

SUPPLEMENTAL MATERIALS

Social life in the deep: variation in network structure and association patterns of rough-toothed dolphins (*Steno bredanensis*) around the main Hawaiian Islands

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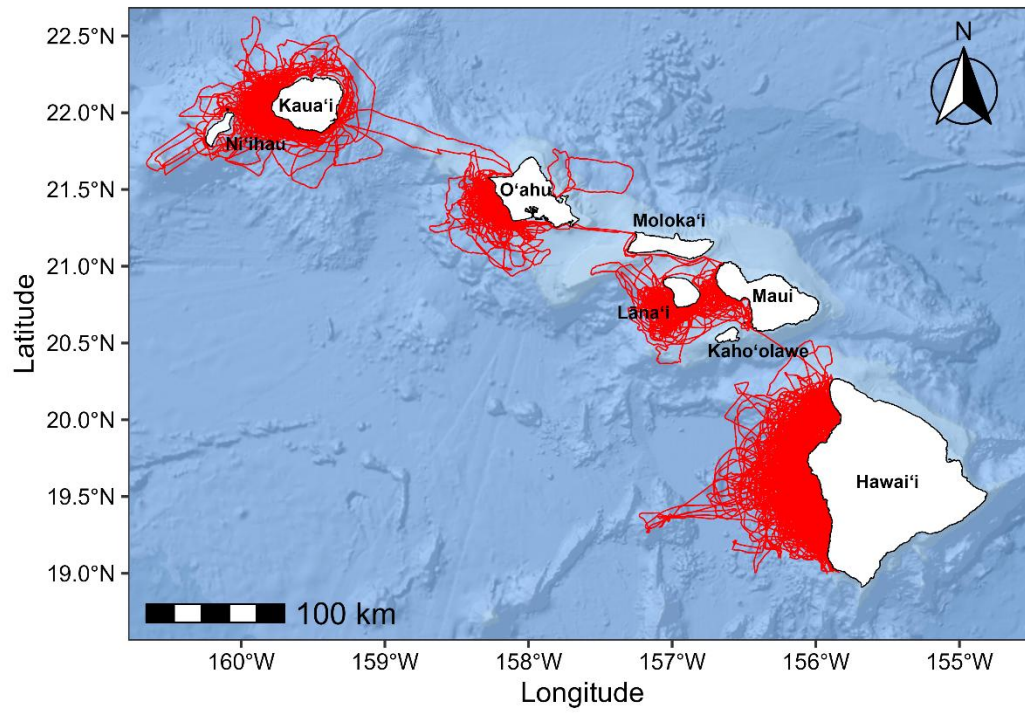
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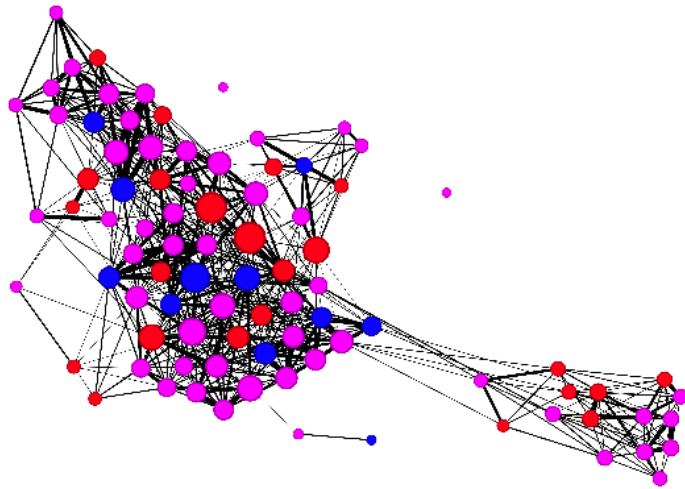
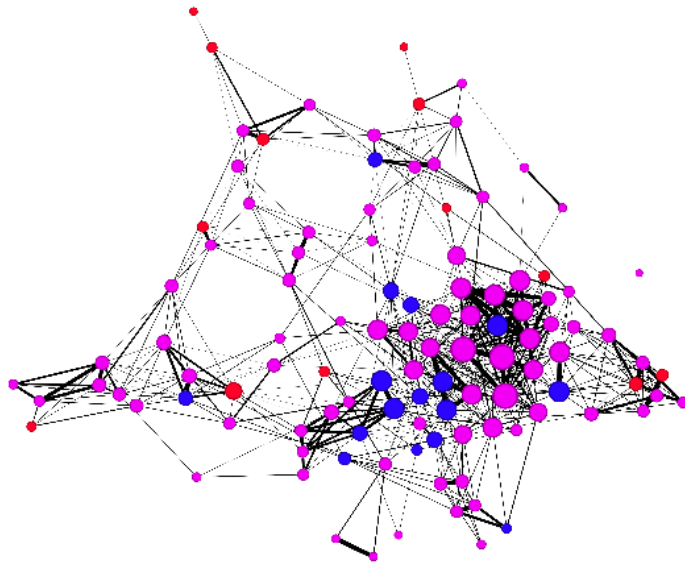
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11 The number of photo-identified individuals (i.e., individuals in the catalog) from each
12 sighting that were included in the study ranged from 1 to 85 (median = 3, mean = 5.71, SD =
13 8.66) off Kaua'i-Ni'ihau (n = 176 sightings) and from 1 to 31 (median = 3, mean = 4.7, SD =
14 5.38) off Hawai'i Island (n = 147 sightings).



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16 **FIGURE A** Survey effort tracks around the main Hawaiian Islands from 2002 to 2020.



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18 **FIGURE B** Social networks of the Kaua'i-Ni'ihau (top) and Hawai'i Island (bottom)
 19 populations of rough-toothed dolphins around the main Hawaiian Islands, highlighting sex
 20 and association strength. Nodes are scaled by degree and colored by sex (blue = male, red =
 21 female, fuchsia = unknown). Edge thickness increases with HWI. Networks are restricted to
 22 distinctive and very distinctive individuals seen at least three times.

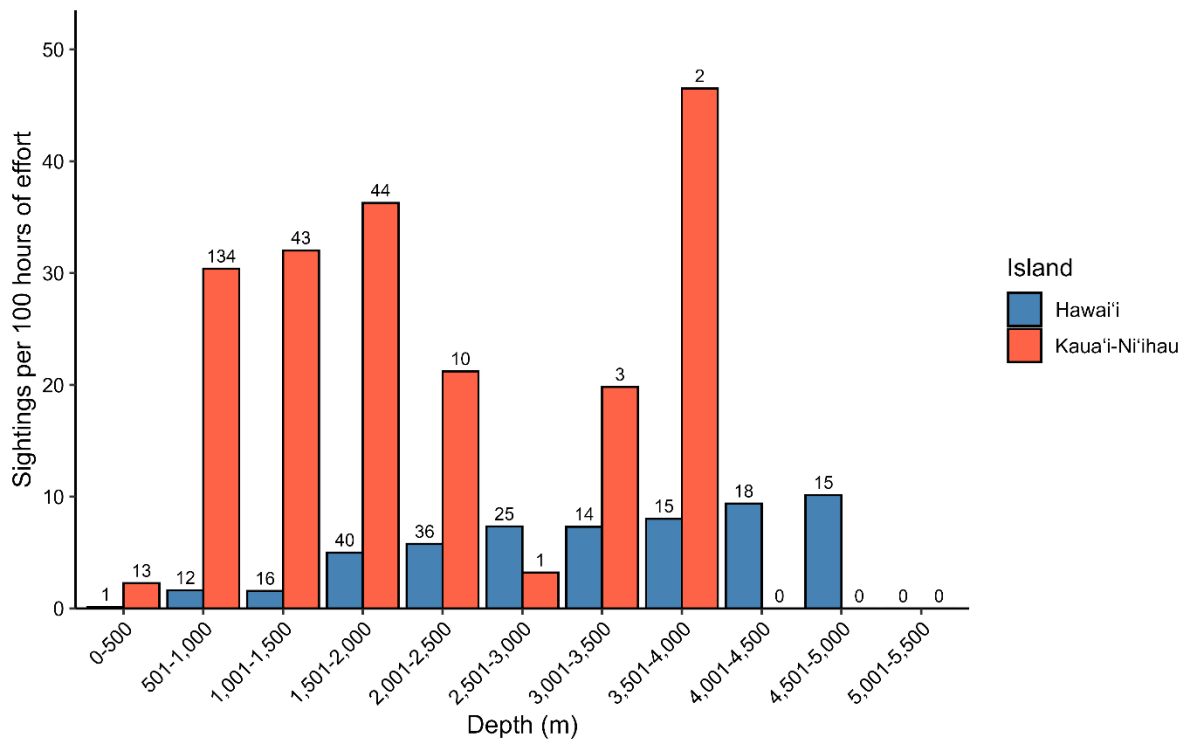


FIGURE C Number of rough-toothed dolphin encounters per 100 hours of survey effort by depth ranges in the two populations around the main Hawaiian Islands (2003-2020). The number of sightings (without correction by effort time) is provided atop each column.

TABLE A Number of rough-toothed dolphin identifications by area, year, and month around the main Hawaiian Islands. Values restricted to distinctive and very distinctive individuals with good or excellent photograph quality, excluding calves and juveniles.

Area	Year	Month											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<i>Kaua‘i-Ni‘ihau</i>	2003	0	0	0	0	0	64	0	0	0	0	0	64
	2005	0	0	0	0	0	0	0	0	0	27	117	0
	2008	0	0	0	0	0	39	0	0	0	0	0	39
	2011	0	29	0	0	0	0	77	41	0	0	0	0
	2012	12	0	0	0	0	57	15	0	0	0	0	57
	2013	0	9	0	0	0	0	17	0	0	0	0	0
	2014	0	17	0	0	0	0	0	0	0	18	0	0
	2015	0	86	0	0	0	0	0	0	134	0	0	0
	2016	0	46	0	0	0	0	0	0	0	0	0	0
	2017	0	0	0	0	0	0	0	109	0	0	0	0
	2018	0	0	0	0	0	0	0	62	0	0	0	0
	2020	0	29	0	0	0	0	0	0	0	0	0	0
<i>Hawai‘i Island</i>	2003	0	0	0	0	0	0	0	0	0	10	0	0
	2004	0	0	0	0	0	0	0	0	13	8	49	4
	2005	0	15	0	0	0	0	0	0	0	0	0	0
	2006	0	0	5	42	0	0	18	0	0	0	9	11
	2007	0	0	0	0	0	0	0	61	0	0	0	0
	2008	0	0	0	2	14	0	63	0	0	0	0	8
	2009	0	0	0	37	17	0	0	0	0	21	0	8
	2010	0	0	0	10	0	0	31	9	0	0	0	0
	2011	0	0	0	0	36	0	0	22	0	5	0	0
	2012	0	0	0	0	3	0	0	60	0	0	0	0
	2013	0	0	0	0	0	0	0	0	0	2	0	0
	2014	0	0	0	0	0	0	6	0	0	0	19	0
	2015	0	0	0	4	0	7	0	0	0	0	5	0
	2016	0	0	0	0	0	0	7	0	0	0	0	0
	2017	0	0	0	0	0	6	0	0	0	9	0	0

2018	0	0	0	17	0	0	0	0	0	0	10	0
2019	0	0	0	6	0	0	0	0	0	2	0	0
2020	0	0	0	0	0	2	1	0	0	0	0	0

28 **TABLE B** Summary of identifications of rough-toothed dolphins around the main Hawaiian Islands in each area broken down by photograph
 29 quality and distinctiveness. Calves and juveniles were excluded. Data that was included in the analysis is boldened.

Island	Kaua‘i-Ni‘ihau				Hawai‘i Island			
	Distinctiveness 1	Distinctiveness 2	Distinctiveness 3	Distinctiveness 4	Distinctiveness 1	Distinctiveness 2	Distinctiveness 3	Distinctiveness 4
Photo Quality 1	2	7	39	10	0	8	53	18
Photo Quality 2	6	31	153	26	5	40	164	103
Photo Quality 3	11	90	446	106	10	38	322	210
Photo Quality 4	4	53	303	150	1	17	96	66

31 **TABLE C** Comparison of mean, maximum, and sum HWI by sex for each rough-toothed dolphin population around the main Hawaiian Islands,
32 restricted to distinctive and very distinctive adults and sub-adults with good or excellent quality photos, seen at least three times. Values shown
33 are grand means (i.e., means of the values for all individuals in each class).

Population	<i>n</i>	Class	Mean HWI (<i>SD</i>)	Maximum HWI (<i>SD</i>)	Sum HWI (<i>SD</i>)
<i>Kaua ‘i-Ni ‘ihau</i>	109	Females (13)	0.02 (0.01)	0.56 (0.26)	3.25 (1.51)
		Males (16)	0.05 (0.02)	0.70 (0.29)	6.40 (2.38)
		Female-Female	0.02 (0.02)	0.25 (0.18)	1.27 (0.23)
		Male-Male	0.08 (0.06)	0.47 (0.32)	2.23 (0.94)
		Female-Male	0.02 (0.03)	0.16 (0.2)	0.28 (0.42)
		Male-Female	0.02 (0.02)	0.16 (0.18)	0.23 (0.26)
<i>Hawai ‘i Island</i>	88	Females (23)	0.05 (0.02)	0.65 (0.16)	5.49 (2.12)
		Males (11)	0.08 (0.03)	0.73 (0.20)	7.55 (2.64)
		Female-Female	0.05 (0.03)	0.47 (0.24)	2.09 (0.56)
		Male-Male	0.08 (0.06)	0.39 (0.27)	1.77 (0.58)
		Female-Male	0.06 (0.06)	0.30 (0.21)	0.70 (0.61)
		Male-Female	0.06 (0.02)	0.37 (0.19)	1.47 (0.56)

TABLE D Results of the alternate analysis removing records of individuals seen more than once on the same day. Within-day records were removed based on group size; the largest group the individual was seen in that day was used in this analysis. As in the main analysis, overall network metrics were calculated using individuals seen at least twice (i.e., on two or more days). Permutation tests were conducted only using individuals seen at least three times (i.e., on three or more days). When calculating network metrics, isolated nodes or pairs that did not connect to the main body of the network were removed from the analysis to avoid biasing metrics.

Only Individuals Seen 2 or More Times						Only Individuals Seen 3 or More Times					
Population	<i>n</i>	Modularity	Density	Degree Centralization	Betweenness Centralization	<i>n</i>	Statistic	Real	Random	Real>Random	<i>p</i>
<i>Kaua‘i- Ni‘ihau</i>	225	0.64	0.07	0.12	0.07	101	Mean	0.04083	0.04087	12189/30000	0.4063
							SD	0.13034	0.11934	30000/30000	<0.0001
							CV	3.19263	2.91974	29999/30000	<0.0001
<i>Hawai‘i Island</i>	157	0.58	0.12	0.26	0.12	85	Mean	0.06026	0.06025	16757/30000	0.5586
							SD	0.14843	0.14433	29977/30000	0.0008
							CV	2.46298	2.39558	29991/30000	0.0003