**Figure 1.** Initial NJ Tree Based on Pinniped\_initdata.txt**Table 1.** Table linking FASTA files to genomic locations

Common Name/Identifier	Accession Number	COX1 Sequence Position Range
Harbor Seal	NC_001325.1	6275-7819
Caspian Seal	NC_008431.1	5344-6888
Harp Seal	NC_008429.1	5341-6885
Leopard Seal	NC_008425.1	5351-6895
Elephant Seal	NC_008422.1	5353-6897
Crabeater Seal	NC_008423.1	5352-6896
N Fur Seal	NC_008415.3	5352-6896
SA Fur Seal	NC_063561.1	5354-6898
Walrus	NC_004029.2	5350-6894
House Cat	NC_001700.1	6216-7760
Dog	NC_002008.4	5349-6893
Aus Sea Lion	NC_008419.1	5360-6904
Cali Sea Lion	NC_008416.1	5358-6902
Caribbean Manatee	NC_010302.1	5336-6877
Steller's Sea Cow	NC_040161.1	2942-4483
Asiatic Elephant	NC_005129.2	5329-6879
Cape Rock Hyrax	NC_004919.1	5332-6872
American Alligator	NC_001922.1	5314-6868
Chicken	NC_053523.1	5419-6969

**New MSA Including Additional Sequences**

Please refer to end of document.

**Script to Produce ML Phylogenetic Tree**

```
#Create new MSA with new sequences and save MSA
```

```
new_data <- readDNAStringSet("new_msa_data.txt")
```

```
new_msa <- msa(new_data)
```

```
sink(file = "new_msa_output.txt")
```

```
print(new_msa, show="complete")
```

```
sink()
```

```
#Format new MSA
```

```
new_msa_phyDat <- as.phyDat(new_msa)
```

```
#Maximum likelihood analysis: Model selection
```

```
mt <- modelTest(new_msa_phyDat, model=c("JC", "F81", "K80", "HKY", "SYM", "GTR"))
```

```
mt
```

```
which.min(mt$BIC)
```

```
env = attr(mt, "env")
```

```
bestmodel <- mt$Model[which.min(mt$BIC)]
```

```
fitStart = eval(get(bestmodel, env), env)
```

```
fit = optim.pml(fitStart, rearrangement = "stochastic",
```

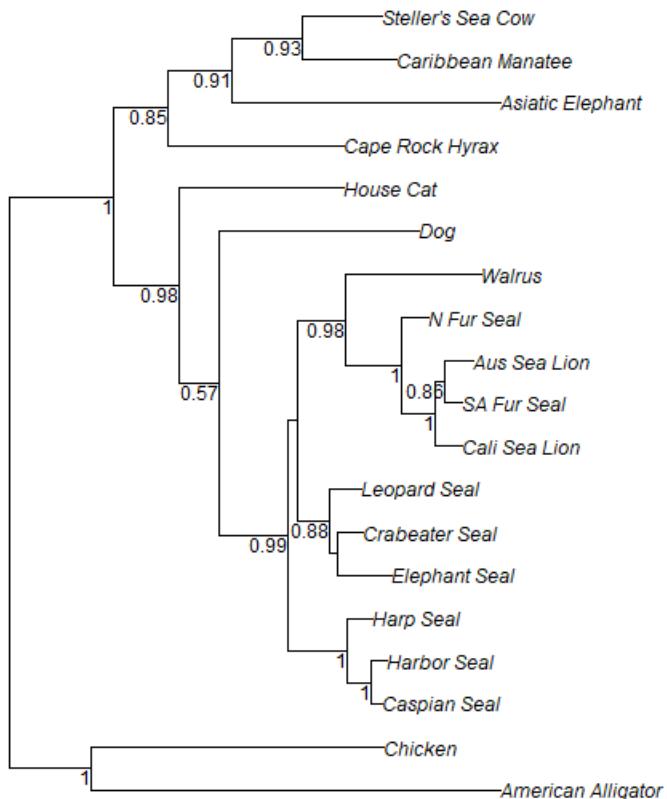
```
    optGamma = TRUE, optInv = TRUE, bestmodel)
```

```
fit
```

```
#Maximum likelihood analysis: Bootstrap
```

```
bs <- bootstrap.pml(fit, bs=100, optNni=TRUE)
```

```
plotBS(midpoint(fit$tree), bs, p = 0.5, type="p", cex = 0.6)
```



**Figure 2. ML Phylogenetic Tree from Own Dataset**

## Discussion on Evolutionary Model and Branch Support

The best fit evolutionary model based on the AICs is GTR+G(4)+I since it is the model with the lowest BIC (~24830). Based on the generated tree above, most branches are well supported due to the high bootstrap confidence values (>0.85). However, the only exception is the branch separating Dog from various seals with a relatively low bootstrap confidence (0.57).

## Questions

- A)** The first event of terrestrial ancestors adapting to a marine environment occurs at the 0.91 branch involving a split between the Asiatic Elephant and Steller's Sea Cow and Caribbean Manatee, which is a single event. The other event involves the 0.57 branch split between Dog and various seals, walrus, and sea lions, which also occurs as a single event. Therefore, yes, manatees share a common evolutionary origin with seals in adapting to a marine environment since both groups had undergone a single event involving a split from a terrestrial group (i.e., manatees with elephant vs. seals with dogs).

**B)** Yes, the Caspian seal, Harbor seal, and Harp seal are a monophyletic group since this grouping includes their ancestor (the 1 branch split between Harp seal vs. Harbor and Caspian seal) and all its descendants.

**C)** No, the fur seals are not a monophyletic group since this grouping does not include the ancestor (the 1 branch split between N Fur Seal vs. other seals) and all its descendants. The monophyletic group would also include the Aus Sea Lion and Cali Sea Lion, but since it does not, the fur seals are a polyphyletic group.

**D)** No, walruses are not distinct from the other seal groups since they are more closely related to one of the seal groups (fur seals and sea lions) than the other seal groups. For walruses to be considered distinct, there would have to be a split between walrus vs. *all* seal groups.

**E)** Yes, the results are broadly consistent with the results in Fig. 1 of Arnason 2006. All variants of seals and sea lions are most closely related, with walrus most closely related to sea lions. From there, all seals, sea lions, and walrus are then most closely related to dog, then cat, and least closely related to the outgroups. There does not appear to be any exceptions or major deviations between the two trees.

**F)** As mentioned previously, most branches are well supported with high bootstrap confidences, except for the 0.57 branch that splits Dog vs. sea lions, seals, and walrus. Several methods to improve this may include improving data quality by performing a multiple gene analysis, compare results with other phylogenetic methods (ex. neighbour-joining), compare with other independent data sources (ex. morphological or ecological data), etc.

**G)** Based on quantitative measurements from a ruler to estimate branch lengths, the dog-cat split is ~4cm from today, which indicates that 4cm = 52 million years ago. To determine how many cm represents 1 million years,  $4\text{ cm}/52 = 0.1\text{ cm}$ . Thus, every 0.1 cm = 1 million years. For the walrus, it occurs at approximately 1.5 cm from today, so  $1.5\text{ cm}/0.1\text{ cm} = 15$ , and thus the walrus split with sea lions and fur seals occurred ~15 million years ago. For manatees, the split occurs at approximately 2cm from today, so  $2\text{ cm}/0.1\text{ cm} = 20$ , and thus the manatee split with the Steller's Sea Cow occurred ~20 million years ago.

### New MSA Including Additional Sequences

MsaDNAMultipleAlignment with 19 rows and 1558 columns

	aln (1..106)	names	
[1]	ATGTTCATAAATCGATGGTTATTTCCACAAATCATAAGGATATCGGCACTCTTATTGCTGTTGGCGCATGAGCTGG		---
	AATAGTAGGCACCGCCCTAGTC Harbor_Seal		
[2]	ATGTTCATAAATCGATGGTTATTTCCACAAATCATAAGGATATTGGCACTCTTATTGCTGTTGGCGCATGAGCTGG		---
	AATGGTAGGCACCGCCCTAGTC Caspian Seal		
[3]	ATGTTCATAAATCGATGGTTATTTCCACAAATCATAAGGATATCGGTACTCTTACTGTTGGTGCATGGGCTGG		---
	CATGGTAGGCACCGCTTAGTC Harp Seal		
[4]	ATGTTCATAAACCGATGACTATTTCCACAAACCATAAAGATATTGGTACTCTCTATCTATTGGTGCATGCCGG		---
	TATAGTAGGTACCGCCCTAGTC Leopard Seal		

[5]

ATGTTCATAAATCGATGGCTATTCACAAATCACAAGATATTGGCACTCTACCTACTATTGGTGCATGAGCCGG  
CATAGTAGGTACCGCCCTCAGTC Crabeater Seal

[6]

ATGTTCGTAAATCGATGACTATTCTCTACAAATCATAAAGACATGGCACTCTACCTATTGGTGCATGAGCCGG  
CATAGTAGGCACCGCCCTCAGTC Elephant Seal

[7]

ATGTTCGTAAATCGATGATTATTCTCCACAAACCATAAAGATATTGGCACCCTTATCTACTATTGGTGCATGAGCTGG  
AATGGCTGGCACCGCCCTCAGCC SA Fur Seal

[8]

ATGTTCGTAAATCGATGATTATTCTCTACAAACCATAAAGATATTGGCACCCCTATCTACTATTGGTGCATGAGCCGG  
AATAGCTGGCACCGCCCTCAGCC Aus Sea Lion

[9]

ATGTTCGTAAATCGATGATTATTCTCTACAAACCATAAAGATATTGGCACCCCTATTTACTATTGGTGCATGAGCTGG  
AATGGCTGGCACCGCTCTCAGCC Cali Sea Lion

... ...

[12]

ATGTTCATAAACCGGTGACTATTCACAAATCACAAGATATTGGTACTCTTACCTTTATTGGTGCCTGAGCTGG  
CATGGTGGGGACTGCTCTAGTC House Cat

[13]

ATGTCATTAACCGATGACTGTTCTCCACTAACATCACAAGGATATTGGTACTTTACTATTGGAGCATGAGCCGG  
TATAGTAGGCAGTGCTTGAGCC Dog

[14]

ATGTCATCAATCGTTGATTATTCTCAACCAATCACAAGATATTGGCACCCGTATTTACTATTGGCGCTTGAGCCGG  
AATGGTAGGAAGTGCTCTGAGCA Caribbean Manatee

[15]

ATGTCATTAACCGTTGACTGTTCAACTAACATCACAAGACATTGAACTCTGTACCTGCTATTGGCGCTTGAGCCGG  
GAATAGTAGGGACTGCCCTAAGTA Steller's Sea Cow

[16]

ATGTTGCTAACCGCTGACTATTCACAAACCACAAGATATTGGAACACTGTATCTACTATTGGTGCCTGAGCTG  
GTATAGTAGGGACTGCTTAGTA Asiatic Elephant

[17]

ATGTCATCAACCGTTGATTGTTCAACCAACCATAAAGACATGGCACTTTGTACTTACTATTGGAGCTTGAGCTG  
GAATAGTAGGAACCGCCCTAAGCA Cape Rock Hyrax

[18]

GTGAACCTCC---  
ACCGTTGACTCTCTACTAACCAACAAAGACATTGGCACCCTTACTTCATTTGGAACTTGAGCCGAATGGTGG  
GAACAGCACTTAGCC American Alligator

[19]

GTGACCTCATCAACCGATGATTATTCTCAACCAACCACAAAGACATTGGACTCTTACCTAATTCGGCACATGGG  
CGGGCATAGCCGGCACAGCACTAGCC Chicken

Con

ATGTTCATAAATCGATGATTATTCTC?ACAAACCATAAAGATATTGGCACTCT?TACCTACTATTTGGTCATGAGC?GG  
AATAGTAGGCACCGCCCT?AGCC Consensus

aln (107..212)

names

[1]

TCTTAATCCGCGCAGAACTAGGACAACCTGGCGCCCTACTAGGAGATGACCAAATTACAACGTAATTGTACCGCCC  
ATGCATTCTGAATAATTTCTTCATGGT Harbor\_Seal

[2]

TCTTAATCCGCGCAGAACTAGGACAACCTGGCGCCCTACTAGGAGATGACCAAATTACAACGTAATTGTACCGCCC  
ATGCATTCTGAATAATTTCTTCATAGT Caspian Seal

[3]

TCTTAATCCGCGCAGAATTAGGACAACCTGGTGCCCTACTAGGAGATGACCAAATTACAATGTAATTGTACCGCCC  
ATGCATTCTGAATAATTTCTTATAGT Harp Seal

[4]

TTTTAATCGCGCAGAACTAGGACAACCTGGTGCCCTGCTAGGAGACGATCAGATCTAACGTGATTGTACCGCCC  
ACGCATTCTGAATAATCTTCTTCATAGT Leopard Seal

[5]

TTTTAATCGCGCAGAACTAGGACAACCTGGCGCTTACTAGGAGACGACCAAATTATAACGTGATCGTCACCGCCC  
ACGCATTCTGAATAATCTTTTTATAGT Crabeater Seal

[6]

TTTTAATCGCGCAGAACTAGGGCAGCCTGGCGCTTACTAGGAGACGATCAGATCTAACGTGATTGTACCGCTC  
ACGCATTCTGAATAATCTTTTTATAGT Elephant Seal

[7]

TATTGATCCGCGCGAGTTGGCCAACCAGGCACCTACTAGGAGATGACCAAATCTAACGTAAATTGTACCGCCC  
ATGCATTCTGAATAATCTTTCTTCATGGT SA Fur Seal

[8]

TATTGATCCGCGCGAGTTAGGCCAACCAGGCACCTACTAGGAGATGACCAAATCTAACGTAAATTGTACCGCCC  
ACGCATTCTGAATAATCTTCTTCATGGT Aus Sea Lion

[9]

TATTAATCCGCGCGGAATTAGGCCAACCAGGCACCTACTAGGGGACGACCAAATCTAACGTAAATTGTACCGCCC  
ATGCATTCTGAATAATCTTTCTTCATGGT Cali Sea Lion

... ...

[12]

TTCTAATCCGGGCCGAACTGGGCCAACCTGGTACACTACTAGGAGATGATCAGATTACAATGTAATCGTCAGGCC  
ATGCTTTGTAATGATCTTTTATGGT House Cat

[13]

TCCTCATCCGAGCCGAACTAGGTCAAGCCCCGGTACTTACTAGGTGACGATCAAATTATAATGTCATCGTAACCGCCC  
TGCTTCGTAATAATCTCTCATAGT Dog

[14]

TTCTAATTGGGCCGAATTAGGCCAGCCCCGGCACCCCTGGGAGATGATCAAATCTACAATGTCATCGTAACAGCCC  
ATGCCTCGTAATAATTCTTCATGGT Caribbean Manatee

[15]

TCTTAATTGAGCTGAATTGGGTCAACCAGGCCTCTCCTAGGAGACGACCAAACTATAACGTTATCGTAACGGCCC  
ATGCTTCGTAATAATTCTTCATAGT Steller's Sea Cow

[16]

TTCTAATTGGGCAGAATTAGGTCAACCAGGCCTCTCTGGAGACGACCAAACTATAATGTCATTGTCACAGCAC  
ACGCCTTGTAATAATCTTCTTATAGT Asiatic Elephant

[17]

TCCTAATCCGGGCCGAACTCGGCCAACCAGGAGCCCTACTGGGAGATGATCAAATCTACAACGTTAGTTACAGCT  
CACGCATTGTAATAATTCTTCATAGT Cape Rock Hyrax

[18]

TCCTTATTGGACAGAATTAAGCCAGCCCCGACCTCTATTAGGTGATGACCAAAATTATAACGTAATTGTCACCGCCC  
TGCCTTCATTATAATCTTTTATAGT American Alligator

[19]

TTCTAATTGCGCAGAACTAGGACAGCCCCGAACTCTCTTAGGAGACGATCAAATTACAATGTAATCGTCACAGCCC  
ATGCTTCGTCATAATCTTCTTATAGT Chicken

Con

T?TTAACCGCGCAGAACTAGG?CAACC?GGCACTCTACTAGGAGACGACCAAACTACAACGTAATTGTCACCGCCC  
ATGCATTGTAATAATCTCTTATAGT Consensus

aln (213..318)

names

[1]

AATGCCCATCATAATTGGCGGCTTGGAACTGACTGGTCCCCCTAATAATTGGAGCTCCTGATATAGCATTCCCCGA  
ATAAATAACATAAGTTCTGACTTTA Harbor\_Seal

[2]

AATGCCCATCATAATTGGGGCTTGGAACTGACTAGTGCCCTAATAATTGGAGCTCCTGATATAGCATTCCCCGA  
ATAAACACATAAGTTCTGACTCTA Caspian Seal

[3]

AATGCCTATTATAATTGGCGGGTTGGAACTGATTAGTACCCCTGATAATCGGAGCCCTGATATAGCATTCCCCGA  
ATAAATAATATAAGTTCTGACTTTA Harp Seal

[4]

AATACCTATCATAATCGGAGGCTCGGAAACTGATTAGTACCCCTAATAATCGGCGCTCCTGACATGGCATTCCCCGA  
ATAAACAAATATAAGCTTCTGACTCCTT Leopard Seal

[5]

AATACCTATCATAATCGGAGGCTCGGAAACTGATTAGTACCCCTAATAATTGGTGCTCCTGACATAGCATTCCCCGA  
TAAATAATATGAGCTTCTGACTTCTA Crabeater Seal

[6]

AATACCTATCATGATCGGAGGTTCGGAAACTGGTTAGTACCTCTAATGATTGGTGCCTGACATAGCATTCCCCGA  
ATAAATAATATAAGCTTCTGACTTCTA Elephant Seal

[7]

AATACCTATTATAATTGGGGGCTTGGAAATTGATTAGTACCCCTAATAATTGGAGCCCCGATATGGCATTCTCGAA  
TAAATAACATAAGTTCTGACTTCTA SA Fur Seal

[8]

AATACCTATTATAATTGGAGGCTCGGAAATTGATTGGTGCCTGATAATTGGAGCTCCGACATGGCATTCCCCGA  
ATAAACAAACATAAGTTCTGACTTCTA Aus Sea Lion

[9]

AATGCCTATTATGATTGGAGGCTTGGAAATTGATTAGTACCCCTAATAATTGGTGCTCCGACATGGCATTCCCCGA  
ATAAACAAACATAAGTTCTGACTTCTA Cali Sea Lion

....

[12]

GATGCCTATTATAATTGGAGGGCTTGGAAACTGATTGGTCCCATTATAATTGGAGCTCCTGACATAGCATTCCCCGA  
ATAAACAAACATGAGCTTCTGACTCCTC House Cat

[13]

CATGCCCATCATAATTGGGGGCTTGGAAACTGACTAGTGCGTTAATAATTGGTGCTCCGACATGGCATTCCCCG  
ATAAAATAACATGAGCTTCTGACTCCTT Dog

[14]

TATGCCCATCATAATCGGAGGATTGGAACTGACTAGTCCCTCTAATAATTGGAGCCCCGACATGGCGTTCCCCG  
ATAAAATAATATGAGCTTCTGACTCCTA Caribbean Manatee

[15]

AATACCTATTATGATTGGAGGCTTGGAAATTGGTTGGCCCTTAATAATTGGAGCACCTGACATGGCTTCCCCGA  
ATAAACAAACATGAGCTTCTGACTCTA Steller's Sea Cow

[16]

TATGCCAATCATAATTGGAGGCTTGGAAACTGGTAATTCCACTTATAATTGGAGCACCTGATAGCCTTCCTCGAA  
TAAACAATATAAGTTCTGACTACTG Asiatic Elephant

[17]

AATGCCAATTATAATCGGAGGGTTCGGCAACTGACTAGTCCCCTTAATAATTGGCTCCCGGATATGCATTCCACGA  
ATAAACAAACATGAGCTTCTGACTATTA Cape Rock Hyrax

[18]

AATACCAATTATAATTGGAGGGTTGGAAACTGGCTATTACCCCTAATAATCGGAGCCCCAGACATGGCATTCCCCGA  
ATAAACAAACATAAGTTCTGATTACTC American Alligator

[19]

TATACCCATCATGATCGGTGGCTCGGAAACTGACTAGTCCCCTAATCGGTGCCAGACATAGCATTCCCCGC  
ATAAATAACATAAGCTTCTGACTCCTC Chicken

Con

AATACCTATCATAATTGGAGGCTTGGAAACTGATTAGT?CCCCTAATAATTGGAGC?CC?GACATAGCATTCCCCGA  
ATAAACAAACATAAGCTTCTGACT?CTA Consensus

aln (319..424)

names

[1]

CCACCGTCCTCCTACTACTACTGGCCTCCTATAGTAGAAGCAGGTGCCGAACCGGGTGAACCGTTATCCTCCCG  
TAGCTGGAACCTGGCTCATGCAGGAG Harbor\_Sea

[2]

CCACCATCCTCCTACTACTACTGGCCTCCTATAGTAGAAGCAGGTGCCGGACCGGGTGAACCGTTATCCTCCCG  
TAGCTGGAACCTGGCTCATGCAGGGG Caspian Seal

[3]

CCACCATCCTCCTATTACTACTGGCCTCCTATAGTAGAAGCAGGTGCCGAACGGATGAACGTCTATCCTCCCG  
TAGCTGGTAATCTAGCTCATGCAGGAG Harp Seal

[4]

CCACCATCTTCCTACTACTAGCTTCATCCATAGTAGAAGCAGGTGCAGGAACAGGATGGACTGTGTATCCTCCCG  
TAGCTGGAACCTAGCTCATGCAGGAG Leopard Seal

[5]

CCACCATCCTCTTATTACTACTAGCTTCCTCCATGGTAGAAGCAGGTGCAGGAACAGGATGAACCGTATATCCTCCCG  
TAGCTGGCAATCTAGCTCATGCAGGAG Crabeater Seal

[6]

CCACCATCCTCCTATTACTATTAGCTTCCTCCATAGTAGAAGCAGGTGCAGGAACAGGATGAACCGTCTATCCTCCCG  
TAGCTGGAACCTAGCCCATGCAGGAG Elephant Seal

[7]

CCCCCTCCTCCTACTACTAGCCTTTCTAGTTGAAGCCGGCGCAGGTACGGATGAACAGTTACCCTCCCG  
TAGCAGGAAACCTAGCCCATGCAGGAG SA Fur Seal

[8]

CCCCCCTCCTTCTACTACTAGCCTTTCTAGTTGAAGCCGGCGCAGGTACCGGATGAACGGTTACCCCTCCCC  
TAGCAGGGAACCTAGCCCACGCAGGGG Aus Sea Lion

[9]

CCCCCCTCCTTCTACTACTAGCCTTTCTAGTTGAAGCCGGCGGGTACCGGATGAACGGTTACCCCTCCCC  
TAGCAGGGAACCTAGCCCATGCAGGGAG Cali Sea Lion

... ...

[12]

CCTCCATCCTTCTACTCTTACTCGCCTCATCTATGGTAGAAGCCGGAGCAGGAACGGGTGAACAGTATAACCCACCCCC  
TAGCCGGCAACCTGGCTCATGCAGGAG House Cat

[13]

CCTCCATCCTTCTTCTACTATTAGCATCTTCTATGGTAGAAGCAGGTGCAGGAACGGGATGAACCGTATAACCCCCAC  
TGGCTGGCAATCTGGCCATGCAGGAG Dog

[14]

CCTCCATCATTCTACTCCTCTAGCCTCATCTATAATTGAAGCTGGGCTGGAACAGGCTGAACAGTCTACCCACCTC  
TAGCTGGAACCTAGCCCATGCCGGAG Caribbean Manatee

[15]

CCCCCCTCATTCTTCTTCTAGCCTCATCCATAGTCGAAGCCGGGCTGGAACGGGTGAACAGTTACCCCTT  
TAGCAGGAAACTTAGCTCACGCCGGAG Steller's Sea Cow

[16]

CCTCCGTCTTCTACTACTTTGGCATCCTCCATAGTAGAAGCTGGAACAGGCAGGTTGGACCGTATATCCTCCTC  
TGGCAGGAAACTAGCCCATGCAGGAG Asiatic Elephant

[17]

CCCCCATCCTTCTACTCTGCTAGCCTTTCTATAGTAGAAGCCGGAGCAGGAACAGGCTGAACAGTATAACCGCCT  
CTGGCGGGTAATTAGCCCACGCAGGGG Cape Rock Hyrax

[18]

CCCCCATTTCACACTACTCTCCTCAGCCTGCATCGAAGCAGGTGCTGGAACAGGGTGAACCGTACCCCTCCC  
CTAGCCGGAAACCTAGCCCACGCCGGC American Alligator

[19]

CCTCCCTCCTTCTTCTACTAGCCTCATCTACCGTAGAAGCTGGGCGGCACAGGATGGACAGTTACCCCTT  
TAGCCGGCAACCTAGCCCACGCTGGCG Chicken

Con

CC?CCATCCTTCTACTACTAGCCTC?TCTATAGTAGAAGC?GG?GCAGGAAC?GGATGAAC?GT?TACCCCTCCC  
AGC?GG?AACCTAGCCCATGCAGGAG Consensus

aln (425..530)

names

[1]

CCTCTGTAGATCTAACAACTTCTCGCTCCACTTGGCAGGTGTATCATCTATTCTGGAGCTAACCTCATCACTACC  
ATCATTAATATAAAAACCCCTGCAAT Harbor\_SeaL

[2]

CATCTGTAGATCTAACGATTTCTCCCTCATTGGCAGGTGTATCATCTATTCTGGGGCTAACCTCATCACCA  
TTATTAATATAAAAACCCCTGCAAT Caspian Seal

[3]

CATCCGTAGATTAAACGATTTCTCCCTCATCTGGCAGGTGTATCATCTATTCTGGGGCATAACCTCATCACTACTA  
TCATTAATATAAAAACCCCTGCAAT Harp Seal

[4]

CATCCGTAGACCTGACAATTTCTCCCTCACCTAGCAGGAGTATCATCCATCCTGGAGCTATTAATTCATTACTACTA  
TCATCAATATAAAAACCTCCTGCAAT Leopard Seal

[5]

CATCTGTAGACTAACAACTTCTCTTCACCTGGCAGGTGTATCATCCATCCTGGGGCTATTAATTTATTACTACCA  
TTATCAACATAAAACCTCCTGCAAT Crabeater Seal

[6]

CATCTGTAGACCTAACAACTTCTCTTCACCTGGCAGGTGTATCATCCATCCTGGAGGCCATCAACTTATTACCA  
ATTATTAACATAAAACCCCTGCAAT Elephant Seal

[7]

CTTCCGTAGACTAACAACTTCTCCCTCACCTGGCAGGAGTATCATCTATTCTGGAGGCCATTAACCTTATTACTACTA  
TTATCAACATGAAACCCCTGCCAT SA Fur Seal

[8]

CTTCCGTAGACTTGACTATTTCTCCCTCACCTGGCTGGAGTGTATCTATTCTAGGAGGCCATTAACCTTATTACCA  
ATTATCAACATGAAACCCCTGCTAT Aus Sea Lion

[9]

CTTCCGTAGACTTGACTATTTCTCCCTCACCTGGCAGGAGTATCATCTATTCTGGAGGCCATCAACTTATTACTACCA  
ATTATCAACATGAAACCCCCGCTAT Cali Sea Lion

....

[12]

CATCCGTAGACCTAACAACTTTTCACTACACCTGGCAGGTGTCTCTCAATCTGGGTGCTATTAATTCATTACTACTA  
TTATTAATATAAAAACCTCCTGCCAT House Cat

[13]

CATCCGTTGACCTACAATTTCTCCTACACTTAGCCGGAGTCTCTTCTATTAGGGGCAATTAATTCATCACTACTA  
TTATCAACATAAAACCCCTGCAAT Dog

[14]

CCTCGGTAGATCTGACTATCTCTCGCTCCATCTGGCTGGAGTATCTCAATTCTAGGGGCTATTAACCTTACTACA  
ATTATCAACATGAAACCTCCAGGCCAT Caribbean Manatee

[15]

CCTCTGTAGATCTAACAACTTCTCACTCCATCTAGCCGGGTATCTCGATTCTAGGGGCTATTAACTTATTACTACAA  
TTATCAATATAAAACCCCCAGCTAT Steller's Sea Cow

[16]

CTTCTGTAGATTTAACTATTTTCACCTCACCTGCAGGAGTATCCTCTATTCTAAGTGCAATTAATTTCACCTACCAT  
CATCAACATAAAACCCCCAGCCAT Asiatic Elephant

[17]

CCTCTGTAGACCTACAATCTTCACTACACCTAGCAGGGTTCTCAATCTAGGGTATCAACTTCATCACC  
ATCATTAACATAAAACCCCCAGCAAC Cape Rock Hyrax

[18]

CATCCGTAGATTTAACTATCTCTCTACACTTAGCCGGAGTATCTCCATCCTGGAGCAATTAACTTATTACAACAG  
CAATCAACATAAAACCCCCAGCAAT American Alligator

[19]

CATCAGTAGACCTAGCCATCTTCATTACACTTAGCAGGTGTTCTCATTCTAGGAGCCATCAACTTATCACTACC  
ATCATCAACATAAAACCCCCGCACT Chicken

Con

CATCCGTAGACCTAAC?ATTTCTC?CTTCACCTGGCAGG?GTATCATC?ATTCT?GG?GC?ATTAACTTATTACTAC?AT  
TATCAACATAAAACCCCCGCAAT Consensus

aIn (531..636)

names

[1]

GTCTCAATACCAAACTCCACTGTTGTATGATCCGTATTAATCACAGCGGTGCTCTACTATTGTCACTACCAGTCCTGG  
CAGCTGGCATCACCATGCTACTCACA Harbor\_SeaL

[2]

GTCTCAATACCAAACTCCACTGTTGTGTGATCCGTATTAATCACGGCAGTGCTCTGCTATTGTCACTACCAGTCCTAG  
CAGCTGGCATCACCATGTTACTTACA Caspian Seal

[3]

GTCTCAATACCAAACTCCACTATTGTATGATCCGTGTTAACAGGCAGTACTCCTACTATTGTCATTACCAAGTCCTAGC  
AGCTGGCATTACCATGCTACTTACA Harp Seal

[4]

ATCTCAATATCAAATTCCCCTGTTGTGATCTGACTAACAGCAGTCCTACTGCTATCACTACCAGTCCTAGC  
AGCTGGTATTACTATACTACTTACA Leopard Seal

[5]

ATCTCAATACCAAAATTCCCCTATCGTGTGATCCGTACTGATCACAGCAGTACTCCTACTGCTATCACTACCAGTCCTAGC  
AGCTGGCATTACTATACTACTTACA Crabeater Seal

[6]

ATCTCAATATCAAATTCCCTTATTCGTATGATCCGTACTAATTACAGCAGTACTTCTGCTATTACACTACCAGTTCTAGCA  
GCTGGTATTACTATACTTACA Elephant Seal

[7]

ATCCAATACCAAACCCCTTATTCGTGTGATCCGTACTAATCACAGCAGTACTACTTCTGCTATCCCTACCAGTCCTGG  
CAGCTGGTACTATATTACTTACG SA Fur Seal

[8]

GTCCTAACAAACCCCCCTATTCGTGTGATCCGTACTAATCACAGCGGTACTACTTCTGCTGTCCCTACCAGTCCTAG  
CAGCTGGTACTATATTACTTACG Aus Sea Lion

[9]

GTCCTACCAAACTCCTTATTCGTGTGATCCGTACTAATCACAGCAGTACTACTTCTGCTATCCCTACCAGTACTAG  
CAGCCGGTACTACTACTTACG Cali Sea Lion

... ...

[12]

GTCCTAACATCAAACACCTCTATTGTCTGATCAGTCTTAATCACTGCTGCTTACTACTTCTATCACTCCAGTCTTAGC  
AGCGGGAACTACTATATTATTAACA House Cat

[13]

ATCCCAGTATCAAACCTCCCTGTTGTATGATCAGTACTAATTACAGCAGTTCTACTCTTACTATCCCTGCCTGTACTGGC  
TGCTGGAATTACAATACTTTAACCA Dog

[14]

ATCTCAATACCAAACCTCCCTGTTGTCTGATCTGTTCTAGTCACAGCCGTCTTCTTCTGTCCCTCCAGTTCTAG  
CAGCAGGAATCACTACTCCTGACG Caribbean Manatee

[15]

AACCCAAATACCAGACTCCCTGTTGTTGATCTGTCCTAGTAACAGCTGTTCTACTTCTTGTCCCTCCAGTCCTAG  
CAGCAGGTATCACCACTTCAACT Steller's Sea Cow

[16]

GTCTCAATATCATATACCCCTATTTGATCCATTAGTTACAGCCGTTCTTCTTCTATCTCTCCAGTTCTAGCA  
GCAGGTATTACAATACTATTAACG Asiatic Elephant

[17]

CACCCAAATACCAAACACCCCTATTCGTTGATCCGTACTAATCACTGCTGACTCCTTTATTATCCCTACCAGTGCTAGC  
AGCCGGAATTACAATACTAACCA Cape Rock Hyrax

[18]

ATCCAATACCAAACACCACTATTTGATCCGTCTCATTACAGCTGACTTCTCCTACTATCCCTACCAGTACTAGC  
TGCTGGAATTACAATACTACTCACA American Alligator

[19]

GTCACAATACCAAACACCCCTATTCGTATGATCCGTCTCATTACTGCCATCCTACTACTCCTCTCCTACCCGTCTAGC  
AGCTGGGATTACCATACTTACCA Chicken

Con

ATCCAATACCAAACCTCCCTATTCTG?TGATCCGTACTAATCACAGC?GTACT?CT?CT?CTATCCCTACCAGTCCTAGC  
AGCTGG?ATTACTATACTACTTACA Consensus

aln (637..742)

names

[1]

GACCGAAACCTGAATACAACATTCTCGACCCCTGCCGGAGGAGGTGATCCTATCCTGTATCAACATCTGTTCTGATTCT  
TCGGACATCCTGAGGTGTATATTCTAA Harbor\_Sea

[2]

GACCGAAACCTGAATACAACATTCTCGACCCCTGCCGGAGGAGGTGATCCTATCCTGTATCAACATCTATTCTGATTCT  
TCGGGCATCCCGAAGTGTATATTCTAA Caspian Seal

[3]

GATCGGAATCTAACACAAACATTCTCGATCCTGCCGGAGGAGGTGATCCTATCCTATATCAACATCTGTTCTGATTCTT  
CGGACACCCCGAAGTGTATATCCTGA Harp Seal

[4]

GATCGAAACCTAAATACAACATTCTTGACCCCGCTGGAGGAGGGGACCTATTTATATCAACATCTATTCTGATTCTT  
TGGACATCCCGAAGTTATATTCTAA Leopard Seal

[5]

GATCGAAATCTAAATACAACATTCTCGATCCTGCTGGAGGAGGTGACCCCTATTCTGTATCAACATCTATTGATTCTT  
TGGACACCCCTGAAGTTACATTCTAA Crabeater Seal

[6]

GACCGAAATCTAAATACAACATTCTTGATCCTGCTGGAGGAGGTGACCCCTATTCTATATCAACATCTATTCTGATTCTT  
TGGACACCCCGAAGTATATATTCTAA Elephant Seal

[7]

GACCGAAATCTAACACAAACCTTTTGATCCAGCCGGAGGGGGTGACCCCTATCCTATATCAACACCTATTCTGATTCT  
TCGGACACCCAGAAGTATATATTCTCA SA Fur Seal

[8]

GACCGAAATCTAAATACAACCTTTTGATCCAGCCGGAGGGGGTGACCCCTATCCTATATCAACACCTATTCTGATTCT  
TCGGACATCCAGAAGTATATATTCTTA Aus Sea Lion

[9]

GACCGAAATCTAAATACAACCTTTTGATCCAGCCGGAGGGGGTGACCCCTATCCTATATCAACATCTATTCTGATTCTT  
CGGACACCCAGAAGTATATATTCTTA Cali Sea Lion

....

[12]

GATCGAAACCTAAACACCAACATTCTTGACCCCGCTGGGGAGGGAGATCCTATCTTATACCAACACTTATTCTGATTCT  
TTGGCCATCCAGAAGTTACATTCTAA House Cat

[13]

GACCGGAATCTTAATACAACATTTTGATCCGCTGGAGGAGGAGACCTATCCTATCAACACCTATTCTGATTCTT  
CGGACATCCTGAAGTTACATTCTTA Dog

[14]

GACCGAACCTAAACACTACCTTCTTGACCCGGCTGGAGGGGAGACCAATCCTGTACCAACACCTATTCTGATTCT  
TTCGGGCACCCCTGAAGTGTACATTCTTA Caribbean Manatee

[15]

GATCGTAACCTAACACAAACCTTCTCGATCCAGCTGGAGGAGGGATCCAATCCTGTATCAACATCTATTCTGATTCT  
TTGGACACCCCTGAAGTGTATATTCTTA Steller's Sea Cow

[16]

GATCGCAATCTCAATACTACTTCTTGACCCCTGCAGGAGGAGGAGACCCAGTTCTATACCAACACCTATTCTGGTTT  
TTGGACACCCCTGAAGTCTATATTCTAA Asiatic Elephant

[17]

GATCGAACATCAACACAAACCTTTGACCCAGCGGGTGGAGGAGACCCAGTTCTATACCAACATCTATTCTGATTCT  
TTCGGACACCCCTGAAGTTACATCCTCA Cape Rock Hyrax

[18]

GACCGAACCTAACACAAACCTTCTTGACCCCGCAGGGGAGGAGATCCCATCCTATACCAACACCTTTCTGATTCT  
TTGGCCACCCAGAAGTATATCCTAA American Alligator

[19]

GACCGAACCTTAACACCACATTCTCGACCCAGCTGGAGGAGGAGACCCATCCTATACCAACACCTATTCTGATTCT  
TTCGGTCACCCCGAAGTTACATCCTCA Chicken

Con

GACCGAACATCTAAATACAAC?TTCTTGATCC?GC?GGAGGAGG?GACCTATCCTATCAACATCTATTCTGATTCTT  
CGGACACCC?GAAGT?TATATTCT?A Consensus

aln (743..848)

names

[1]

TCCTACCAGGATTCGGAATAATCTCACACATCGTACCTACTATTCAAGGAAAAAAAAGAACCTTTGGTTATAGGAAT  
AGTTGAGCAATAATGCCATCGGCTT Harbor\_Sea

[2]

TCCTACCAGGATTCGGAATAATCTCACACATTGTCACCTACTATTCAAGGAAAAAAAAGAACCTTTGGTTATAGGAAT  
AGTTGAGCAATAATGCCATCGGCTT Caspian Seal

[3]

TCCTACCAGGATTCGGAATAATCTCACACATCGTCACCTACTATTCAAGGAAAAAAAAGAACCTTTGGTTACATAGGAAT  
AGTTGAGCAATAATGCCATCGGCTT Harp Seal

[4]

TTCTCCAGGATTCGGAATAATTCGCACATCGTACCTACTACTCAGGAAAAAAAGAACCTTGCTATAGGAAT  
AGTATGAGCAATAATATCCATTGGCTT Leopard Seal

[5]

TCCTCCAGGATTCGGAATGATTCACATATCGTACCTATTATTCAAGGGAAAAAAAGAACCTTGTTATAGGAATA  
GTCTGAGCAATAATCTATCGGCTT Crabeater Seal

[6]

TTCTCCAGGATTGGAAATAATCTCACACATCGTCACCTACTCAGGAAAAAAAGAACCCCTCGGCTATAGGAAT  
AGTCTGAGCAATAATATCCATTGGTTT Elephant Seal

[7]

TCCTACCAGGATTGGATAATCTCACACATCGTCACCTACTCAGGAAAAAAAGAACCCCTTGTTATAGGAAT  
AGTCTGAGCAATAATATCCATCGGCTT SA Fur Seal

[8]

TTTGCCAGGATTGGTATAATCTCACATATCGTCACCTATTACTCAGGAAAAAAAGAACCCCTCGGCTATAGGAATA  
GTCTGAGCAATAATCCATTGGCTT Aus Sea Lion

[9]

TCCTACCAGGGTCGAATAATCTCATATCGCACATATTATTCAAGGAAAAAAAGAACCCCTTGCTATAGGAAT  
GGTCTGAGCAATAATCCATTGGCTT Cali Sea Lion

... ...

[12]

TCCTACCCGGTTGGATAATCTCACATATTGTTACCTATTTCAGGTAAAAAAAGAACCCCTTGCTACATGGAAATA  
GTTTGAGCCATGATCAATCGGCTT House Cat

[13]

TCCTGCCGGATTGGATAATTCACATCGTACCTACTCAGGGAAAAAAAGAGCCTTCGGTTATAGGAAT  
AGTATGAGCAATAATCTATTGGTT Dog

[14]

TCCTACCCGGCTCGGTATAATTCACACATCGTACCTATTTCAGGTAAAAAAAGAACCCATTGGTTATAGGTATG  
GTTTGGGCCATAATGTCATCGGCTT Caribbean Manatee

[15]

TCCTGCCGGATTGGTATAATCTCACATATCGTCACCTATTTCAGGCAAAAAAGAACCCCTTGATATAGGAATA  
GTTTGAGCCATAATGTCATTGGTT Steller's Sea Cow

[16]

TCCTCCCAGGATTGGAAATAGTTCTCATATCGTACGTACTCAGGGAAAAAAAGAACCCCTTGCTATAGGGAT  
AGTGTGGCTATAATCAATTGGTT Asiatic Elephant

[17]

TTTACCCGGATTGGATAATCTCCACATTGTCACCTACTCAGGCAAAAAAGAACCTTCGGTTACAGGTAT  
GGTATGAGCCATAATCAATTGGCTT Cape Rock Hyrax

[18]

TTCTCCAGGGTTCGGAATAATTCACGTAGTAGCCTTTATTCAAGGCAAAAAAGAACCATCGGCTATAGGAAT  
AGCATGAGCCATATTATCCATTGGATT American Alligator

[19]

TCCTCCCAGGTTTCGGAATAATTCACGTAGTAGCATACTATGCAGGAAAAAAAGAACCATCGGATACATAGGAA  
TAGTCTGAGCCATACTGTCAATCGGATT Chicken

Con

TCCTACCAGGATTCGGAATAATCTCACACATCGCACCTACTATTCAAGG?AAAAAAGAAC?TTTGG?TATATAGGAATA  
GT?TGAGCAATAATCCATTGGCTT Consensus

aln (849..954)

names

[1]

CCTGGGCTTCATTGTATGAGCCCACCATATTTACTGTAGGGATGGACGTCGACACACGAGCATACTTCAGCC  
ACTATAATTATTGCAATTCCAACGGGA Harbor\_Sea

[2]

CCTGGGCTTCATTGTATGAGCCCACCATATTCACTGTAGGGATGGACGTCGACACACGAGCATACTTCAGCC  
ACTATAATTATTGCAATTCCGACAGGA Caspian Seal

[3]

TCTAGGCTTCATTGTATGAGCCCACCATATTCACTGTAGGGATGGACGTTGATAACGAGCATACTTACTTCAGCC  
ACTATAATCATTGCAATTCCAACAGGA Harp Seal

[4]

CCTAGGCTTCATCGTATGAGCCCACCATATTTACCGTAGGAATGGATGTTGATAACGAGCATACTTACTTCAGCC  
CTATAATTATTGCAATTCCAACAGGA Leopard Seal

[5]

CTTAGGCTTCATCGTATGAGCCCACCATATTCACTGTAGGAATAGATGTTGACACACGAGCTTACTTCAGCC  
CTATAATTATTGCAATTCCAACAGGA Crabeater Seal

[6]

CCTAGGCTTCATTGTATGAGCTCATCATATTACCGTAGGAATAGATGTTGACACACGAGCTTACTTCAGCC  
CTATAATTATTGCAATTCCAACAGGA Elephant Seal

[7]

CTTAGGCTTATCGTATGAGCACATCATATTACCGTAGGAATAGATGTTGACACACGAGCATACTTCACCTCAGCC  
ACTATAATTATGCCATCCCTACAGGA SA Fur Seal

[8]

CCTAGGCTTATCGTATGAGCACATCACATATTACCGTAGGAATGGATGTTGACACCGAGCATACTTCACCTCAGCC  
ACTATAATTATCGCTATCCCTACAGGA Aus Sea Lion

[9]

CTTAGGCTTATCGTATGAGCACATCATATTCACCGTAGGAATAGATGTTGACACGCGAGCATAATTCACCTCAGCCA  
CTATAATCATGCCATCCCTACAGGA Cali Sea Lion

....

[12]

CCTGGGCTTATCGTATGAGCCCACATCACATGTTACTGTAGGAATGGATGTAGACACACGAGCATACTTACATCAGCC  
ACTATAATTATTGCCATTCCCTACCGGG House Cat

[13]

TTTAGGCTTATCGTATGAGCTACCATATGTTACCGTAGGAATAGATGTAGACACACGAGCGTACTTACGTCCGCC  
ACTATAATTATCGCTATTCCAACGGGA Dog

[14]

TCTCGGTTCATCGTATGAGCTCATCATATTCACCGTAGGTAGATGTGGACACTCGAGCCTACTTACGTCA  
CAATAATTATTGCCATCCCCACAGGT Caribbean Manatee

[15]

CCTAGGATTATTGTGTGAGCTACCATATATTCACTGTAGGAATAGACGTGGACACTCGAGCCTACTTACATCAGCT  
ACGATAATCATTGCTATTCCAACGGGT Steller's Sea Cow

[16]

CCTAGGGTTCATTGTATGAGCCCACCATATATTACCGTAGGTAGACGTTGACACTCGAGCCTACTTACATCAGCTA  
CTATAATTATTGCTATTCCAACGGC Asiatic Elephant

[17]

CTTAGGATTATTGTATGAGCTACCATATATTACAGTGGAAATAGACGTAGACACCCGAGCCTATTACGTCA  
ACCATAATTATCGCAATCCAACAGGA Cape Rock Hyrax

[18]

CTTAGGGTTCATCGTCTGAGCCCACCATATTACAGTCGGAATAGACGTAGACACCCGAGCATACTTACCA  
CACAATAATCATTGCCGTTCCCACCGGG American Alligator

[19]

CCTGGCTTCATTGTATGAGCCCACCATATATTACAGTCGGAATGGACGTAGACACCCGAGCCTACTTACATCAGCC  
ACAATAATCATGCCATCCAACGGT Chicken

Con

CCTAGGCTTCATTGTATGAGC?CACCATATATTAC?GTAGGAATAGATGTTGACACACGAGCATACTTAC?TCAGCCA  
CTATAATTATTGC?ATTCCAACAGGA Consensus

aln (955..1060)

names

[1]

GTAAAGGTATTCTAGCTGACTAGCTACCCATTGAAAAATCAAATGGCTCCAGCCATTATGAGCCCTGGGCT  
TTATCTTCTATTACGGTAGGGGCC Harbor\_Seal

[2]

GTAAAGTATTCTAGCTGACTAGCTACCCATGGGGCAATATCAAGTGATCTCCAGCCATTATGAGCCCTGGCT  
TTATCTCCTATTACAGTGGGGGCC Caspian Seal

[3]

GTAAAGTATTAGCTGACTAGCCACCCTCATGGGGCAATATCAAATGATCTCCAGCCATACTATGAGCCCTGGCT  
TTATCTCCTATTACAGTAGGGGAC Harp Seal

[4]

GTAAAAGTATTAGCTGATTAGCTACCCATGGAGGTAACATCAAATGATCTCCAGCTACTATGAGCTCTAGGATT  
TATTTCTATTACAGTAGGGGTC Leopard Seal

[5]

GTAAAAGTCTTAGCTGATTAGCTACTCTACACGGAGGCAACATCAAATGATCTCCAGCTACTATGAGCTCTAGGTT  
TTATCTCCTATTACAGTAGGAGGTC Crabeater Seal

[6]

GTAAAAGTCTCAGCTGACTGGCTACTCTGCACGGAGGCAATATCAAATGATCTCCAGCCATACTATGAGCTCTAGGA  
TTTATTTCTATTACAGTTGGAGGTC Elephant Seal

[7]

GTAAAAGTATTAGCTGACTAGCTACTCTGCATGGTGGTAATATCAAATGATCTCCTGCCATACTATGAGCCTTAGGATT  
TATCTCCTATTACAGTAGGAGGCC SA Fur Seal

[8]

GTAAAAGTATTAGCTGGCTAGCTACTCTGCATGGTGGCAATATCAAATGAGCTCTCCGCTACTATGAGCCTTAGGAT  
TCATTTCTATTACAGTAGGGGCC Aus Sea Lion

[9]

GTAAAAGTATTAGCTGACTAGCTACCCATGGCGGCAATATCAAATGATCTCCTGCCATACTATGAGCTTAGGAT  
TCATCTCCTATTACAGTAGGAGGTC Cali Sea Lion

....

[12]

GTGAAAGTATTAGTTGACTGGCTACTCTTCATGGAGGTAATATCAAATGGTCCCTGCTATATTGAGCCTTAGGCTT  
TATTTCTATTACCGTAGGAGGCC House Cat

[13]

GTAAAAGTATTAGTTGACTGGCAACACTTCATGGAGGCAATATCAAATGATCTCCAGCTATGCTATGAGCTTAGGGT  
TTATTTCTATTACAGTAGGCGGGT Dog

[14]

GTAAAGTATTCTAGCTGATTAGCCACGCTACACGGTGGCAATATCAAATGATCTCCTGCCACTATGAGCCCTGGCT  
TTATCTCCTGTTCACAGTCGGAGGCC Caribbean Manatee

[15]

GTGAAAGTATTCTAGCTGATTAGCTACGCTCCACGGCGGCAATATCAAATGGTCCCTGCCACTGTGAGCCTAGGC  
TTATCTCCTATTACAGTTGGAGGCT Steller's Sea Cow

[16]

GTAAAAGTCTTAGCTGACTAGCTACCCATGGCGTAATATTAAATGATCCCCGCTATAATATGAGCCCTAGGATT  
TATCTTCTTACATTGGGGGT Asiatic Elephant

[17]

GTAAAAGTATTCTAGCTGACTAGCAACCCTCACGGAGGTAATATTAACGTGATCCCCGCCACTATGAGCCCTAGGAT  
TCATCTCCTATTACAGTAGGTGGCC Cape Rock Hyrax

[18]

GTAAAAGTATTAGCTGACTAGCCACCATCTATGGCGGCATTGTTAAGTACAAGCCCCAATCTGAGCACTAGGC  
TTCATCTTCTTACCGTCGGGGCC American Alligator

[19]

ATTAAGTCTCAGCTGACTAGCAACCCTGCACGGAGGAACAATTAAATGAGACCCCCCTATGCTATGAGCCCTAGGA  
TTCATCTCCTCTTCACTATCGGAGGCC Chicken

Con

GTAAAAGTATTAGCTGACTAGCTAC?CT?CATGG?GGCAATATCAAATGATCTCC?GCCATACTATGAGCCCTAGGATT  
TATCTTCTTACAGTAGGAGGCC Consensus

aIn (1061..1166)

names

[1]

TCACAGGTATCGTACTAGCCAACTCATCACTAGACATTGTCCTTCATGACACATACTATGTGGTAGCACATTCCATTAT  
GTTTATCAATAGGAGCAGTATTCGC Harbor\_Sea

[2]

TCACAGGTATCGTACTAGCCAACTCATCACTAGACATTGTCCTTCATGACACATACTATGTAGTAGCACATTCCATTATG  
TTTATCAATAGGAGCAGTATTCGC Caspian Seal

[3]

TCACAGGTATTGTACTAGCTAACTCATCACTAGACATTGTCCTTCATGACACATACTATGTAGTAGCACACTTCCACTAT  
GTCCTATCAATAGGAGCAGTATTCGC Harp Seal

[4]

TTACGGGCATTGTACTAGCAAACCTGTCACTAGATATCGTACTCCACGATACTATGTAGTAGCACACTTCCACTAC  
GTCTTATCAATAGGAGCAGTATTCGC Leopard Seal

[5]

TTACGGGCATCGTATTAGCAAACCTCATCACTAGATATCGTACTCCATGATACTATGTAGTAGCGCACTTCCACTAC  
GTCTTATCAATAGGAGCAGTATTCGC Crabeater Seal

[6]

TTACGGGCATCGTACTAGCAAATTGTCACTGGACATCGTGCTCCATGATACTATGTAGTAGCGCACTTCCACTAC  
GTACTATCAATAGGAGCAGTATTCGC Elephant Seal

[7]

TCACAGGCATTGTGTTAGCAAATTCACTCATTAGATATGTCCTCCACGACACATACTACGTGGTGGCACACTTCATTAC  
GTATTATCAATAGGAGCGGTGTTGC SA Fur Seal

[8]

TCACAGGCATTGTGTTAGCAAATTCACTCATTAGATATGTCCTCCACGACATACATTACGTAGTAGCACACTTCATTAC  
GTGTTATCAATAGGAGCAGTGTG Aus Sea Lion

[9]

TCACAGGCATTGTGCTAGCAAACACTCATCATTAGATATTGTCCTCCACGACACATACTACGTAGTGGCCCACTTCCATTAC  
GTATTATCAATAGGAGCAGTGTG Cali Sea Lion

... ...

[12]

TAACGGGAATTGTACTAGCAAACCTTCATTAGACATTGTTCTCAGGACACATATTACGTAGTGGCCCACTTCACTAT  
GTCTGTCAATAGGAGCAGTTCGC House Cat

[13]

TAACAGGTATTGTCCTAGCTAATTGTCCTTAGACATCGTTCTCATGATAACATATTATGTTGTGGCTACTTCACTATGT  
GCTTCAATAGGAGCAGTTTG Dog

[14]

TAACAGGAATTGTCCTAGCCAACACTCATCATTAGATGTACATCCTCCATGACACCTACTATGTCGTAGCACACTTCACTAT  
GTCCTCTCTAGGTGCAGTTCGC Caribbean Manatee

[15]

TAACTGGAATTGTTCTAGCTAACTCATCATTAGACGTTGTCCTCCATGACACCTACTATGTCGTAGCACACTTCACTAC  
GTCCTATCTATAGGCGCTGTTCGC Steller's Sea Cow

[16]

TAACTGGCATTGTCCTTGCTAATTCTCACTAGACATTGTCCTACATGACACTTACTACGTTTAGCTCACTTCACTAC  
GTCTTATCTATAGGTGCAGTTTG Asiatic Elephant

[17]

TCACAGGGATCGTACTGCCAACCTTCCTTAGACATTGTCCTCATGACACTTACTACGTTAGGCCACTTCACTAC  
GTCCTGTCAATAGGAGCAGTTCGC Cape Rock Hyrax

[18]

TAACTGGGATTGTCCTAGCCAACCTCCTCACTAGACATTGTCCTCCACGACACTTATTATGTTAGTGGCCCACTTCACTAC  
GTACTCTCAATAGGAGCAGTTCGC American Alligator

[19]

TAACGGGAATCGTCCTTGCTAACTCATCACTAGATATTGCCCTCATGACACCTACTATGTTAGTCGCCACTTCACTAC  
GTCCTCTCAATGGGGCAGTTTG Chicken

Con

T?ACAGG?ATTGT?CTAGC?AACTCATCACTAGACATTGTCCTCCATGACACACATACTATGTTAGTGGCCCACTTCACTAC  
GT?CTATCAATAGGAGCAGT?TTCGC Consensus

aln (1167..1272)	names
[1]	TATTATGGGTGGATTCGTCCATTGATTCCCCCTATTCTCAGGCTATATACTCGACGACACTTGAGCAAAATTCACTCA CAATCATATTCGTAGGAGTCAACATA Harbor_Sea
[2]	TATTATGGCGGATTGTCCATTGATTCCCCCTATTCTCAGGCTATACACTCGACGACACTTGAGCAAAATTCACTTC ACAATCATTTCTGTAGGAGTCAACATA Caspian Seal
[3]	TATCATGGCGGATTCGTCCATTGATTCCCCCTATTCTCAGGCTACACGCTTAATAATACCTGAGCAAAGATTCACTCA CAATCATATTCGTGGGAGTCAACATA Harp Seal
[4]	TATCATAGGCGGATTGTTCACTGATTCCCCCTATTCTCAGGCTTCACTCTGACGACACTTGAGCAAAATTCACTTTA CAATTATTTGTTGGGGTTAACATA Leopard Seal
[5]	TATTATAGGCGGATTGTTCACTGATTCCCCCTATTCTCAGGCTTCACTCTCGATGATACTGAGCAAAGATTCACTCA CAATTATTTGTTGGAGTTAACATA Crabeater Seal
[6]	CATTATGGCGGATTGTACACTGATTCCCCTTATTCTCAGGCTTCACTCTCGATGACACCTGAGCAAAGATTCACTTT ACAATTATTTGTTGGAGTTAACATA Elephant Seal
[7]	TATCATGGCGGATTGTTCAATTGATTCCCCCTATTTCAGGATTATGCTCGATAGTACCTGGCGAAATCCACTCA CAATCATATTGTTGGGGTCAATATG SA Fur Seal
[8]	TATCATGGCGGATTCGTCCATTGATTCCCCTTATTTCAGGATTGCTCGATAATACCTGAGCGAAAATCCACTCA CAATCATATTCTGTGGAGTCAATATA Aus Sea Lion
[9]	TATCATGGCGGATTGTCCATTGATTCCCCCTATTCTCAGGATTGCTCGACAGCACCTGAGCGAAAATCCACTTC ACAATCATATTGTTGGAGTCAACATG Cali Sea Lion
...	...
[12]	TATCATAGGAGGCTCGTCCATTGATTCCCCCTATTCTCAGGATATAACCTTGACAACACTTGAGCAAAGATTCACTTA CGATTATGTTGTAGGAGTCAATATA House Cat
[13]	CATTATGGGAGGATTGCCACTGATTCCCCTTATTCTCAGGTTACTCTTAACGATACTTGAGCAAAGATTCACTTA CAATTATGTTGTGGAGTAAATATA Dog

[14]

CATTATGGGTGGATTCGTCACTGATTCCCTATTTAGGATACACACTTAATCAAACATGAGCCAAAATCCACTTCTAATCATATTGTTGGTGTAAACCTA Caribbean Manatee

[15]

CATCATGGGTGGGTTCGTCCACTGATTCCCTATTTAGGATACACACTCAACCAGACATGAGCTAAAATCCACTTCTAATCATATTGTAGGTGTCAACTTA Steller's Sea Cow

[16]

CATTATAGGTGGGTTATTCACTGATTCCACTATTTAGGATACACATTAATTACATGAGCTAAAATTCAATTCTAGTTATTTATCGGTGTAAATTG Asiatic Elephant

[17]

AATCATGGGAGGATTCGTCCACTGATTCCCCTATTCTGGATATACTAAATCTCACATGGCCAAAATCCACTTCATCATATTGTAGGAGTAAATCTA Cape Rock Hyrax

[18]

TATCATGAGCGGATTACCCACTGATTCCCCTTTACAGGATTACCCCTACACCATGAACACTAAATCCAATTGTAATTATTTACCGGAGTAAATTG American Alligator

[19]

CATTCTAGCAGGATTACCCACTGATTCCCCCTTCACAGGCTTACCCATGAACCAAGGCACATTGGAGTAATTTACCGGAGTAAACCTA Chicken

Con

TATCATGGG?GGATTCGTCCACTGATTCCCCCTATTCTCAGGATTAC?CT?GAC?A?AC?TGAGCAAAAT?CACTTCA  
CAATCATATTGT?GGAGT?AACATA Consensus

aln (1273..1378)

names

[1]

ACATTCTTCCCCAACACTCCTAGGTCTATCAGGAATACTCGGGATACTCCGACTACCCAGACGCCAACGACAT  
GAAATACAGTCTCCTCCATGGGCTCAT Harbor\_Sea

[2]

ACATTCTTCCCCAACACTCCTAGGTCTATCAGGAATACTCGACGATACTCCGACTATCCAGACGCCAACGACAT  
GAAATACAGTCTCCTCATGGGCTCAT Caspian Seal

[3]

ACATTCTTCCCCAACACTCCTAGGTCTATCAGGAATACTCGACGATACTCCGACTACCCAGACGCCAACGACAT  
GAAATACAGTCTCCTCCATGGGCTCAT Harp Seal

[4]

ACATTCTTCCCCAACATTCTTAGGCTTACAGGAATACTCGACGATACTCCGACTACCCAGACGCCAACGACAT  
GAAACACAGTCTCCTCATAGGTTCTT Leopard Seal

[5]

ACATTCTCCCTAACATTTCTAGGCTTATCAGGAATACCTCGACGATACTCCGACTACCCAGACGCCAACAT  
GAAACACAGTCTCCTCTAGGCTCAT Crab-eater Seal

[6]

ACATTTTCCCTAACATTTCTAGGTCTATCAGGAATACCTCGACGATATTCCGACTATCCAGACGCCAACATG  
AAACACAGTCTCTTAGGTTCAT Elephant Seal

[7]

ACATTCTCCCACAACATTTTAGGCCTATCGGAATACCACGACGATACTGACTACCCAGACGCCAACAT  
GAAATACAATCTCCTCTAGGCTCGT SA Fur Seal

[8]

ACATTCTCCCACAACATTTCTAGGCCTATCGGAATACCACGGCGATATTCTGATTACCCAGACGCCAACAT  
GAAATACAATCTCCTCTAGGCTCGT Aus Sea Lion

[9]

ACATTCTCCCACAACATTTCTAGGGCTGCCGGAAATACCACGACGATATTCTGACTACCCAGACGCCAACAT  
GAAATACAATCTCTTAGGCTCGT Cali Sea Lion

... ...

[12]

ACGTTCTCCCTCAGCACTCCTAGGCCTGCCGGAAATGCCACGACGTTATTCTGACTATCCAGATGCATACAACTT  
GAAATACGATTCCTCAATGGGCTTT House Cat

[13]

ACTTTCTCCCTAACATTCCTAGGTTATCTGGAATACCTCGTCGACTCTGACTACCCAGATGCATATACTACCTGA  
AATACCGTCTCCTCTAGGATCGT Dog

[14]

ACATTCTTCCCCAACATTCCTGGCTATCCGGCATACCTCGTCGACTCAGACTACCCAGATGCCAACCATGTG  
AAACACTGTGCTCTATGGGTCGT Caribbean Manatee

[15]

ACATTCTCCCTAACATTCCTCGGCCTATCAGGCATGCCCGACTCAGACTACCCAGACGCCAACACTCTATG  
AAATACTGTATCCTCTATGGGTCAC Steller's Sea Cow

[16]

ACATTTTCCCCAACACTTCTGGACTATCTGGCATACCACGTCGATATTCTGACTATCCAGATGCCACTGCATG  
AAACACTGCTCTCTAGGTTCAT Asiatic Elephant

[17]

ACATTCTCCCACAGCACTCCTAGGACTATCCGGCATACCTCGTCGATATTCCGACTACCCAGATGCATACACAGCAT  
GAAACATAGTCTCCTCAATAGGACCT Cape Rock Hyrax

[18]

ACTTCTCCCACAACACTCCTAGGACTATCTGGGATACCTCGACGACTCGGACTACCCAGACGCATACACCCTCT  
GAAACCTAACATCATCAATTGGACCT American Alligator

[19]

ACCTTTTCCCCAACATTCCTGGGCCTAGCTGGAATACCCGACGATACTCAGATTACCCAGACGCCACACTAT  
GAAACACACTATCCTCAATCGGCTCCT Chicken

Con

ACATTCTTCCC?CAACATTCCTAGG?CTATC?GGAATACCTCGACGATATT?GACTACCCAGACGCCACACAACATG  
AAATACAGTCTCCTATAGG?TC?T Consensus

aIn (1379..1484)

names

[1]

TCATTTCACTTACAGCAGTGATATTAATAGTATTCTATAATCTGAGAAGCTTCGCATCCAAGCGAGAAGTAGCGGCAGT  
TGAATTAACTACAACAAATATCGAATG Harbor\_SeaL

[2]

TCATTTCACTCACAGCGGTGATATTAATAGTATTCTATAATCTGAGAAGCTTCGCATCTAAGCGAGAAGTAGCAGCAGT  
TGAATTAACTACAACAAATATCGAATG Caspian Seal

[3]

TCATTTCACTCACAGCAGTAATATTAATAGTATTCTATAATCTGAGAAGCTTCGCATCTAAGCGAGAAGTAGCAGCAGT  
TGAATTAACTACAACAAATATCGAATG Harp Seal

[4]

TTATTTCACTCACAGCAGTAATGCTAATAGTATTCTATGATCTGAGAAGCCTTGCATCCAAACGAGAAGTAGCAACAGT  
TGAATTAACTACAACAAATATCGAGTG Leopard Seal

[5]

TTATTTCACTCACAGCAGTAATACTAATAGTATTCTATGATCTGAGAAGCCTTGCATCCAAACGAGAAGTAGGGCAGTAGT  
TGAATTAACTACGACTAATATCGAATG Crabeater Seal

[6]

TTATCTCACTTACAGCAGTAATATTAATAGTCTTCATGATTGAGAAGCCTTGCATCAAACGAGAAGTAGCAACAGT  
TGAATTAACCACAACAAACATAGAGTG Elephant Seal

[7]

TCATCTCACTTACGGCAGTGATACTTATGGTCTTCATAATCTGAGAAGCTTGCCTCAAACGAGAGGTAGAGACGA  
TTGAACTAACATCGACTAATATGGAGTG SA Fur Seal

[8]

TCATCTCACTTACGGCAGTAATACTAATGGTCTTCATAATCTGAGAGGGCTTGCATCTAACGAGAAGTAGAGACGT  
TGAGTTGACATCGACTAATATGGAATG Aus Sea Lion

[9]

TCATCTCGCTTACGGCAGTAATACTAATGGTCTTCATAATCTGAGAGGGCTTGCATCTAACGAGAGGTAGAGACGG  
TCGAATTAACATCAACAAATATGGAATG Cali Sea Lion

....

[12]

TCATCTCATTAACAGCAGTCATGTTAATAGTTTCAAGTGAGAAGCTTCGCATCCAAGCGAGAAGTGGCCATAGT  
AGAACTAACACAACAACTATCTGAATG House Cat

[13]

TTATCTCGTTACAGCGGTGATGCTTATAATTGATCTGGGAAGCCTTGCATCCAAACGAGAAGTTGCTATAGT  
AGAACTTACTACAACTAACATTGAGTG Dog

[14]

TTATCTCTCACGGCCGTTATCTAATAGTATTCAAGTGAGAAGCGTCGCCTCAAACGAGAAGTTCCACAGT  
TGAGCTAACACAACAACTAACCTTGAATG Caribbean Manatee

[15]

TTATCTCACTACAGCCGTAGCCTGATAGTGTGAGAAGCATTGCCTCTAACGAGAGGTCTGCAGT  
TGAGCTAACACAACAACTATCTAGAATG Steller's Sea Cow

[16]

TTATCTTTAGTAGCCGTAATTCTAATAGTCTTATAATTGAGAGGCATTGCTCTAACGCGGAAGTTCTATGATAG  
AACTCATAACAAACAAACGTAGAATG Asiatic Elephant

[17]

TCATTTCCCTAACAGCCGTAATCCTCATAGTATTCAATTGAGAAGCATTGCCTCTAACGAGAGGTATCCAAAGT  
AGAACTAACACAACAAACCTGGAGTG Cape Rock Hyrax

[18]

TAATTTCCATGGTTGCAGTTATCCTCTAACATTCTGAGAAGCATTCACATAAAACGAAAAGTGACAGCACTC  
GAAAACAATAACCAACATTGAGTG American Alligator

[19]

TAATTCATAAACAGCCGTAATCATACTCATATTCTCGTCTGAGAAGCCTCTAGCAAAACGAAAAGTGCTCCAACC  
CGAATTAACGCCACTAACATATCGAATG Chicken

Con

TCATTCACT?ACAGCAGTAATACTAATAGT?TTCATAATCTGAGAAGC?TTCGCATC?AAACGAGAAGTAGC?ACAGT  
TGAATTAAC?ACAACAACTAT?GAATG Consensus

aln (1485..1558)

names

[1] ACTGCATGGATGTCCCCCTCCTTACACACACATTGAAGAGGCCACTACGTCGTACTAAAATAA-----  
Harbor\_Seal

[2] ACTGCATGGATGTCCCCCTCCTTACACACACACATTGAAGAGGCCACTACGTCGTACTAAAATAA----- Caspian  
Seal

[3] ACTGCATGGATGTCCCTCCCTTACACACACACATTGAAGAACCCACTACGTTGTACTAAAATAA----- Harp  
Seal

[4] ACTACACGGATGTCCTCCCTTACACATTGAAGAACCTACTTATGTTGTATTAAAATAA----- Leopard  
Seal

- [5] ACTACACGGATGTCCTCCTCCTTATCATACATTGAAGAACCTACTTATGTTGTATTAAAATAA----- Crabeater Seal
- [6] ACTACACGGATGCCCTCCTCCCTACCACATACATTGAAGAACCTACTTACGTTGTATTAAAATAA----- Elephant Seal
- [7] ACTTCACGGATGTCCTCCTCCCTATCACACATTGAAGAACCTACCTATATTGTATCGAAATAA----- SA Fur Seal
- [8] ACTTCACGGATGTCCTCCTCCCTATCACACATTGAAGAACCTACCTCATCATATTGAAATAA----- Aus Sea Lion
- [9] ACTTCATGGATGCCCTCCTCCCTACCACACATTGAAGAACCTACTTACATTATATTAAAATAA----- Cali Sea Lion
- ....
- [12] ATTGCATGGATGTCCTCCTCCGTACCACACATTGAAGAGCCAACCTACGTACTATTAAAATAA----- House Cat
- [13] ACTACATGGATGTCCCCCTCCATACCACACGTTGAAGAACCTACATATGTGATCCAAAAATAA----- Dog
- [14] ACTCAACGGCTGCCACCACATCATACACATTGAGGAACCAGCCTACGTCAAGGTCTAG----- Caribbean Manatee
- [15] ACTCAACGGTTGCCACCTCCATACCACACATTGAAGAGCCAACCTACGTCAAAGTATAG----- Steller's Sea Cow
- [16] ACTCAACGGGTGTCCACCTCCACATCATACTACATTGAAGAACCCAGCCTACGT-AAAATCTAACTCGAGAAGG--- Asiatic Elephant
- [17] ATTAAATGGCTGCCCTCCCCCTTACCACACATTGAAGAACCCAGCATTGTTAAGCCCTA----- Cape Rock Hyrax
- [18] ACTTAACAACGTCCCCCATCTCATCACACACCTACGAAGAGCCGTATCGCTGTAGTACGACCCAAATACTATG American Alligator
- [19] AATTCAATGGCTGCCACCCCCATACCACACACCTCGAAGAACCCAGCCTTGACAAGTGCAAGAAAGG----- Chicken
- Con Consensus ACT?CACGGATGTCCTCCTCC?TATCACACATTGAAGAAC?AC?TACGTT?TA?TAAAATAA-----