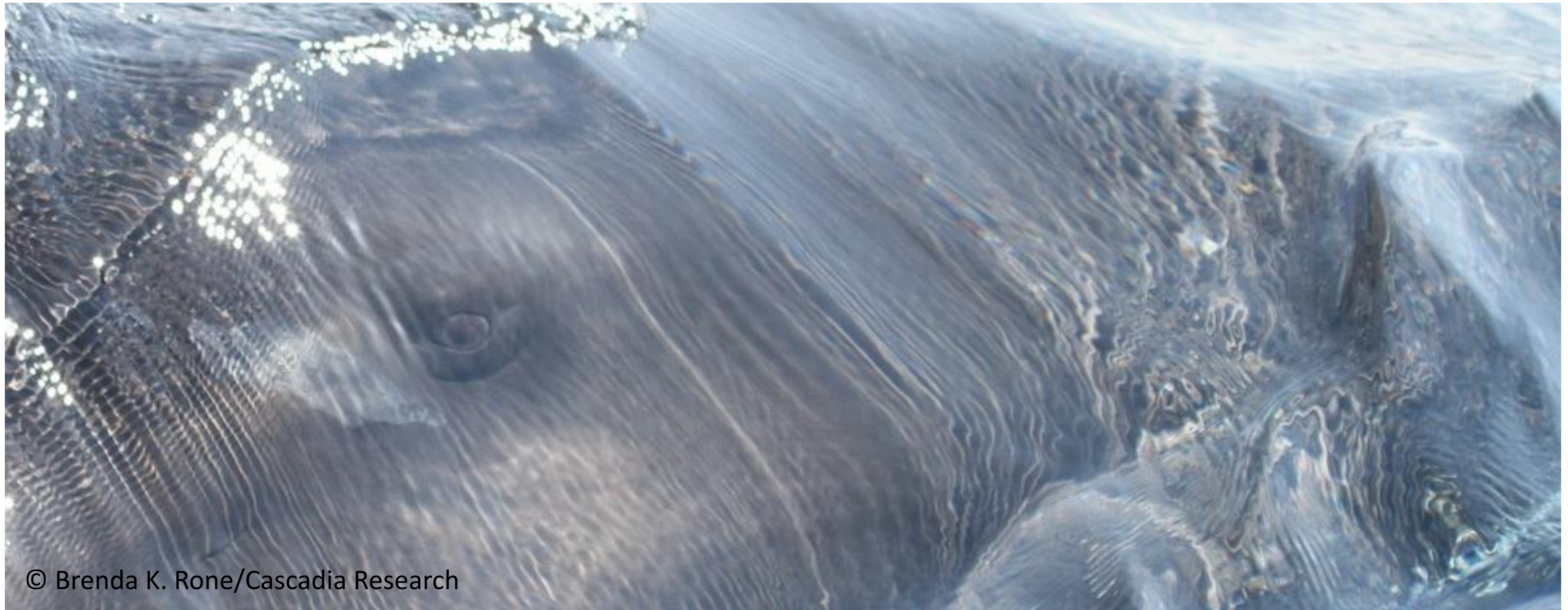


Sightings and satellite tag data suggest an open-ocean population of sperm whales (*Physeter macrocephalus*) in Hawaiian waters

Robin W. Baird, Michaela A. Kratofil, Daniel L. Webster, Sabre D. Mahaffy, Annette E. Harnish, and Brenda K. Rone

Cascadia Research Collective, Olympia, WA USA

rwbaird@cascadiaresearch.org



© Brenda K. Rone/Cascadia Research

Thanks to Dolphin Quest, Commander, Pacific Fleet, the Pacific Islands Fisheries Science Center, and the Office of Naval Research for tags and support of field efforts, Greg Schorr and Russ Andrews for playing an important role in tag design and deployment, and Daniel Barrios for producing sightings graph. Tagging undertaken under NMFS Research Permits

Presentation at the Cachalotes del Pacífico workshop, 21 November 2022

SNP GENOTYPING AND APPLICATIONS

Sperm whale population structure in the eastern and central North Pacific inferred by the use of single-nucleotide polymorphisms, microsatellites and mitochondrial DNA

SARAH L. MESNICK,*† BARBARA L. TAYLOR,* FREDERICK I. ARCHER,* KAREN K. MARTIEN,* SERGIO ESCORZA TREVIÑO,‡ BRITTANY L. HANCOCK-HANSER,* SANDRA CAROLINA MORENO MEDINA,§ VICTORIA L. PEASE,* KELLY M. ROBERTSON,* JANICE M. STRALEY,¶ ROBIN W. BAIRD,** JOHN CALAMBOKIDIS,** GREGORY S. SCHORR,** PAUL WADE,†† VLADIMIR BURKANOV,††† CHRIS R. LUNSFORD,§§ LUKE RENDELL¶¶ and PHILLIP A. MORIN*†

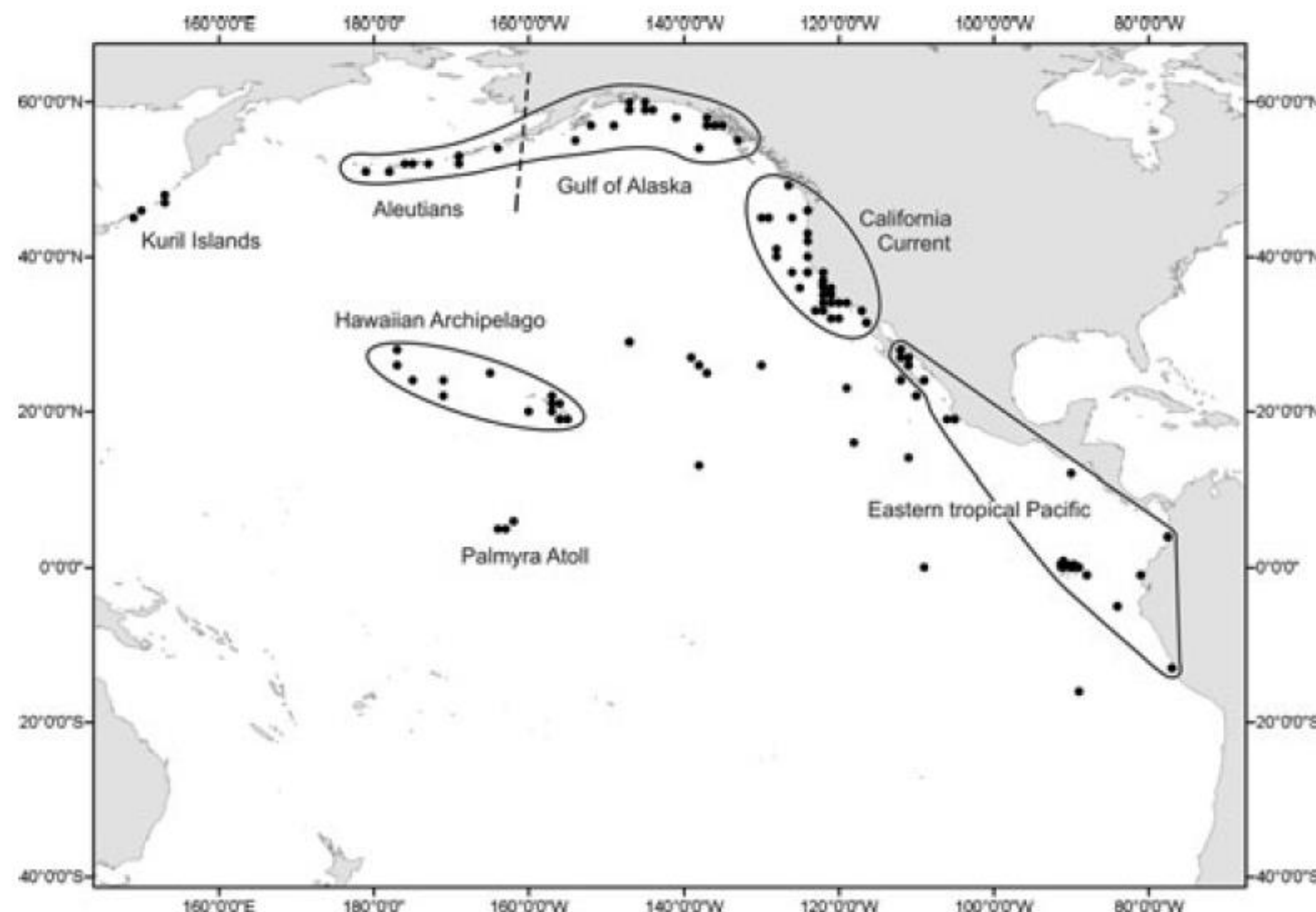


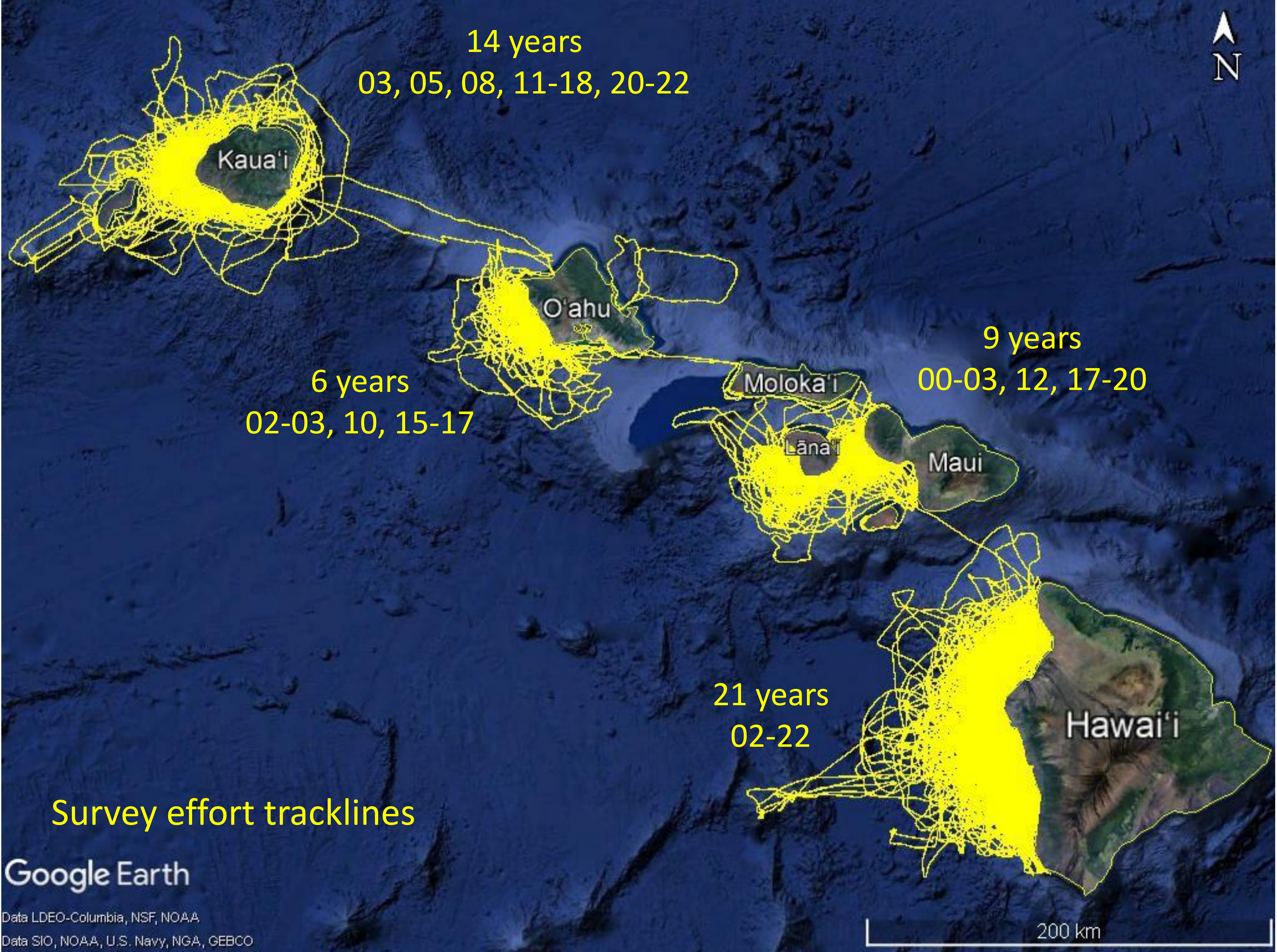
Fig. 2 Map showing sample and strata locations. See text for discussion of strata designations.

- Significant differentiation in mtDNA between Hawai'i and other strata
- No significant differences in SNPs or microsatellites between Hawai'i and the ETP (but more samples needed)
- Since Mesnick et al. analysis sample size for Hawai'i has increased by >1/3

- Multi-species effort yearly since 2000
- 1,292 days of effort (~56 days/year)
- Typically 2 or 3 multi-week field efforts off 2+ island areas each year
- Rapid response off Hawai‘i Island (since COVID)



© Jordan K. Lerma/Cascadia Research



Island area	# years surveyed	# days effort
Kaua‘i/Ni‘ihau	14	229
O‘ahu	6	83
Maui Nui	9	171
Hawai‘i	21	809

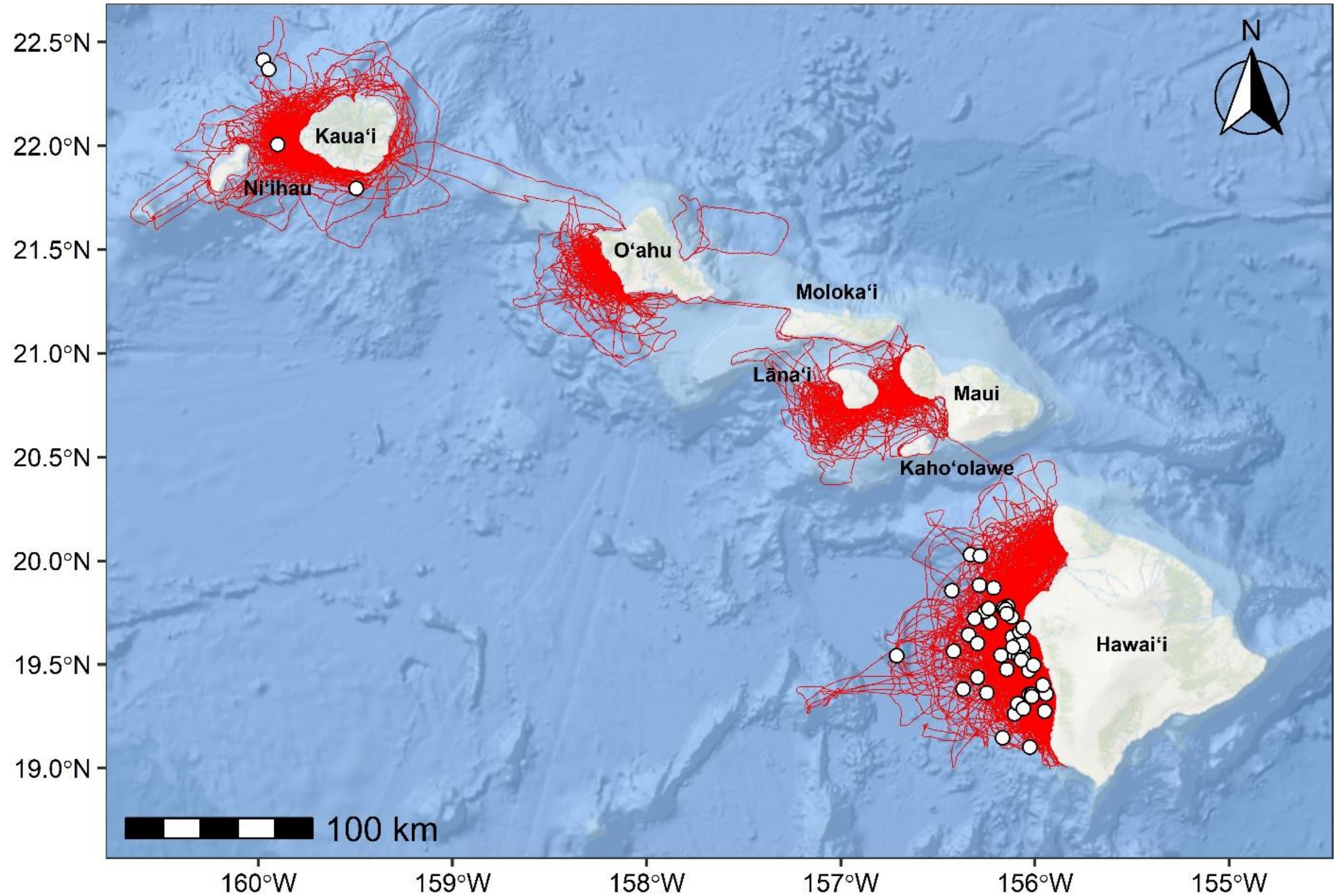
Species	# sightings	Resident, pelagic, migratory
Short-finned Pilot Whale	842	Resident and pelagic
Pantropical Spotted Dolphin	618	Resident and pelagic
Rough-toothed Dolphin	510	Resident and pelagic
Common Bottlenose Dolphin	372	Resident and pelagic
Spinner Dolphin	305	Resident
Humpback Whale	210	Migratory
False Killer Whale	118	Resident and pelagic
Melon-headed Whale	103	Resident and pelagic
Dwarf Sperm Whale	97	Resident and pelagic
Cuvier's Beaked Whale	94	Resident and pelagic
Blainville's Beaked Whale	71	Resident and pelagic
Pygmy Killer Whale	64	Resident and pelagic



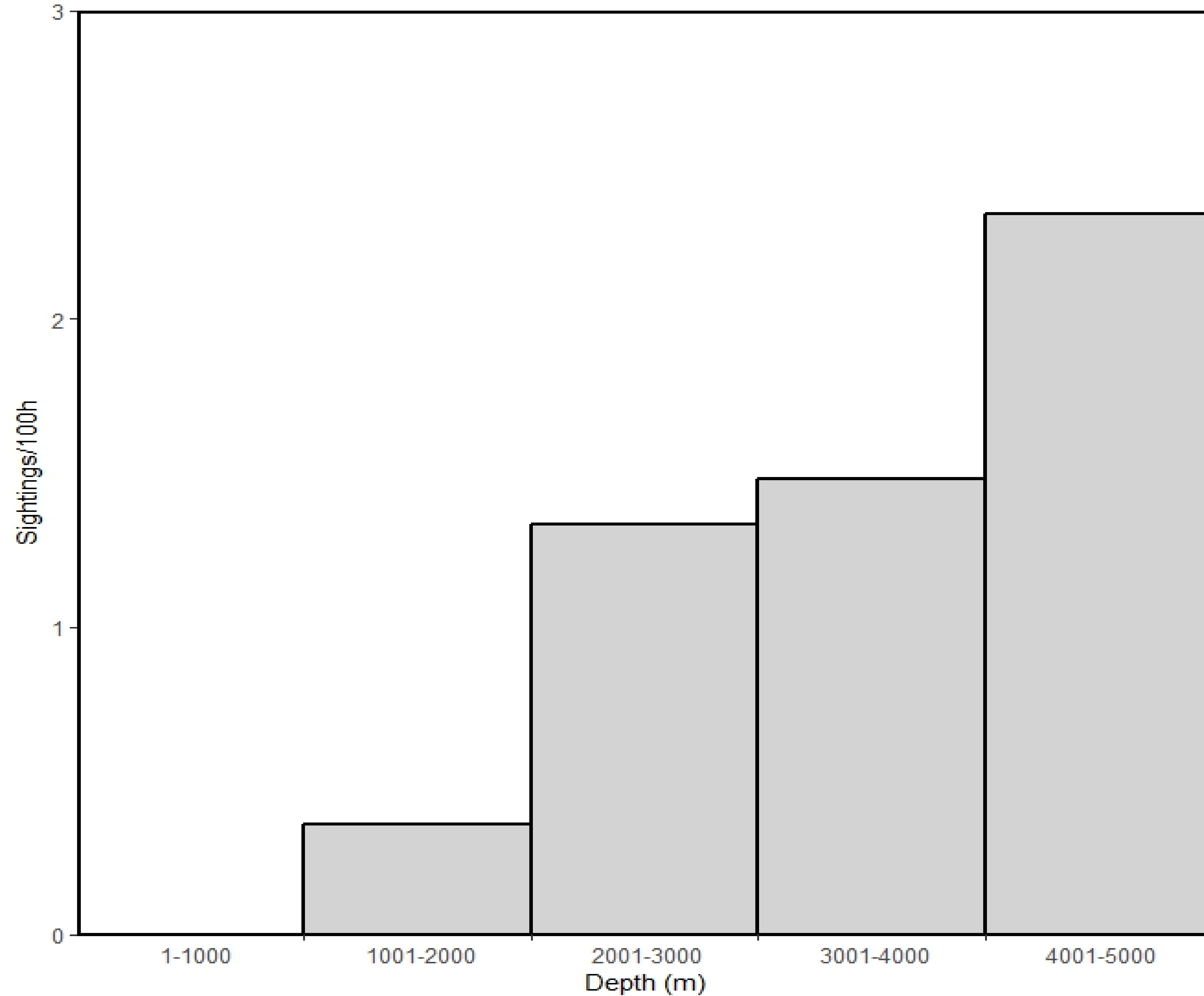
Species	# sightings	Resident, pelagic, migratory
Short-finned Pilot Whale	842	Resident and pelagic
Pantropical Spotted Dolphin	618	Resident and pelagic
Rough-toothed Dolphin	510	Resident and pelagic
Common Bottlenose Dolphin	372	Resident and pelagic
Spinner Dolphin	305	Resident
Humpback Whale	210	Migratory
False Killer Whale	118	Resident and pelagic
Melon-headed Whale	103	Resident and pelagic
Dwarf Sperm Whale	97	Resident and pelagic
Cuvier's Beaked Whale	94	Resident and pelagic
Blainville's Beaked Whale	71	Resident and pelagic
Pygmy Killer Whale	64	Resident and pelagic
Sperm Whale	52	Pelagic?
Striped Dolphin	42	Pelagic
Risso's Dolphin	17	Pelagic
Pygmy Sperm Whale	8	Pelagic?
Fraser's Dolphin	7	Pelagic
Killer Whale	5	Pelagic
Sei Whale	3	Migratory
Fin Whale	2	Migratory
Longman's beaked whale	1	Pelagic



Sperm whales represent 1.5% of odontocete sightings between 2000-2022



Sperm whale sighting rates (sightings/100 h effort) increase with depth

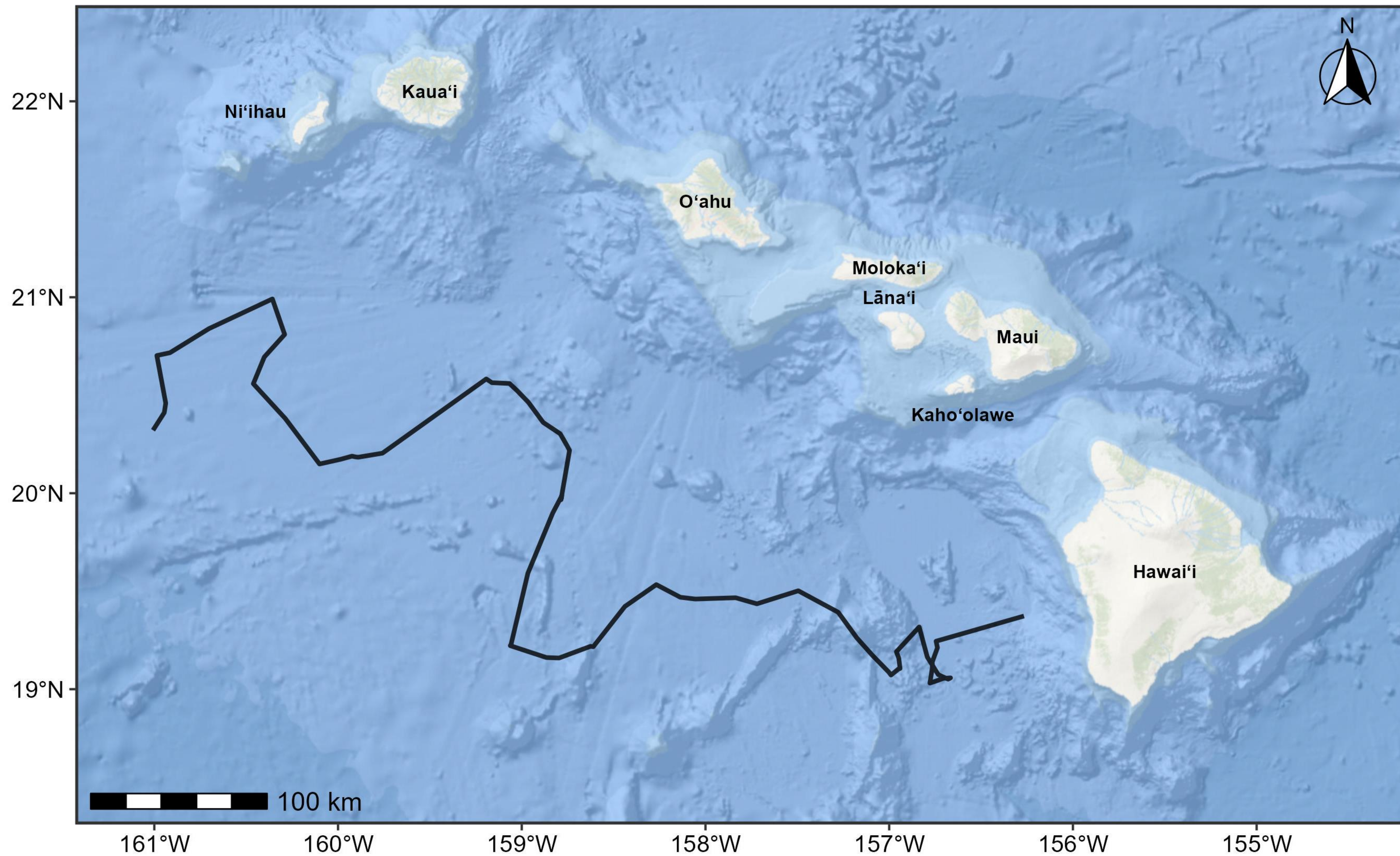


LIMPET satellite tags deployed on 12 individuals between 2009 and 2014

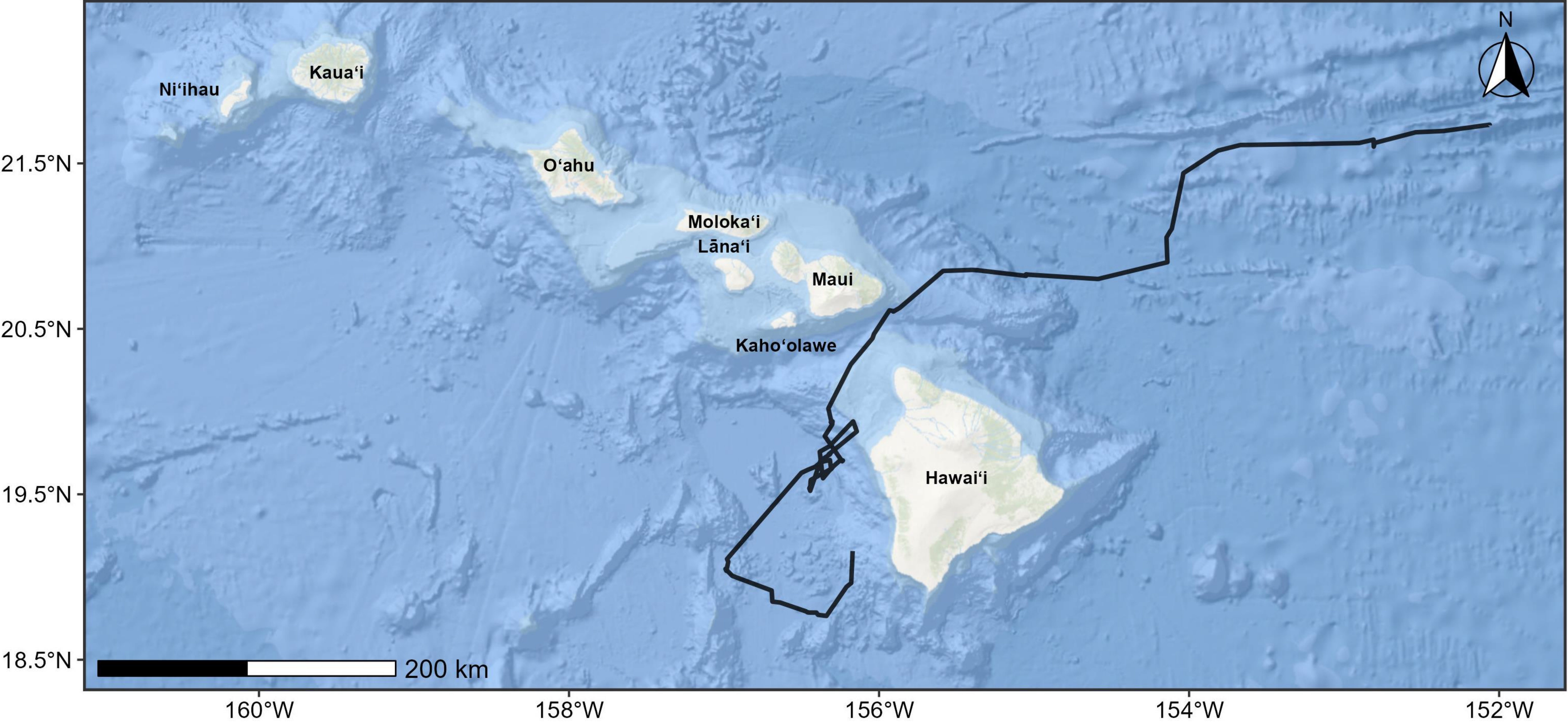


Tag #	Group	Tagging Date	# Days of Data	Distance Travelled (km)	Distance from Deployment (km)		Distance to Shore (km)			Depth at Transmission (m)		
					median	max	min	median	max	min	median	max
PmTag012	1	20 NOV 2009	9	456	20	102	4	18	51	941	2853	4819
PmTag013	2	11 APR 2010	14	945	948	514	36	136	251	3709	4471	4746
PmTag015	3	8 DEC 2010	6	406	113	142	14	87	139	2086	4642	5070
PmTag016	4	20 NOV 2011	13	635	57	104	8	30	77	2012	3897	4885
PmTag017	4	20 NOV 2011	10	503	61	96	5	32	75	1693	4045	4777
PmTag019	5	16 MAY 2013	14	983	86	515	10	56	378	960	4623	5755
PmTag020	5	23 MAY 2013	1	120	25	52	10	19	49	777	2583	4088
PmTag021	6	27 OCT 2013	14	702	135	192	5	73	151	1226	4626	5045
PmTag022	7	1 NOV 2013	8	650	201	388	9	68	125	2300	4484	4888
PmTag023	8	9 OCT 2014	14	924	234	328	35	172	217	2442	4476	4842
PmTag024	9	30 NOV 2014	5	141	66	105	14	59	109	2565	4366	4764
PmTag025	9	30 NOV 2014	11	771	105	401	5	96	175	1643	4313	4901

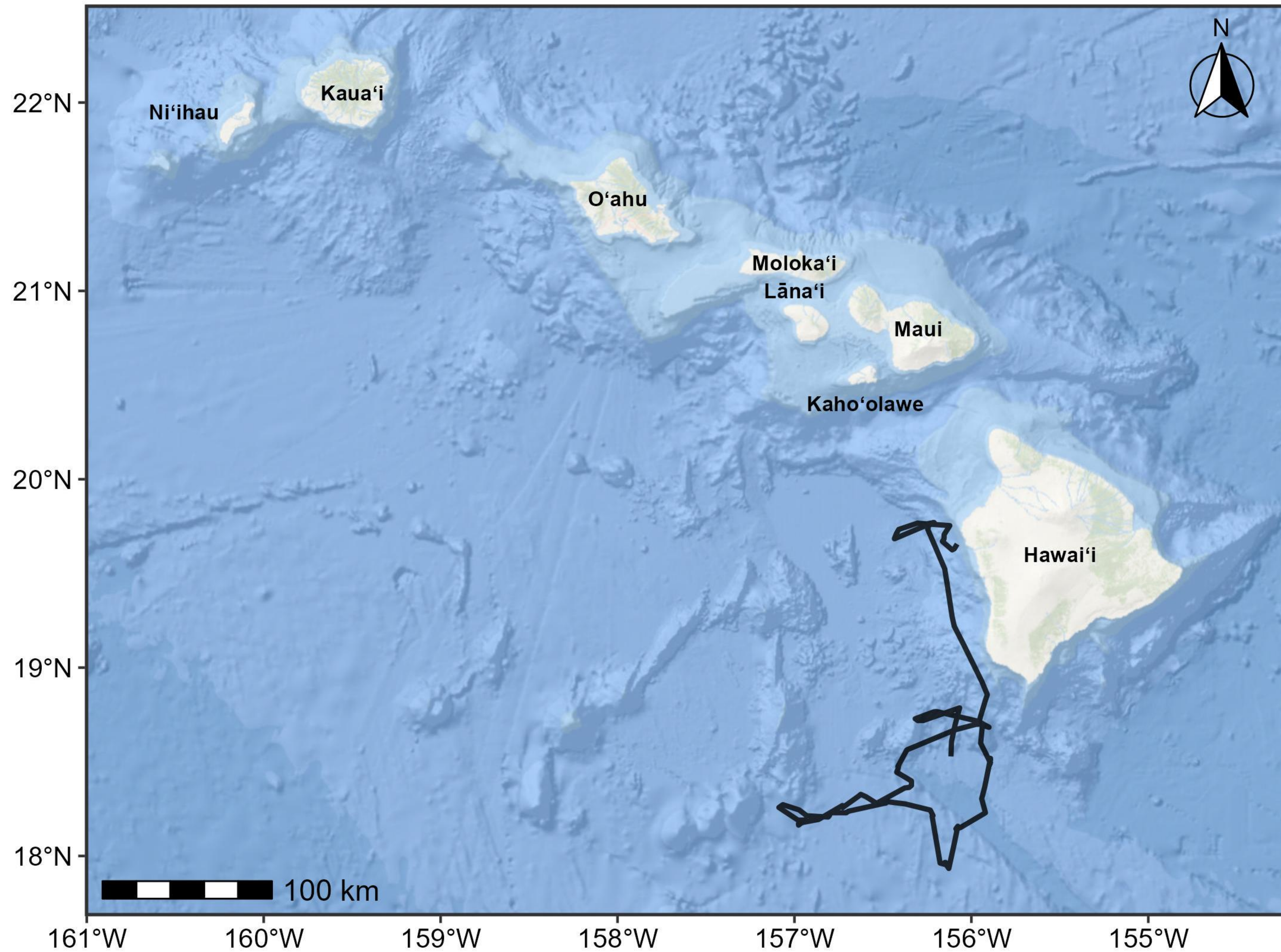
PmTag013 - 13.5 days

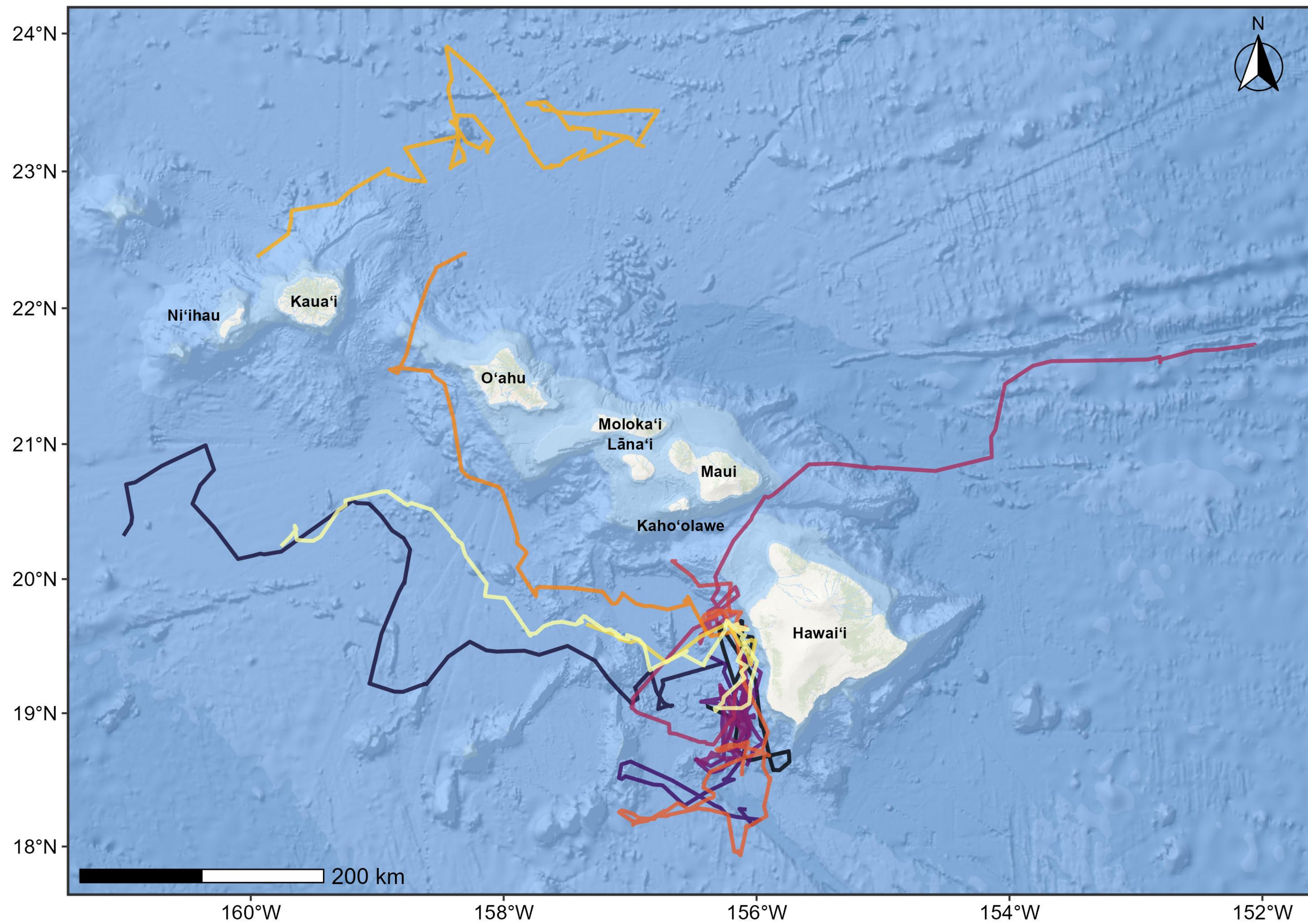


PmTag019 - 13.7 days



PmTag021 - 14.5 days





Possibly responding to cold-core (cyclonic) eddies – planning on additional analyses

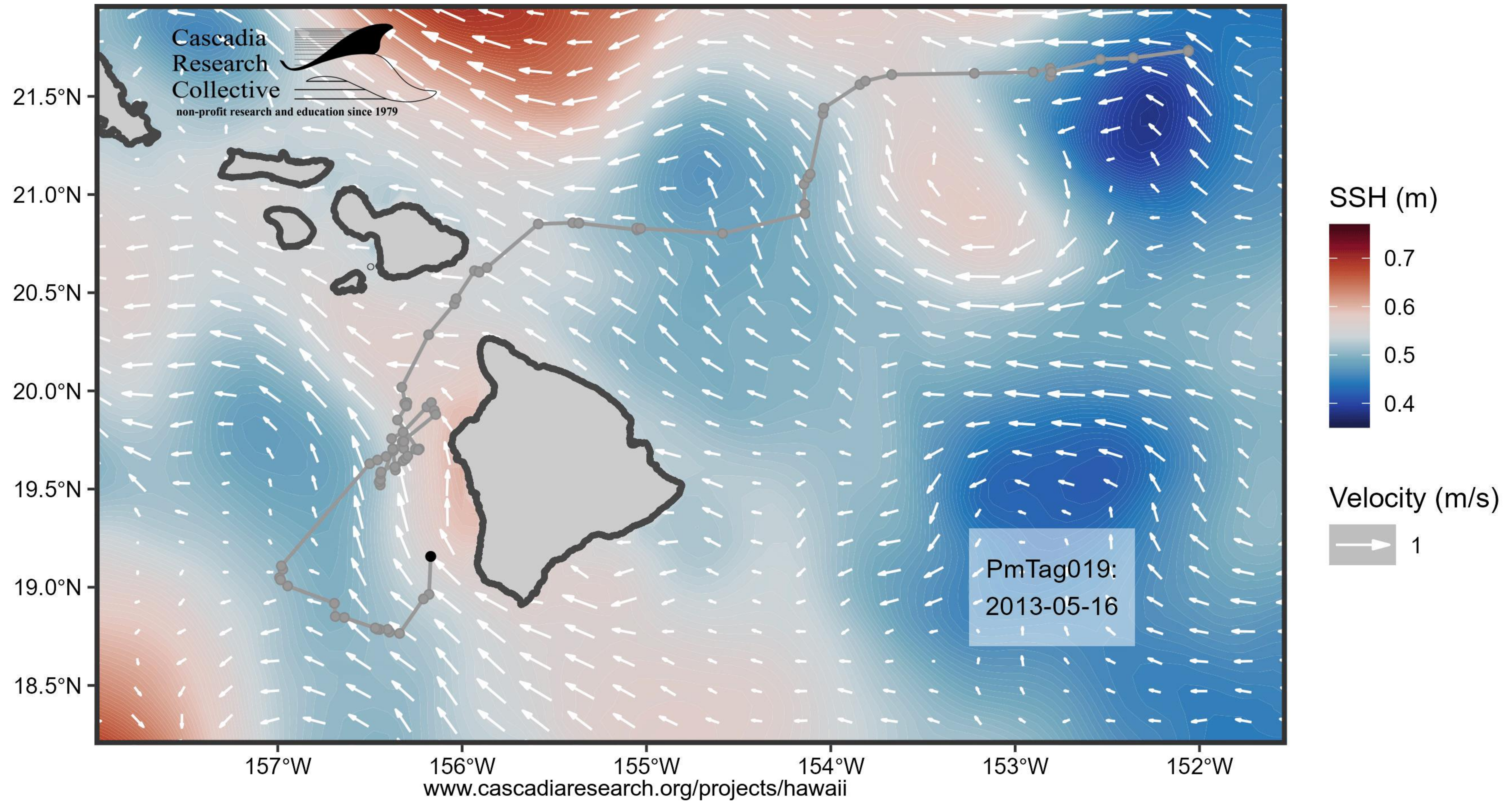


Photo-ID limited by rarity of fluking and thus small catalog



© Robin W. Baird/Cascadia Research

One re-sighted individual > 4 years apart by community scientist contributions



29 October 2010



26 February 2015



Geographic and temporal patterns in the acoustic detection of sperm whales *Physeter macrocephalus* in the central and western North Pacific Ocean

Karlina P. Merkens^{1,*}, Anne E. Simonis¹, Erin M. Oleson²

¹NOAA Affiliate through Lynker Technologies – Contractor to Pacific Islands Fisheries Science Center, Honolulu, HI 96818, USA
²NOAA NMFS Pacific Islands Fisheries Science Center, Honolulu, HI 96818, USA

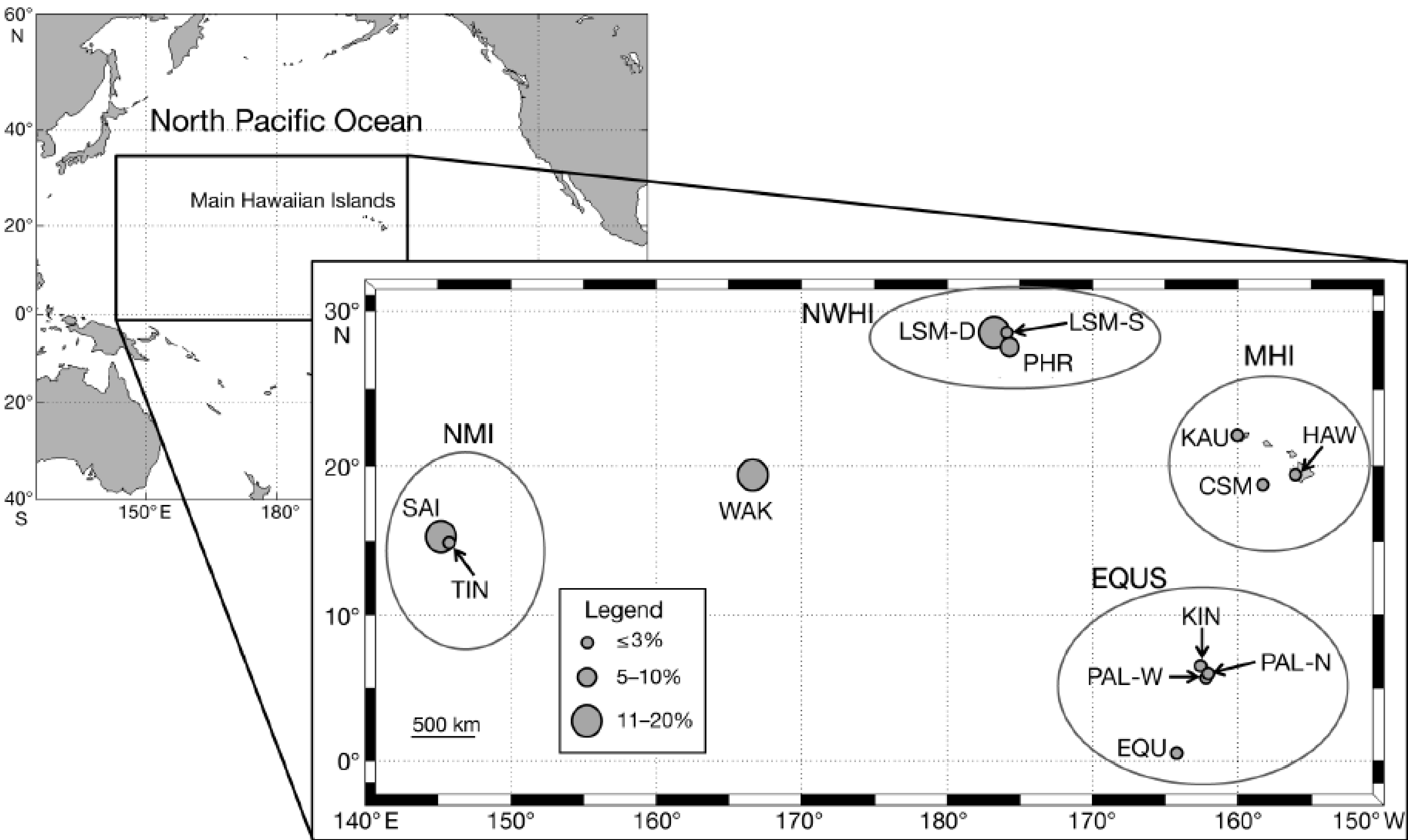


Fig. 1. Monitoring locations across the central and western North Pacific Ocean. Monitoring sites are indicated by gray filled circles. Size of circle indicates relative rate of sperm whale detection at each site. Sites are: Cross Seamount (CSM), Equator (EQU), Hawai'i Island (HAW), Kauai (KAU), Kingman Reef (KIN), Ladd Seamount-Deep (LSM-D), Ladd Seamount-Shallow (LSM-S), Palmyra Atoll-North (PAL-N), Palmyra Atoll-West (PAL-W), Pearl and Hermes Reef (PHR), Saipan (SAI), Tinian (TIN), and Wake Atoll (WAK). Subregions (gray ovals, bold font) are: Main Hawaiian Islands (MHI), Northern Mariana Islands (NMI), Northwestern Hawaiian Islands (NWHI), and Equatorial subregion (EQU)

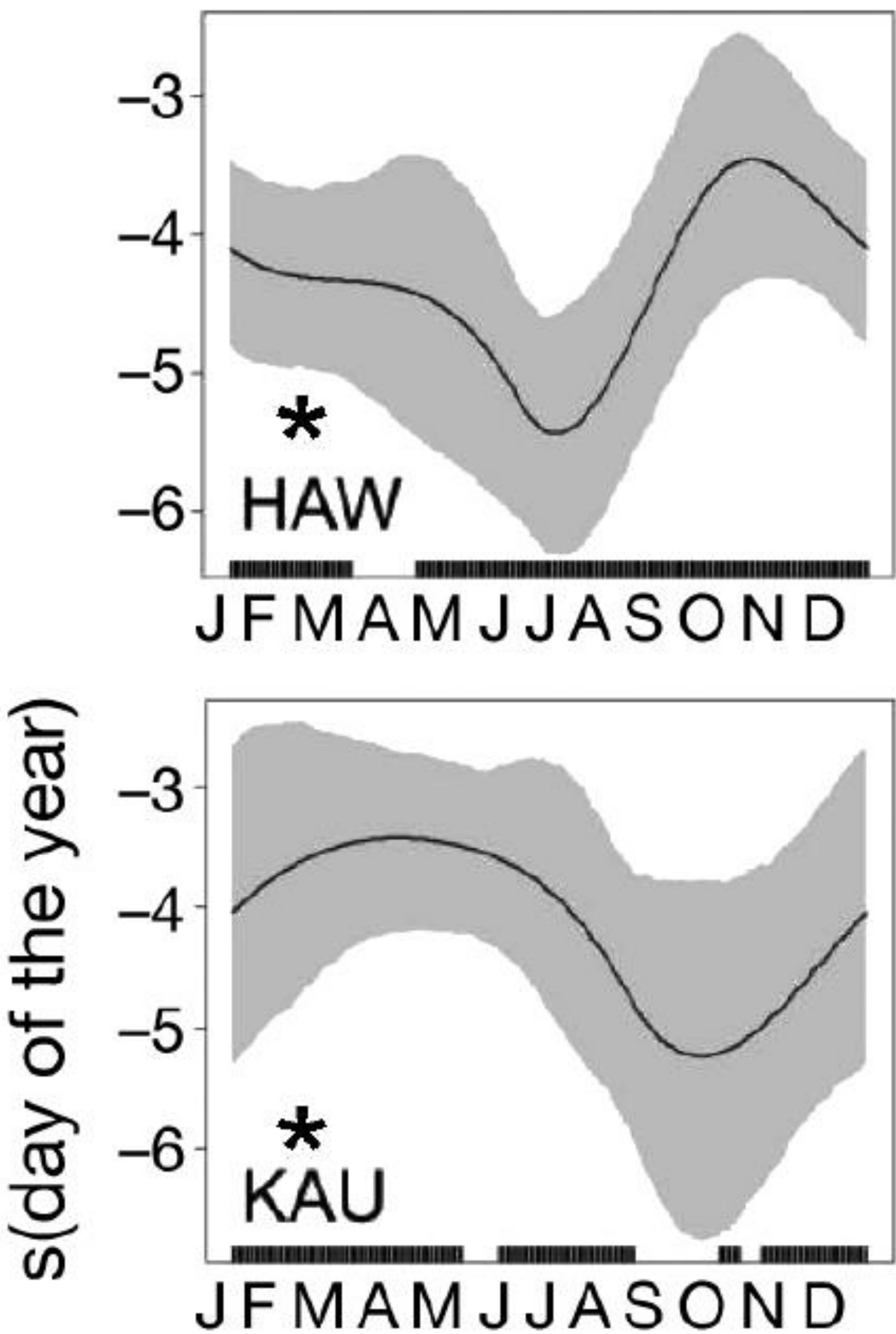


Fig. 6. Seasonal trends for 11 data sets with data from at least 270 d of the year, including subregions (top panel, above line) and all individual sites (below line). For an explanation of the figure layout see Fig. 4. Site abbreviations as in Fig. 1. Rug plots (at bottom of graphs) denote effort. The y-axis is the partial-fit smooth function of the day of the year. All plots include 95 % confidence intervals (gray regions). Asterisk (*) indicates parameter was selected for final model of round 1 of modeling. NA indicates there was not sufficient data (<270 d of the year) to model seasonal trends. There is no plot from EQU because of uneven seasonal coverage at the different sites



Hawai'i publications, reports,
& conference presentations



Hawai'i field project pages



Dolphin and whale species in
Hawai'i



CascadiaResearch



@CascadiaRes



cascadiaresearch