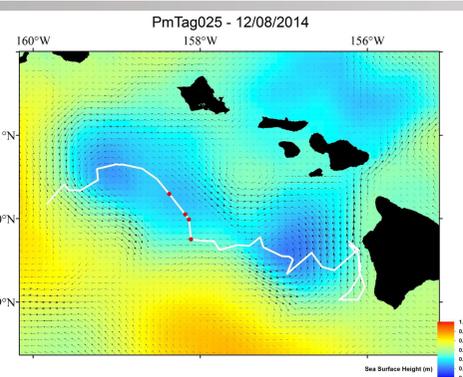
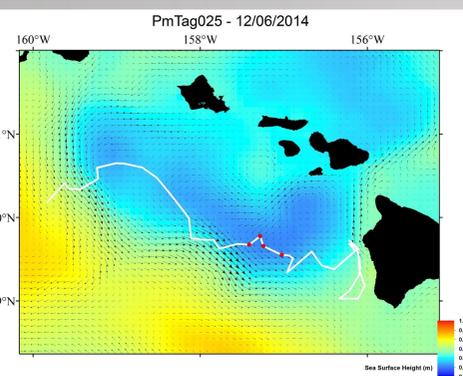
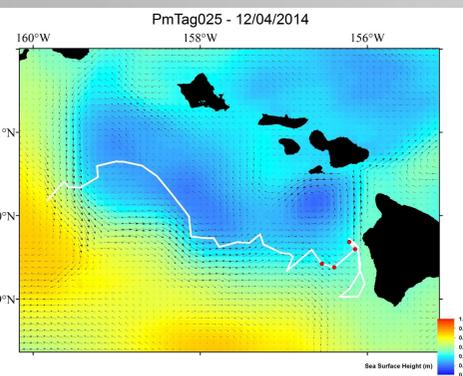
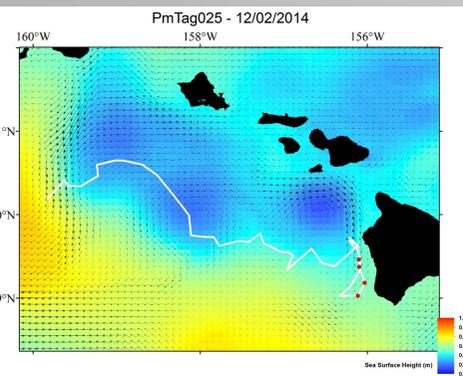


Satellite telemetry results indicate an open-ocean population of sperm whales (*Physeter macrocephalus*) in Hawaiian waters

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A sample of days of daily sea surface height (m) & currents (vectors) from the HYCOM regional model in relation to the track from PmTag025. The track was derived from a Switching State-Space Model (6-hr time step). Red circles designate whale positions on the day coinciding with the HYCOM raster model.

IN HAWAIIAN WATERS, at least 11 of 18 species of odontocetes have island-associated, resident populations. Sperm whales are sighted throughout Hawaiian waters, and groups are comprised of females and juveniles. Around the main Hawaiian Islands, they make up < 2% of odontocete sightings.

We used satellite tag data to assess whether sperm whales in Hawai'i are part of an open-ocean or island-associated population. Analyses were limited to one individual per group. Individuals were tracked from 6.1-14d (median=12.7) with a mean travel distance of 719km (range=406-983) and a grand median of 4,476m (range of max=4,746-5,755). Grand median distances from tagging locations and shore were 133km (range of max=102-515) and 82km (range of max 49-378), respectively.

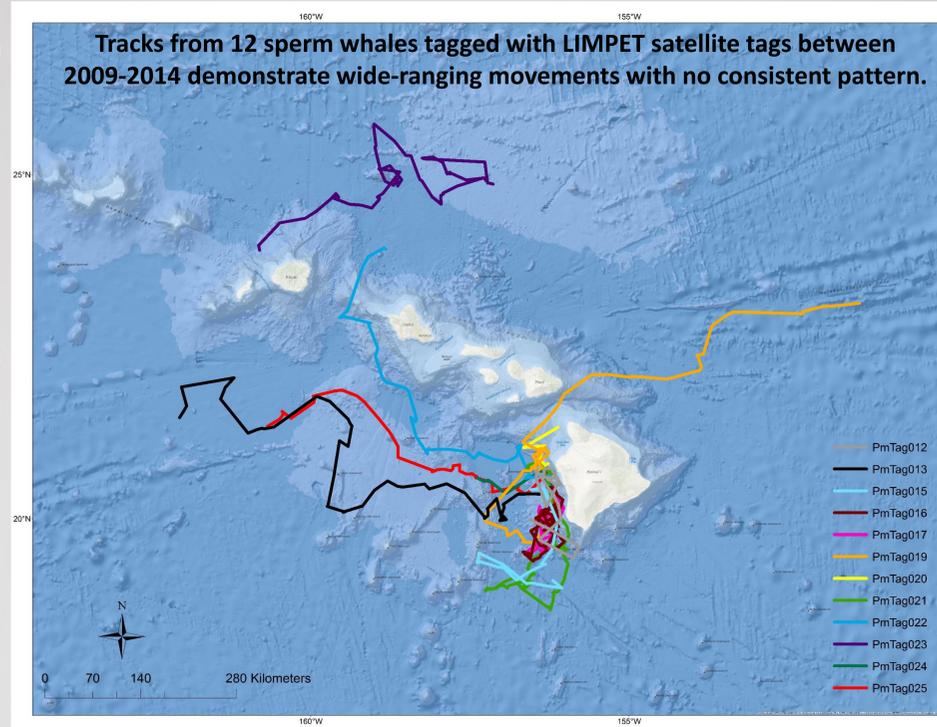
Although tag transmissions were relatively short, results indicate movements are wide-ranging with no consistent pattern or particular association with the islands, **suggesting sperm whales in Hawai'i are part of a broadly-ranging population that likely extends across much of the central tropical Pacific.**

Deployment information and results from ArcGIS analysis of sperm whale LIMPET satellite tag data after processing through Douglas Argos-filter v.8.5.

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

* removed from further analyses

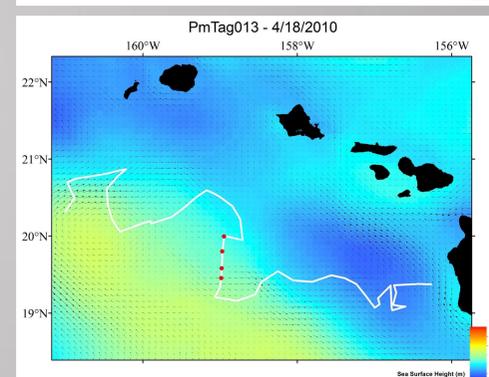
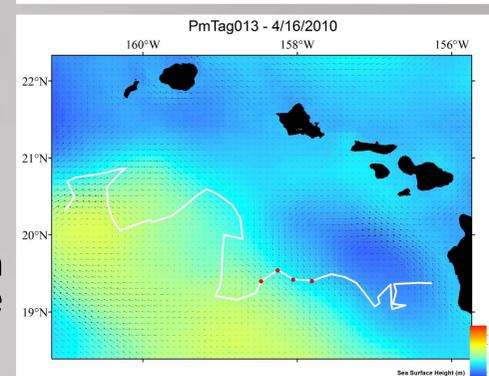
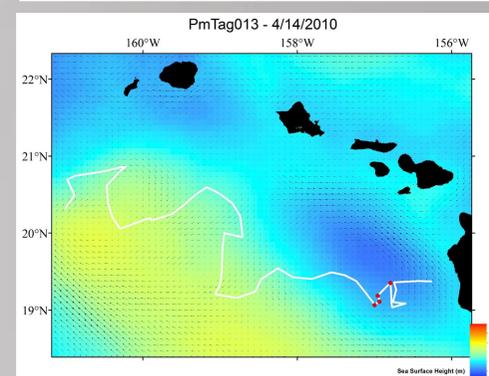
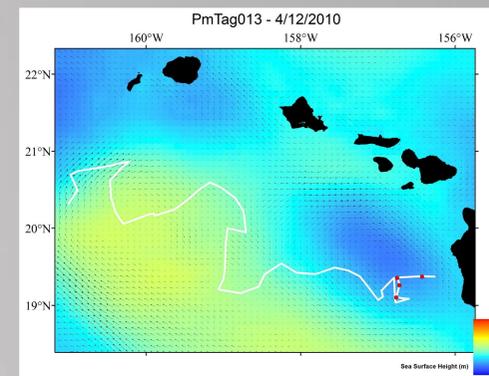
All sperm whales were associated with seamounts at some point during the tracking period, although seamounts are numerous throughout the area. Although there is still much to learn about the biological effects of current-topography interactions, seamounts have been identified as areas of increased biological productivity due to a number of factors such as localized upwellings and the formation of eddies [1]. Eddies are also formed from the interaction between the Hawaiian Islands and the winds and currents. These eddies may concentrate prey [2]. A preliminary visual examination of eddies in relation to



select whale tracks was conducted to evaluate movement in relation to eddy occurrence.

Conclusions

A preliminary inspection of movements in relation to eddies suggests that at least some sperm whales may utilize cold core cyclonic eddies (sea surface height < 0.65 m), presumably for foraging.



A sample of days of daily sea surface height (m) & currents (vectors) from the HYCOM regional model in relation to the track from PmTag013. The track was derived from a Switching State-Space Model (6-hr time step). Red circles designate whale positions on the day coinciding with the HYCOM raster model.

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- [1] Boehlert, G.W. and A. Genin. 1987. A review of the effects of seamount on biological processes. Washington DC American Geophysical Union Geophysical Monograph Series 43:319-334.
- [2] Seki, M.P., et al. 2002. Hawaiian cyclonic eddies and blue marlin catches: The case study of the 1995 Hawaiian International Billfish Tournament. J. Oceanography 58:739-745.