Human interaction in stranded San Diego County cetaceans between 2001 and 2010

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ABSTRACT

Between 2001 and 2010, seven cetacean species in San Diego County were impacted by three types of human interaction: entanglements, vessel strikes, and gunshots. Entanglements accounted for 66.7% of known human interactions, primarily impacting long-beaked common dolphins (*Delphinus capensis*). Possible signs of entanglement were observed in 23.2% of all *D. capensis* strandings. These entanglements were observed throughout the year, with a peak in May, November, and December. The frequency of *D. capensis* strandings was similar in the south part of the county along Imperial Beach and Coronado and in the north on the beaches north and south of Oceanside Harbor (2.4 animals per mile of coastline for both locations). However, only 14.7% of *D. capensis* strandings were observed to show possible signs of fishery entanglement in the south while 35.9% showed possible signs of fishery interactions in the north. *D. capensis* entanglements in the south have only been observed in 2008 and 2009 while those in the north vary annually but have been observed throughout the study period. An unobserved or minimally observed fishery is likely responsible for observed entanglements of stranded *D. capensis*. The stranding data also suggest the fishery interacting with these cetaceans likely operates off the coast of northern San Diego County and has only more recently operated off southern San Diego County beaches.

METHODS

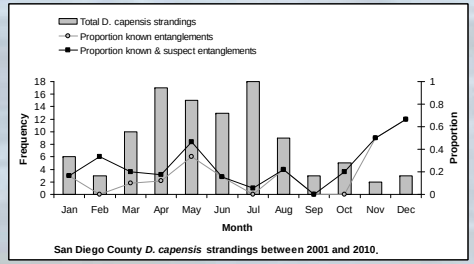
- Stranded cetaceans, San Diego County, 2001-2010
- Fishery set locations from fishery log book data. Coordinate points are approximate, at a resolution of 10.2 nmi. Thus, multiple sets are represented by one coordinate point.
- Human Interaction (HI) Classification
  - Gunshot: bullet found
  - Vessel strike: parallel lacerations
  - Entanglement
    - -known: appendages remove or net impression
    - -suspect: linear impression of unknown origin coupled with robust animal or full stomach or no significant histological findings

RESULTS & DISCUSSION

Summary of San Diego County cetacean strandings with evidence of human interaction from 2001-2010.

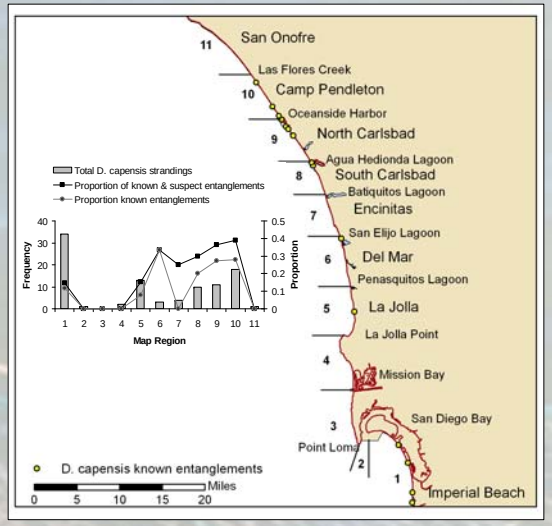
	Vessel Strike	Entanglement		Gunshot	Total Strandings
	known	known	suspect	known	HI & non-HI
Balaenoptera physalus	2				3
Delphinus capensis		16	7	4	99
Delphinus delphis		1	2		37
Delphinus spp.	1				7
Eschrictius robustus	2		1		6
Grampus griseus				1	4
Lagenorhyncus obliquidens		1			9
Tursiops truncatus		1	2		38
Total	5	20	15	5	

Entanglements were the most common type of human interaction, primarily impacting *D. capensis.* *Note that the table is only a list of species with documented HI and does not represent all species that have stranded in San Diego County.*

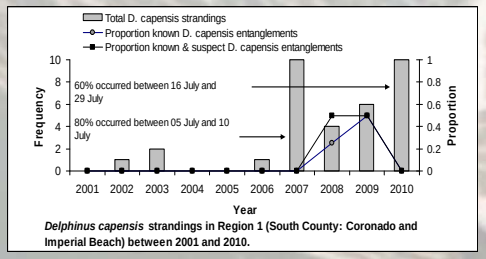


San Diego County *D. capensis* strandings between 2001 and 2010.

***D. capensis* primarily strand between March and August with evidence of entanglements highest in May during this period.** The high proportion of winter entanglements may be an artifact of small sample size (n = 2 and 3 strandings in November and December, respectively), but suggest a fishery is active at this time.

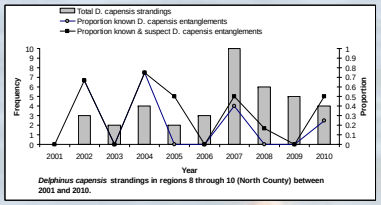


***D. capensis* entanglements were most common on the beaches north and south of Oceanside Harbor (regions 8 -10).**



Delphinus capensis strandings in Region 1 (South County: Coronado and Imperial Beach) between 2001 and 2010.

***D. capensis* entanglements only occurred in Region 1 during 2008 & 2009, suggesting a shift in fishing activity off southern San Diego or northern Mexico.** Stranding peaks in 2007 and 2010 are unusual and need to be investigated further.



Delphinus capensis strandings in regions 8 through 10 (North County) between 2001 and 2010.

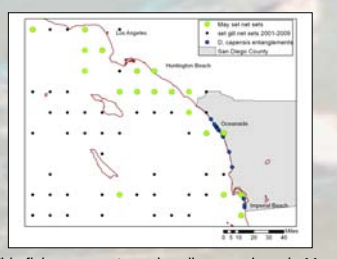
***D. capensis* entanglements on the beaches north and south of Oceanside Harbor (regions 8-10) occurred throughout the study period and varied annually.** Further investigation is needed to identify potential correlations with fishery activities or oceanographic conditions.

Summary of Southern California gill net and purse seine fisheries.

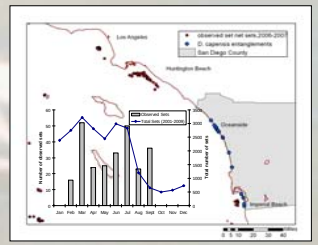
	Halibut & white sea bass set gillnet fishery	Squid purse seine fishery	Anchovy, mackerel, & sardine purse seine fishery	Thresher shark/swordfish large mesh drift gillnet fishery	Yellowtail, barracuda, white sea bass, & tuna small mesh drift gillnet fishery
Fishing effort	Coastal (>3 nmi) & Offshore	Primarily Coastal	Primarily Coastal	Coastal (> 3nmi) & Offshore	Primarily offshore & not w/in San Diego County
Years Observed[1]	Sporadically since 1990.During study period: 2006/2007.	2004-2007	2004-2007	1990-2010	2002-2004
Observer coverage	<10% (2006/2007 average) [1]	Low (e.g. 1.3% in 2007) [2]	Low (e.g. 5% in 2007) [2]	20% (average since 1997) [2]	13%[1]
Season	Year round, most active Jan-July	Year round, most active in southern California Oct - Mar[1]	Year round[1]	Most active Oct-Dec[1]	Year round[1]
Observed *D.* spp mortality	2 *D.* spp. (fisher self-reports) [1]	1 *D.* sp.[1]	0 *D.* spp.[1]	D. capensis = 8.9% and D. delphis = 65.5% of observed cetacean bycatch, 2001-2008	2 *D. capensis*[1]

***D. capensis* entanglements likely originate from the set gillnet or purse seine fisheries, which operate relatively close to the San Diego shore when most strandings with signs of entanglement are observed (i.e., May)**. The large mesh drift gillnet fishery is unlikely to be the source of the observed entanglements because the cetacean bycatch is only 8.9% *D. capensis*. *D. delphis* are the most frequently killed cetacean in this fishery (66.5%) but strandings occur less frequently (14.8% of all strandings) with known entanglements observed only in 2.6% of them.

Halibut & white sea bass set gillnet fishery



This fishery operates primarily near shore in May when strandings of *D. capensis* with signs of entanglement peak.



Observer coverage occurred during the most active months of this fishery (Jan-July). However, coverage was low or non-existent during peaks of *D. capensis* entanglements (May, November, & December) and only 3.9% of observed sets were off San Diego County.

CONCLUSIONS

Entanglements were most often observed in stranded *D. capensis* and it is likely that an unobserved or minimally observed fishery is responsible. Spatial and temporal trends in fishing activity suggest that entanglements could originate from the set gillnet or purse seine fisheries. A reactivation of the observer program may be merited for these fisheries. Recommendations for such a program include 20% observer coverage, greater persistence of the program, inclusion of boats operating out of Oceanside, and to concentrate observations from March – August when *D. capensis* most often strand.

ACKNOWLEDGEMENTS

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REFERENCES

[1]Carretta et al. 2010. U.S. Pacific Marine Mammal Stock Assessments: 2009. NOAA-TM-NMFS-SWFSC-453

[2]Carretta JV, Enriquez L (2009) Marine Mammal and seabird bycatch in observed California commercial fisheries in 2007. Southwest Fisheries Science Center, National Marine Fisheries Service, LJ-09-01, La Jolla