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1237 Mitochondrial DNA sequencing of cetaceans and dugong from the Indian seas for their conservation and management

Understanding taxonomy is fundamental to conservation efforts of bioresources. The units on which conservation is based are determined largely by species designation. Ambiguous identification of species may lead to erroneous conclusions, which may be more serious than lack of understanding of the population structure and status; for example, conclusions such as loss of genetic variability (e.g., by unwitting extinction of a species).

In cetaceans (whales, dolphins and porpoises), morphological features are subtle and difficult to compare because of the rarity of specimens or widespread distributions. Identifying the geographical variants of recognized species of cetaceans is more cumbersome using the conventional

approaches and in this context molecular genetics can provide significant contributions to taxonomic understanding of inter and intra-specific variations for conservation and management purposes. Similarly, in dugong, a critically endangered marine mammal, in order to devise adequate conservation and management strategies for the species of concern, it is essential to study the population genetic characteristics of the species throughout the range of its distribution. DNA sequence analysis has become a powerful tool for conservation. Now it is possible to trace the source of samples if it is suspected as derived from threatened or endangered species. In cetaceans and dugong, the technique could be effectively used in forensic identification of commercial products and

(1) *Stenella longirostris* (Pantropical spinner dolphin)

Sl. No.	Sequence definition of the individuals	GenBank Accession No
1	<i>Stenella longirostris</i> isolate CH07 cytochrome b (cytb) gene, partial cds; mitochondrial <i>Stenella longirostris</i> isolate CH07 mitochondrial control region, partial sequence.	DQ232770 & DQ232772 EF057435
2	<i>Stenella longirostris</i> isolate VRC/DOL/05 cytochrome b (cytb) gene, partial cds; mitochondrial	DQ270182 & DQ270183
3	<i>Stenella longirostris</i> isolate CH6 cytochrome b (cytb) gene, partial cds; mitochondrial	EF057434

4	<i>Stenella longirostris</i> isolate CH9 cytochrome b (cytb) gene, partial cds; mitochondrial.	I EF057436
	<i>Stenella longirostris</i> isolate CH9 mitochondrial control region, partial sequence	LF438306
5	<i>Stenella longirostris</i> isolate CH17 cytochrome b (cytb) gene, partial cds; mitochondrial.	FF057437
	<i>Stenella longirostris</i> isolate C17 mitochondrial control region, partial sequence	EF438309
6	<i>Stenella longirostris</i> isolate CH 18 cytochrome b (cytb) gene, partial cds; mitochondrial.	EF057438
7	<i>Stenella longirostris</i> isolate VRC/Dol/06 cytochrome b (cytb) gene, partial cds; mitochondrial.	EF057433
8	<i>Stenella longirostris</i> isolate VRC/Dol/04 cytochrome b (cytb) gene, partial cds; mitochondrial.	EF203445
	<i>Stenella longirostris</i> isolate VRC/Dol/04 control region, partial sequence; mitochondrial.	EF203451
9	<i>Stenella longirostris</i> isolate CH02 cytochrome b (cytb) gene, partial cds; mitochondrial.	EF203446
	<i>Stenella longirostris</i> isolate CH02 control region, partial sequence; mitochondrial.	EF203452
10	<i>Stenella longirostris</i> isolate CH03 cytochrome b (cytb) gene, partial cds; mitochondrial.	EF203447
	<i>Stenella longirostris</i> isolate CH03 mitochondrial control region, partial sequence	EF438307
11	<i>Stenella longirostris</i> isolate MNG3 cytochrome b (cytb) gene, partial cds; mitochondrial.	EF203448
12	<i>Stenella longirostris</i> isolate CH10 cytochrome b (cytb) gene, partial cds; mitochondrial.	EF203449
13	<i>Stenella longirostris</i> isolate CH11 cytochrome b (cytb) gene, partial cds; mitochondrial.	EF203450
14	<i>Stenella longirostris</i> isolate CH19 mitochondrial control region, partial sequence	EF438303
	<i>Stenella longirostris</i> isolate CH 19 cytochrome b (cytb) gene, partial cds; mitochondrial.	EF446613

15 *Stenella longirostris* isolate CH19 cytochrome b (cytb) gene, EF446614
partial cds; mitochondrial.

(2) *Stenella attenuata* (bridled dolphin/pantropical spotted dolphin)

Sl. No.	Sequence definition of the individuals	GenBank Accession No.
1	<i>Stenella attenuata</i> isolate CH5 cytochrome b (cytb) gene, partial cds; mitochondrial	EF438304
	<i>Stenella attenuata</i> isolate CH5 control region, partial sequence, mitochondrial	EF438305

(3) *Tursiops aduncus* (Bottlenose dolphin)

Sl. No.	Sequence definition of the individuals	GenBank Accession No.
1	<i>Tursiops aduncus</i> isolate VIZI cytochrome b (cytb) gene, partial cds; mitochondrial	DQ232769 & DQ232771
2	<i>Tursiops aduncus</i> isolate CH04 cytochrome b (cytb) gene, partial cds; mitochondrial	DQ270184 & DQ270185
3	<i>Tursiops aduncus</i> isolate CH08 cytochrome b (cytb) gene, partial cds; mitochondrial.	EF203434

(4) *Delphinus capensis* (Common dolphin)

Sl. No.	Sequence definition of the individuals	GenBank Accession No.
1	<i>Delphinus capensis</i> VRC/Dol/3 cytochrome b (cytb) gene, partial cds; mitochondrial	DQ320765 & DQ320766
2	<i>Delphinus capensis</i> isolate MNG18 cytochrome b (cytb) gene, partial cds; mitochondrial	EF061405

(5) *Sousa chinensis* (Indopacific humpbacked dolphin)

Sl. No.	Sequence definition of the individuals	GenBank Accession No.
1	<i>Sousa chinensis</i> isolate MNG4 cytochrome b (cytb) gene, partial cds; mitochondrial	DQ364689 & DQ364693

2	<i>Sousa chinensis</i> isolate MNG16 mitochondrial control region, partial sequence.	EF061406
	<i>Sousa chinensis</i> isolate MNG16 cytochrome b (cytb) gene, partial cds; mitochondrial	EF057445

(6) *Grampus griseus* (Risso's dolphin)

Sl. No.	Sequence definition of the individuals	GenBank Accession No.
1	<i>Grampus griseus</i> isolate CH15 cytochrome b (cytb) gene, partial cds; mitochondrial.	DQ270178 & DQ270179
	<i>Grampus griseus</i> isolate CH15 mitochondrial control region, partial sequence.	EF438308

(7) *Neophocaena phocaenoides* (Finless porpoise)

Sl. No.	Sequence definition of the individuals	GenBank Accession No.
1	<i>Neophocaena phocaenoides</i> isolate MNG7 control region, partial sequence; mitochondrial	DQ364690
	<i>Neophocaena phocaenoides</i> isolate MNG7 cytochrome b (cytb) gene, partial cds; mitochondrial	DQ364692
2	<i>Neophocaena phocaenoides</i> isolate MNG8 control region, partial sequence; mitochondrial	DQ364694
	<i>Neophocaena phocaenoides</i> isolate MNG8 cytochrome b (cytb) gene, partial cds; mitochondrial	DQ364691
3	<i>Neophocaena phocaenoides</i> isolate MNG5 cytochrome b (cytb) gene, partial cds; mitochondrial.	EF203435
4	<i>Neophocaena phocaenoides</i> isolate MNG6 cytochrome b (cytb) gene, partial cds; mitochondrial.	EF203436
5	<i>Neophocaena phocaenoides</i> isolate MNG9 cytochrome b (cytb) gene, partial cds; mitochondrial.	EF203437
6	<i>Neophocaena phocaenoides</i> isolate MNG10 cytochrome b (cytb) gene, partial cds; mitochondrial.	EF203438
7	<i>Neophocaena phocaenoides</i> isolate MNG11 cytochrome b (cytb) gene, partial cds; mitochondrial.	EF203439

8	<i>Neophocaena phocaenoides</i> isolate MNG12 cytochrome b (cytb) gene, partial cds; mitochondrial.	EF203440
9	<i>Neophocaena phocaenoides</i> isolate MNG13 cytochrome b (cytb) gene, partial cds; mitochondrial.	EF203441
10	<i>Neophocaena phocaenoides</i> isolate MNG14 cytochrome b (cytb) gene, partial cds; mitochondrial.	EF203442
11	<i>Neophocaena phocaenoides</i> isolate MNG15 cytochrome b (cytb) gene, partial cds; mitochondrial.	EF203443
12	<i>Neophocaena phocaenoides</i> isolate MNG17 cytochrome b (cytb) gene, partial cds; mitochondrial.	EF203444

(8) *Physeter macrocephalus* (Sperm whale)

Sl. No.	Sequence definition of the individual	GenBank Accession No.
1	<i>Physeter macrocephalus</i> isolate CHW 1 cytochrome b (cytb) gene, partial cds; mitochondrial	DQ270180 & DQ270181

(9) *Balaenoptera musculus* (Blue whale)

Sl. No.	Sequence definition of the individuals	GenBank Accession No.
1	<i>Balaenoptera musculus</i> isolate M5 mitochondrial control region, partial sequence.	EF057441
	<i>Balaenoptera musculus</i> isolate M5 Cytochrome b (Cytb) gene, partial cds; mitochondrial.	EF057442

(10) *Balaenoptera edeni* (Bryde's whale)

Sl. No.	Sequence definition of the individuals	GenBank Accession No.
1	<i>Balaenoptera edeni</i> isolate M6 mitochondrial control region, partial sequence	EF057443
	<i>Balaenoptera edeni</i> isolate M6 Cytochrome b (cytb) gene, partial cds; mitochondrial.	EF057444

(11) *Dugong dugon* (Dugong)

Sl. No.	Sequence definition of the individuals	GenBank Accession No.
1	<i>Dugong dugon</i> isolate M4 mitochondrial control region, partial sequence	EF057439
	<i>Dugong dugon</i> isolate M4 Cytochrome b (cytb) gene, partial cds; mitochondrial	EF-057440

verification of trade records and for identifying ambiguous beach-cast specimens.

Against this background, CMFRI has initiated mitochondrial DNA sequencing of cetaceans and dugong from the Indian seas under a project sponsored by the Ministry of Earth Sciences, with a view to accurately identify the species even from a piece of skin, by mtDNA PCR and sequencing of specific loci, such as control region and cytochrome b gene, followed by phylogenetic reconstruc-

tion. The following table depicts 63 mtDNA sequences from 40 individuals of 11 species hitherto deposited by the CMFRI team in GenBank, details of which can be accessed from www.ncbi.nlm.nih.gov/. using the accession number given in the third column.

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