaC"

 CDS 124441..124686

 /gene="psaC"

 /codon\_start=1

 /transl\_table=11

 /product="photosystem I subunit VII"

 /translation="MSHSVKIYDTCIGCTQCVRACPTDVLEMIPWDGCKAKQIASAPR

 TEDCVGCKRCESACPTDFLSVRVYLWHETTRSMGLAY"

 gene 124807..126312

 /gene="ndhD"

 CDS 124807..126312

 /gene="ndhD"

 /exception="alternative start codon"

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 /transl\_except=(pos:124807..124809,aa:Met)

 /transl\_table=11

 /product="NADH-plastoquinone oxidoreductase subunit 4"

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 LLLTTYAFCYHFQLDDPLIQLEEAYKWINTFDFHWRPGIDGLSIGPILLTGFITTLAT

 LAARPVTRDSRLFHFLMLAMYSGQIGSFSSRDLLLFFLMWELELIPVYLLVSIWGGKK

 RLYSATKFILYTAGGSIFLLMGVPGMGLYGSNEPTLNFETLANQSYPLGLEIIFYIGF

 LIAYAVKSPIIPLHTWLPDTHGEAHYSTCMLLAGILLKMGAYGLVRINMELLPHAHSI

 FSPWLMIVGAIQIIYAASTSFGQRNLKKRIAYSSVSHMGFTLIGIGSITDTGINGAIL

 QIISHGFIGAALFFLAGTSYDRIRLVYLDEMGGIAIPMPKIFTMFSSFSMASLALPGM

 SGFVAESVVFFGIITSPKYLLMPKILITFVMAIGMILTPIYSLSMSRRMFYGYKLFNV

 PNSYFFDSGPRELFVSVCILLPVIGIGIYPDFVLSLSIDRIEAILSIYFHK"

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 CDS complement(126535..127485)

 /gene="ccsA"

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 /transl\_table=11

 /product="CcsA"

 /translation="MIFATLEHILTHISFSIISIVITIHLMTLLIHETVVLFDLSEKA

 MMATFFCITGLLVTRWIYSRHLPLSDLYESLMFLSWSFSIIHMFPKRRNQKSYLSAIT

 APSAIFTQGFATSGLSTEMHQSAILVPALQSQWLMMHVSMMLLSYAALLCGSLLSIAL

 LVITFRKNLDIPRKSNHLLIGSFSFVNEKRSVLQNTSFLSFRNYHRYQLTQQLDQCSY

 RVISLGFTFLTIGILSGAVWANEAWGSYWNWDPKETWAFITWTIFAIYLHSRTNQSFQ

 GVDSAIVASIGFLIIWICYFGVNLLGIGLHSYGSFTLTTN"

 gene complement(127573..127652)

 /gene="trnL-UAG"

 tRNA complement(127573..127652)

 /gene="trnL-UAG"

 /product="tRNA-Leu"

 /note="anticodon:UAG"

 gene complement(129044..129217)

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 CDS complement(129044..129217)

 /gene="rpl32"

 /codon\_start=1

 /transl\_table=11

 /product="ribosomal protein L32"

 /translation="MAVPKKRTSLSKKHIRRNIWKGRGYQAAAKALSLAKSISTGHSK

 SFFVRQTSNKALE"

 gene 130423..132657

 /gene="ndhF"

 CDS 130423..132657

 /gene="ndhF"

 /codon\_start=1

 /transl\_table=11

 /product="NADH-plastoquinonevoxidoreductase subunit 5"

 /translation="MEHTYQYAWIIPFALLPVTMSIGLGLLLVPTATKNLRRMWTFPS

 VSLLSIVMVFSSDLSIQQINGSSIYQHLWSWTINTDFSLEFGYLIDPLTSIMSILITT

 VGIMVLIYSDNYMSHDQGYLRFFAYMSFSNTSMLGLVTSSNLIQIHIFWELVGMCSYL

 LIGFWFTRPAAANACQKAFVTNRVGDFGLLLGILGFYWITGSFEFRDLFEIFNNLIRN

 NGVNSLFATLCASLLFVGAVAKSAQFPLHVWLPDAMEGPTPISALIHAATMVAAGIFL

 VARFLPLFTVIPYIMNLISLIGVITVLLGATLALAQRDIKRSLAYSTMSQLGYIMLAP

 GIGSYRAALFHLITHAYSKALLFLGSGSIIHSMEPIVGYSPDKSQNMVLMGGLTKYVP

 ITKNTFLLGTLSLCGIPPLACFWSKDEILNDSWLYSPIFAIIACFSAGLTAFYMFRMY

 LLTFDGHLHAHFQNYSGTQNSSFYSISIWGKEGTKPVNRNLFLSTMNNNEKVSFFSRK

 IYKMNGNVRNLIRSCRIYFENKDTSTYPHESDNTMLLPLLILVLFTLFVGSIGIPFDQ

 GVIDFDILSKWLTPSINLLHQNSNYSVDWYEFVTNAIYSVSIACFGIFIASILYGSVN

 SSFQNLDLINSFVKKTGSKKILLDRIINVIYNWSYNRGYIDLFYATCLTTSIRGLAEV

 THFLDRRVIDGITNGVGVASFFVGEGIKYVGGGRISSYLFVYLSYVSGFLLIYYIYYL

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 gene complement(132781..134250)

 /gene="ycf1"

 CDS complement(132781..134250)

 /gene="ycf1"

 /codon\_start=1

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 /product="hypothetical chloroplast RF19"

 /translation="MILKSFLLGNLLSLYMKIINSVVVVGLYYGFLTTFSIGPSYLFL

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 FWNNHKHFLDYGSTTRNSMRNLSIQCVFLNNLIFQLFNHFILPSSTLVRLVNIYMFRC

 NNKMLFVTSSFVGWLIGHIFFMKWVGLVLFWIRQNHSIRSNVLIRSNKYLVSELRNSM

 ARIFTILLFITCVYYLGRIPSPIVTKKLKETSKTEERGESEEETDVEIEKTSETKGTK

 QEQEGSTEEDPSLCSEEREDPKKLHEKKKRQEILKLEILKEKEDKDLFWFEKPLVNLL

 FDYKRCNRPLRYIKKNLFQNAVRNEMSQYFFHVCPVDGKQIISFTYPPSLSIFLEMMQ

 RKMSLCTTEKLSPEDLYNHWVYTNEQKRYSLSNEFINRIEVLNKGSLTMDVLEKRTRL

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 /rpt\_type=inverted

 gene 134628..134699

 /gene="trnN-GUU"

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 tRNA complement(135291..135364)

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 rRNA complement(135596..135716)

 /gene="rrn5"

 /product="5S ribosomal RNA"

 gene 135938..136040

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 rRNA 135938..136040

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 /product="4.5S ribosomal RNA"

 gene complement(136139..138895)

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 rRNA complement(136139..138895)

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 /product="23S ribosomal RNA"

 gene complement(139048..139082)

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 tRNA complement(139048..139082)

 /gene="trnA-UGC"

 /product="tRNA-Ala"

 /note="anticodon:UGC"

 gene complement(139881..139918)

 /gene="trnA-UGC"

 tRNA complement(139881..139918)

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 /note="anticodon:UGC"

 gene complement(139983..140017)

 /gene="trnI-GAU"

 tRNA complement(139983..140017)

 /gene="trnI-GAU"

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 /note="anticodon:GAU"

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 /exception="alternative start codon"

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 /transl\_except=(pos:complement(140785..140787),aa:Met)

 /transl\_table=11

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 gene complement(141248..142689)

 /gene="rrn16"

 rRNA complement(141248..142689)

 /gene="rrn16"

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 gene complement(142918..142989)

 /gene="trnV-GAC"

 tRNA complement(142918..142989)

 /gene="trnV-GAC"

 /product="tRNA-Val"

 /note="anticodon:GAC"

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 /gene="rps7"

 CDS 145619..146086

 /gene="rps7"

 /codon\_start=1

 /transl\_table=11

 /product="ribosomal protein S7"

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 gene 146413..148597

 /gene="ndhB"

 CDS join(146413..147186,147842..148597)

 /gene="ndhB"

 /codon\_start=1

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 exon 146413..147186

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 exon 147842..148597

 /gene="ndhB"

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 gene 149158..149238

 /gene="trnL-CAA"

 tRNA 149158..149238

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 /product="tRNA-Leu"

 /note="anticodon:CAA"

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 /gene="ycf2"

 /pseudogene="unprocessed"

 /codon\_start=1

 /transl\_table=11

 /product="hypothetical chloroplast RF21"

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