Are you my mother? A test of matrilineal social organization in mass strandings and living groups of rough-toothed dolphins

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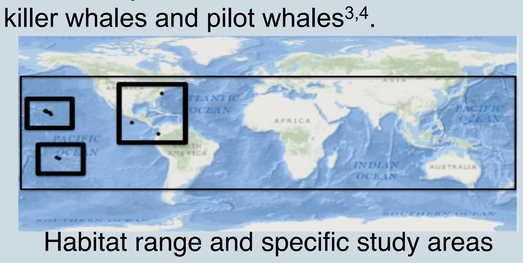
Introduction

Rough-toothed dolphins
Steno bredanensis

- Form isolated communities containing stable groups around some oceanic islands[1]. These groups generally range from 8-15 individuals, but "super groups" have been observed with as many as 90 individuals[2].
- Show clear differences in habitat use between island groups, and limited movement among islands[2].
- Exhibit social characteristics such as cooperative foraging and care-giving behavior similar to species with matrilineal structure like killer whales and pilot whales[3,4].

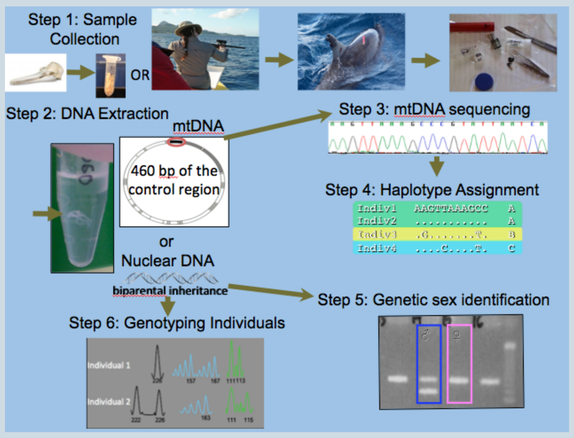


Habitat range and specific study areas

Methods

Sample collection spans 1976-2010

- 4 groups (3 mass strandings and 1 bycatch) n=28 teeth samples from adults
- 14 groups; n=106 skin samples from adults



Markers

- 460bp (biopsies) 350bp (teeth) revealed 24 mtDNA haplotypes.
- 14 microsatellite loci used in genotyping biopsy samples were assessed for null alleles, HWE and linkage disequilibrium, replicates deleted[5].

Bi-parental Relatedness (biopsy samples only)

- Relatedness within groups versus between groups was assessed in GenAlEx[6] using the Queller and Goodnight estimator[7].

Maternal Relatedness

- An AMOVA was performed in Arlequin to test population structure[8].
- Mantel test of correlation was used to test if individuals in a group were more likely to share a haplotype than expected by chance[6].

Research Questions

Q1. Is there geographic structure among island communities?
Q2. Do rough-toothed dolphins form groups with extended matrilines?
Q3. Are groups composed of close kin?

Biopsy samples results

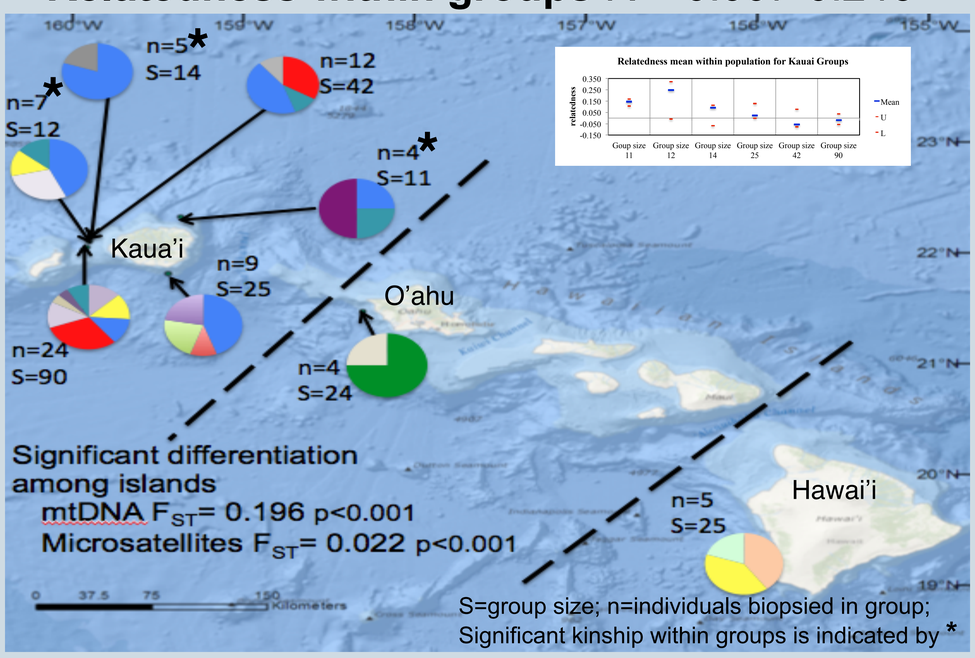
Hawaiian Islands 8 Groups

8 groups with multiple matrilines

Differentiation within Kauai

mtDNA F_{ST}=0.054 p=0.08 Microsatellite F_{ST}=0.022 p=0.003

Relatedness within groups R = 0.007-0.246



S=group size; n=individuals biopsied in group;
Significant kinship within groups is indicated by *

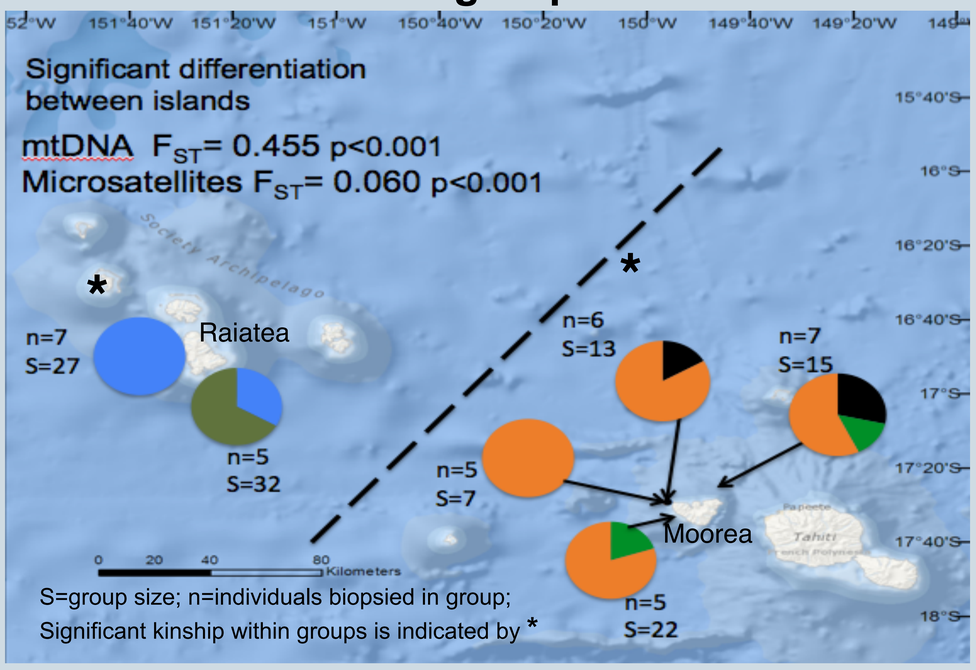
French Polynesia 6 Groups

4 groups with multiple matrilines, 2 groups with single matrilines

Differentiation within Moorea

mtDNA F_{ST}=0.002 p=0.594; Microsatellites F_{ST}=0.051 p=0.004

Relatedness within groups R= 0.001-0.124



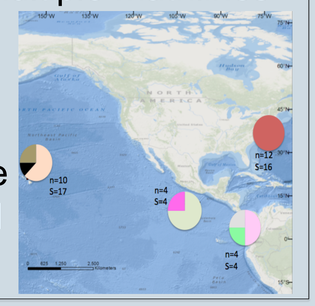
S=group size; n=individuals biopsied in group;
Significant kinship within groups is indicated by *

Teeth sample results

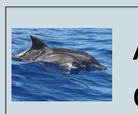
Mass Strandings

1 group with a single matriline
3 groups wtih multiple matrilines

There was no significant difference in maternal structure in live or stranded groups.



Conclusion



A1. Significant genetic differentiation between island communities but not between all groups within islands indicates local fidelity may drive geographic structure.

A2. Multiple matrilines and significant relatedness within some groups suggests genetic structure among groups, but this structure is not strictly matrilineal.

A3. Kinship was significant in 5 of 14 groups. Estimated relatedness was markedly lower in large groups. These groups may be composed of several small groups, similar to the pattern seen in long-finned pilot whales.

Significant relatedness in small groups is consistent with kinship based social behavior such as caregiving or cooperative foraging.

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