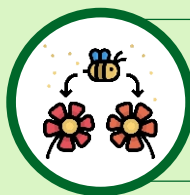


# Deoxyribonucleic acid (DNA) barcodes for Nigerian Pollinators



## Project Description



Pollination is among the most visible and important ecosystem services and is necessary for reproduction of **60–70%** of all plant species and **35% of global crop production**.

The value of pollination by all insects is estimated at US\$175 billion, or nearly 10% of total agricultural production for human consumption.



However, in recent times, dramatic declines in pollinator abundances have generated concern for the maintenance of pollination services.

Unfortunately, Potential drivers of pollinator loss, including habitat loss and fragmentation, agrochemicals, pathogens, alien species, climate change and the interactions between them continue to aid the decline of Pollinators globally



To support the goals of addressing the threats to pollinators in a way that enhances food security and contributes to land degradation neutrality targets in Nigeria, The UNDP-BES-NET Project develops DNA barcodes, QPR codes for Nigerian pollinators (butterflies, bees and bats).

Developing DNA barcodes for Nigerian Pollinator species will enhance knowledge of their distribution and taxonomy as well as facilitate conservation planning using pollinators as a model system







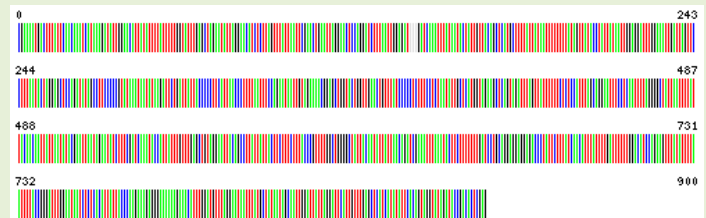
***Papilio dardanus***

Genome: Mitochondrial

Locus: Cytochrome Oxidase Subunit 1 5' Region

Nucleotides: 901 bp

**Illustrative Barcode:**



**Sequence**

CGAAAATGACTTTATTCAACAAATCATAAGATATTGGAACATTATATTTATTTTGGTATTTGAGCTAGAATATTAGGAACATCTCTTAGTTTATTAATTC  
GAACTGAATTAGGAACTCAGGTCTTTAATTGGAGAT---GATCAAATTATAATACTATTGTTACAGCTCATGCT  
TTTATTATAATTTTTTTATAGTTATACCTATTATAATTGGAGGATTGGAAATTGATTA  
GTTCTTTAATACTAGGAGCTCCAGATATAGCCTTCCCCGTATAAATAATATAAGATTCTGATTATTACCCCTTCATTAACCCTTTAATTCCAGAATA  
ATTGTAGAAAACGGAGCTGGTACTGGTTGAACTGTTTATCCCCCTCTTTCTCTAATATTGCTCATGGTAGAAGCTCAGTAGATTTAGTTATTTTTCTCT  
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TTTTTGATCCTGCAGGAGGAGGAGACCCTATTCTTTATCAACATTATTTTGATTTTTGGACATCCAGAAGTTTATATTTAATTTTACCGGGATTGGA  
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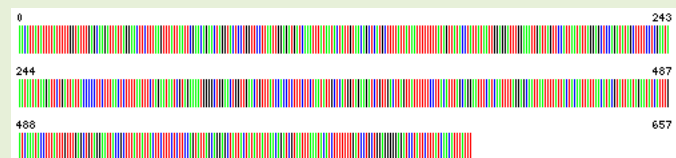
***Papilio menestheus***

Genome: Mitochondrial

Locus: Cytochrome Oxidase Subunit 1 5' Region

Nucleotides: 658 bp

**Illustrative Barcode:**



**Sequence**

AACATTATATTTATTTTGGTATTTGAGCAAGATTATTAGGAACCTCTTTAAGTTTATT  
AATTCGAACAGAAGTAGGTACTCTGGTTCCTTAATTGGAGATGATCAAATTTATAATAC  
TATTGTAACAGCTCATGCTTTTATTATAATTTTTTTATAGTTATACCTATTATAATTGG  
AGGATTTGGAAATTGATTAGTTCATTAAATATTAGGAGCTCCAGATATAGCTTTTCTCG  
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TGCTCATGGTAGAAGATCTGTTGACTTAGTTATTTTTCTTACATTAGCAGGAATTC  
ATCAATTTTAGGAGCAATTAATTTTATTACTACAATTATTAACATACGTATTAATAGAAT  
ATCATTTGATCAAATACCTTTATTTGTTGAGCTGTAGGAATTACCGCTTTATTATTACT  
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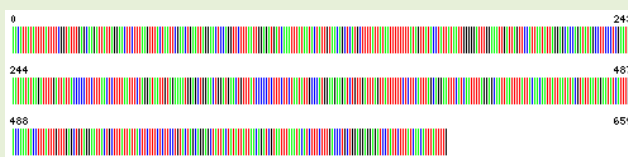




### *Papilio demodocus*

Genome: Mitochondrial  
Locus: Cytochrome Oxidase Subunit 1 5' Region  
Nucleotides: 660 bp

#### Illustrative Barcode:



#### Sequence

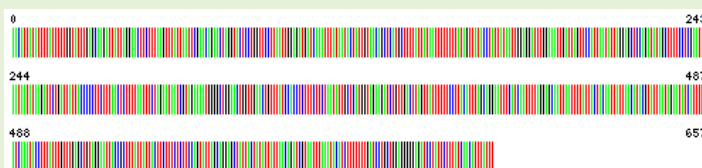
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### *Papilio cyproe filia*

Genome: Mitochondrial  
Locus: Cytochrome Oxidase Subunit 1 5' Region  
Nucleotides: 658 bp

#### Illustrative Barcode:



#### Sequence

AACATTATATTTTATTTTGGTATTTGAGCAAGATTATTAGGAACCTCTTTAAGTTTATT  
AATTCGAACAGAACTAGGTACTCCTGGTTCCTTAATTGGAGATGATCAAATTTATAATAC  
TATTGTAACAGCTCATGCTTTTATTATAATTTTTTTATAGTTATACCTATTATAATTGG  
AGGATTTGGAAATTGATTAGTTCATTAAATATTAGGAGCTCCAGATATAGCTTTTCCTCG  
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TGCTCATGGTAGAAGATCTGTTGACTTAGTTATTTTTCTTACATTAGCAGGAATTC  
ATCAATTTTAGGAGCAATTAATTTTATTACTACAATTATTAACATACGTATTAATAGAAT  
ATCATTTGATCAAAATACCTTTATTTGTTGAGCTGTAGGAATTACCGCTTTATTATTACT  
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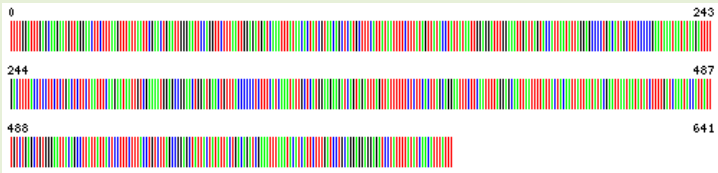




*Papilio chrapkowskoides*

Genome: Mitochondrial  
Locus: Cytochrome Oxidase Subunit 15' Region  
Nucleotides: 642 bp

Illustrative Barcode:



Sequence

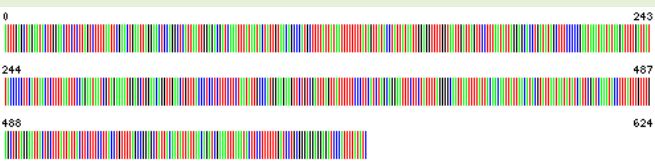
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CCTGCAGGAGGAGGAGATCCTATTTTATATCAACATTTATTT



*Papilio nireus*

Genome: Mitochondrial  
Locus: Cytochrome Oxidase Subunit 15' Region  
Nucleotides: 625 bp

Illustrative Barcode:



Sequence

ATTTGAGCTAGAATACTTGGAACCTCTCTTAGTCTTTAATTCGAACTGAATTAGGAACT  
CCAGGCTCATTAAATTGGAGACGATCAAATTTATAATACTATTGTAACAGCCCATGCTTTT  
ATTATAATTTTTTTATAGTTATACCTATTATAATTGGAGGTTTGGTAATTGATTAGTT  
CCTTTAATATTAGGAGCACCTGATATAGCTTTCCCCGAATAAATAATATAAGATTTTGA  
TTATTACCCCTTCATTAACCTCTTTAATTTCCAGAATAATCGTAGAAAATGGAGCTGGA  
ACAGGTTGAACTGTTTACCCTCCTCTTTCTTCTAATATTGCCATGGAAGAAGTTCTGTC  
GATTTAGTTATTTTTCCCTTCATCTAGCAGGAATTTCTTCTATTTTAGGGGCAATTAAT  
TTTATTACAACAATTATTAACATACGTATTAATAATATATCATTTCGATCAAATACCTTTA  
TTGTTTGAGCTGTAGGAATTACTGCTTTATTATTACTCTTTCCCTTACCTGTTTGTAGCC  
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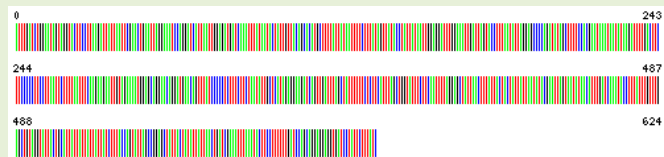




*Graphium polices*

Genome: Mitochondrial  
Locus: Cytochrome Oxidase Subunit 1 5' Region  
Nucleotides: 625 bp

*Illustrative Barcode:*



**Sequence**

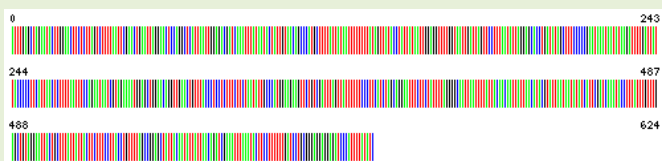
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GATTTAGCTATTTTTCTCTTCATTTAGCTGGTATTTCTTCAATTTTAGGAGCTATTAAC  
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TTTGTGTTGAGCTGTAGGTATTACTGCATTATTATTATTATCTTTACCAGTATTAGCC  
GGAGCTATTACTATATTATTAACATGATCGAAATTTAAATACTTCCTTTTTTGATCCAGCA  
GGAGGAGGTGATCCTATTCTTTATC



*Graphium leonidas*

Genome: Mitochondrial  
Locus: Cytochrome Oxidase Subunit 1 5' Region  
Nucleotides: 625 bp

*Illustrative Barcode:*



**Sequence**

ATTTGATCTGGAATAGTAGGTACTTCCTTAAGATTATTAATTCGAACTGAAGTAGGAAAT  
CCAGGATCATTAAATGGAGATGATCAAATTTATAATACTATTGTTACAGCACATGCTTTT  
ATTATAATTTCTTTATAGTTATACCTATTATAATTGGAGGATTTGGAAATTGATTAGTA  
CCTTTAATATTAGGAGCCCCAGATATAGCTTTCCACGAATAAATAATATAAGATTTTGA  
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GATTTAGCTATTTTTCTCTTCATTTGGCTGGTATTTCTTCAATTTTAGGAGCTATTAAC  
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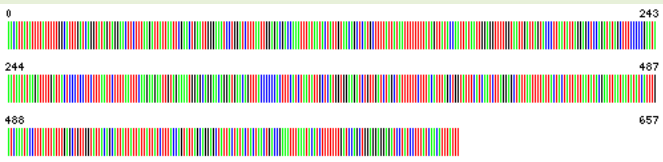




*Graphium angolans*

Genome: Mitochondrial  
Locus: Cytochrome Oxidase Subunit 1 5' Region  
Nucleotides: 658 bp

*Illustrative Barcode:*



**Sequence**

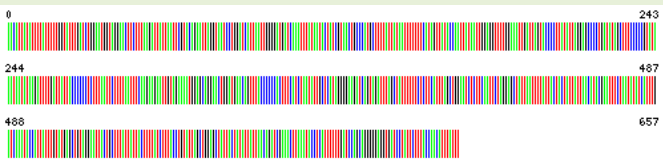
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TACATCTTTTTTTGATCCAGCTGGAGGAGGAGATCCTATCCTTTATCAACATTTATTT



*Graphium antheus*

Genome: Mitochondrial  
Locus: Cytochrome Oxidase Subunit 1 5' Region  
Nucleotides: 658 bp

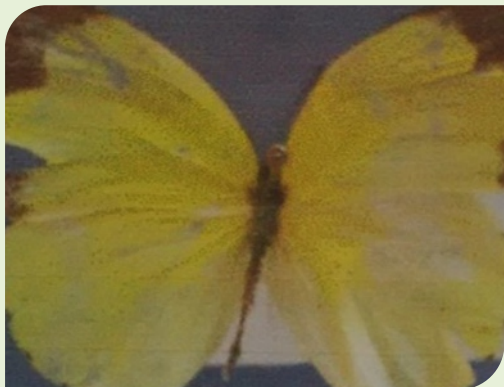
*Illustrative Barcode:*



**Sequence**

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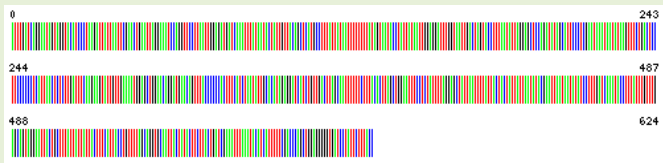




*Eurema senegalensis*

Genome: Mitochondrial  
Locus: Cytochrome Oxidase Subunit 1 5' Region  
Nucleotides: 625 bp

Illustrative Barcode:



Sequence

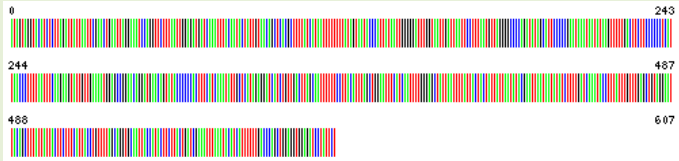
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TTTGTGTTGAGCAGTAGGAATTACTGCTTTATTATTATTACTTTCATTACCTGTTTAGCA  
GGTGCAATTACTATACTTCTTACTGATCGAAATTTAAATACATCATTTTTCGACCCAGCT  
GGAGGGGGTGATCCTATTCTTTACC



*Eurema desjardinsii*

Genome: Mitochondrial  
Locus: Cytochrome Oxidase Subunit 1 5' Region  
Nucleotides: 608 bp

Illustrative Barcode:



Sequence

ATAGTAGGTACATCTCTTAGATTATTAATTCGAACTGAATTAGGAAATCCAGGTTCTTTA  
ATTGGAGATGATCAAATTTACAATACTATTGTAACAGCTCACGCTTTTATCATAATTTTT  
TTTATAGTAATACCCATTATAATTGGGGGATTTGGTAATTGATTAATTCCTTTAATGTTA  
GGGGCCCCAGATATAGCATTCCCCGAATAAATAATATAAGTTTTTGACTTCTTCCCCC  
TCATTAACCCCTTTAATTTCAAGAAGTATTGTTGAAAATGGAGCCGGAACAGGATGAACA  
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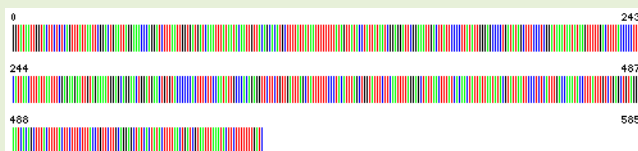




### *Leptosia hybrida*

Genome: Mitochondrial  
Locus: Cytochrome Oxidase Subunit 1 5' Region  
Nucleotides: 586 bp

#### Illustrative Barcode:



#### Sequence

```
GGTATAATTGGTACTTCTCTCAGTTTATTAATTCGGACTGAATTAGGAAACCCAGGATCT
TTAATTGGTGATGATCAAATTTATAATACAATTGTTACAGCACATGCTTTTATTATAATT
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CCTTCATTAACCTTTATTAATTCGAGAAGAATTGTAGAAAATGGAGCAGGAAGTGGATGA
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GCTGTAGGAATCACAGCTTTACTTTTACTTCTTTTACCTGTTCTTGCAGGAGCTATC
ACTATACTTTTAACTGATCGTAATTTAAATACTTCTTTTTTTGATC
```



### *Nephronia argia*

Genome: Mitochondrial  
Locus: Cytochrome Oxidase Subunit 1 5' Region  
Nucleotides: 307 bp

#### Illustrative Barcode:



#### Sequence

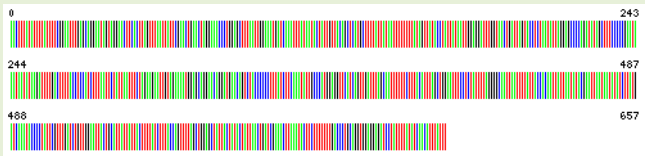
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AATAAATAATATAAGTTTTTGAATACTCCCCCATCCTTAACCTTTATTAATTTCAAGAAG
AATTGTC
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*Charaxes numenes*

Genome: Mitochondrial  
Locus: Cytochrome Oxidase Subunit 1 5' Region  
Nucleotides: 658 bp

Illustrative Barcode:



Sequence

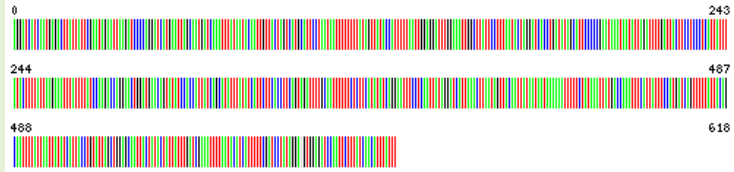
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CTGTTGGAATTACTGCATTATTATTACTTTTATCTTTACCAGTTTTAGCTGGAGCTATTACTATACTATTAACCTGATCGAAACTTAAATACTTCTTTTTTTGA  
CCCTGCAGGTGGAGGAGATCCTATTTTATATCAACATTTATTT



*Apis mellifera*

Genome: Mitochondrial  
Locus: Cytochrome Oxidase Subunit 1 5' Region  
Nucleotides: 619 bp

Illustrative Barcode:



Sequence

AGGATCATCAATGAGACTTATTATTTCGAATAGAATTAAGATCCCCAGGATCATGAATTAGCAATGATCAAATTTATAATACAATTGTTACTAGTCATGCATT  
CCTAATAATTTTTTTTATAGTTATACCATTTTAATTGGAGGATTGGGAAATTGGCTTATTCCTTTAATACTAGGATCACCTGATATAGCATTCCCCCGAATA  
AATAATATTAGATTTTGATTACTTCTCCCTCATTATTTATACTTTTATTAAGAAATTTATTTATCCAAGACCAGGAACTGGATGAACAGTATATCCACCAT  
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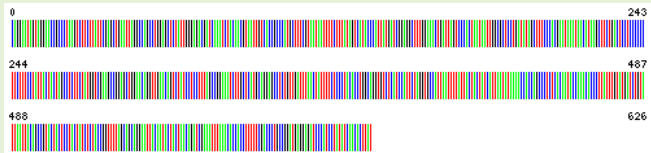




*Chaerephon nigeriae* (Nigerian free-tailed bat)

Genome: Mitochondrial  
Locus: Cytochrome Oxidase Subunit 1 5' Region  
Nucleotides:627 bp

Illustrative Barcode:



Sequence

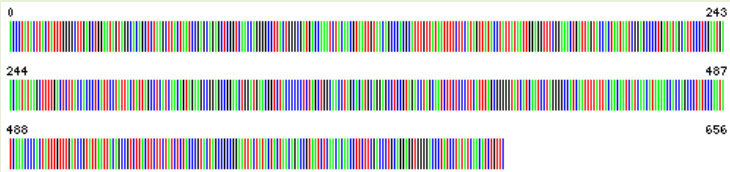
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TTACAATACTACTAACAGATCGAAATTTAAACACCACCTTTTTCGACCCTGCCGGATGAG  
GAGATCCCATCCTATATCAACACTTAT



*Eidolon helvum* (Straw-coloured Fruit bat)

Genome: Mitochondrial  
Locus: Cytochrome Oxidase Subunit 1 5' Region  
Nucleotides: 657 bp

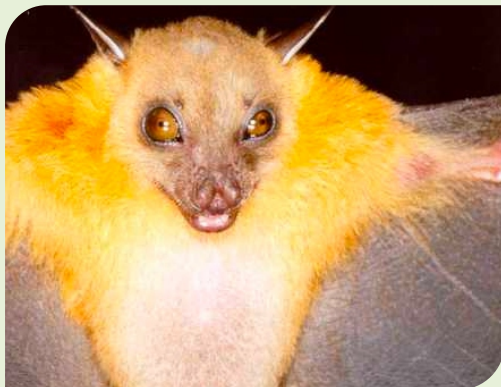
Illustrative Barcode:



Sequence

ACCCTATACTTACTATTTGGGGCTTGAGCTGGAATAGTAGGCACAGCTCTAAGCTTACTA  
ATCCGAGCAGAGCTCGGTCAACCAGGGGCCCTTACTGGGCGATGACCAAATCTACAACGTA  
ATTGTAACAGCCCACGCATTTGTTATAATTTCTTCATAGTTATACCTATTATAATTGGA  
GGTTTCGGAAACTGATTAGTACCACTAATAATCGGAGCCCTGATATAGCATTCCCTCGA  
ATGAACAATATAAGCTTTTGACTCTTACCACCCTCATTCTATTACTATTAGCCTCATCA  
ACAGTAGAAGCCGGAGCCGGAAGTGAACGGTCTACCCCCCTCTAGCTGGCAACCTA  
GCACATGCAGGAGCCTCCGTAGACCTAGCAATCTTCTCCCTTCATTAGCGGGGGTATCA  
TCAATCCTAGGGGCCATCAATTTATTACAACAATCATCAACATAAAACCACCAGCCCTA  
TCCCAATATCAAACCCCACTATTGTTTGATCCGTATTAAATACAGCCGTCTTACTTCTT  
CTATCTCTACCCGTACTAGCCGCCGGAATTACTATACTACTAACAGACCGTAATCTCAAC  
ACAACCTTCTTCGACCCTGCAGGAGGTGGGGACCCTATCCTATATCAACATCTGTTT





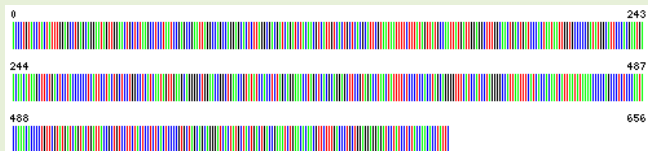
***Hipposideros curtus* (Short-tailed round leaf nosed bat).**

Genome: Mitochondrial

Locus: Cytochrome Oxidase Subunit 1 5' Region

Nucleotides: 657 bp

**Illustrative Barcode:**



**Sequence**

ACCCTGTACCTACTATTTGGAGCCTGAGCAGGAATAGTTGGAAGTCTAAGCCTCCTA  
ATCCGAGCCGAATTAGGCCAGCCAGGAGCACTCTTAGGCGACGATCAGATCTACAACGTC  
ATTGTCACTGCTCAGCATTCGTAATAATTTCTTTATAGTTATGCCAATTATGATTGGA  
GGCTTTGGCAACTGACTGATCCCACTAATAATTGGTGCCCCCGATATGGCATTCCCACGA  
ATGAACAACATAAGCTTCTGACTCCTACCCCCCTCATTCTACTGCTCCTGGCCTCATCA  
ATAGTTGAAGCAGGGGCTGGAACCGGCTGAACCGTATATCCACCTCTAGCAGGAAACCTA  
GCTCACGCAGGAGCTTCCGTAGACCTAACTATTTCTCCCTCCACCTAGCAGGGGTTTCA  
TCCATCCTAGGGGCCATTAATTTATCACCACAATCATTAAATATAAACCCCCAGCCCTC  
TCCCAATACCAAACCCCCGTTCGTATGATCAGTACTGATTACCGCTGTCTTCTACTC  
CTCTCACTCCCCGTGCTAGCAGCAGGGATCACTATGCTACTGACTGACCGAAATCTGAAC  
ACAACGTTCTTTGACCCTGCTGGAGGAGGAGATCCTATCCTTACCAACACCTATTTC







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