

Identification of pinnipeds entangled in marine debris on the central California coast

Geno DeRango - Stranding Coordinator¹, Romy Sidelsky¹, Dr. Shawn Johnson DVM, MPVM – Director of Veterinary Science¹
¹The Marine Mammal Center 2000 Bunker Road Sausalito, CA 94965

INTRODUCTION

- The Marine Mammal Center (TMMC) is comprised of trained rescue personnel and veterinarians who have been responding to pinnipeds entangled in marine debris throughout northern and central California since 1975. Approximately 10-15% of our patients strand annually due to human-related injuries or interactions, and many of these interactions are a result of marine debris. TMMC's rescue range consists of all counties between Mendocino and San Luis Obispo, which includes the Monterey Bay National Marine Sanctuary.
- The most common patients admitted to TMMC for a variety of illnesses are California sea lions (approx. 55%), northern elephant seals (approx. 25%), and harbor seals (approx. 15%). However, California sea lions are the large majority of fisheries interactions patients at approximately 85% (Figure 2). The Marine Mammal Center's Stranding Department is currently tracking commonalities associated with gear types that afflict these animals and the spatial distribution of strandings related to gear types.

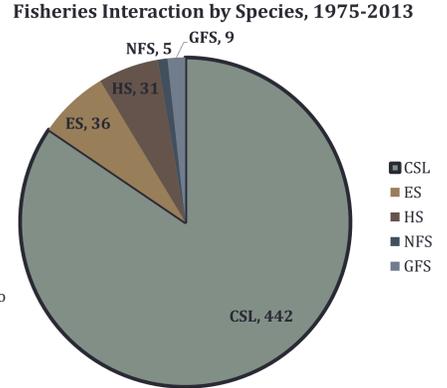
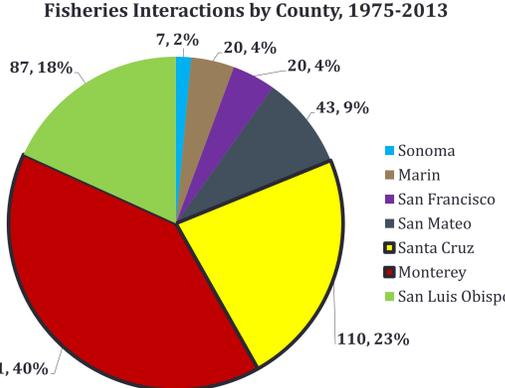


Figure 1. Strand locations for pinnipeds afflicted by fisheries interactions. Santa Cruz and Monterey Counties, which comprise a large portion of the Monterey Bay National Marine Sanctuary, account for approximately 2/3 of cases with fisheries interactions.

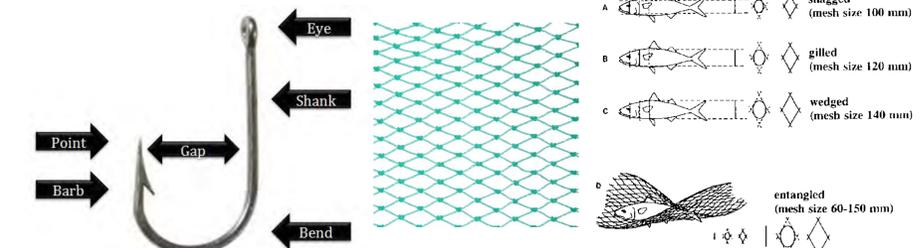
Figure 2. Number of patients admitted to TMMC with fisheries interactions broken down by species, n=523. CSL=California sea lions, ES=elephant seals, HS=harbor seals, NFS=northern fur seals, GFS=Guadalupe fur seals. California sea lions account for 85%.



The most common patients afflicted by marine debris, from left to right: California sea lion, northern elephant seal, and harbor seal.

METHODS

- Gear collected from entangled pinnipeds was categorized according to gear type (hooks, line, plastic debris, etc.) and entered into a Filemaker 12 database for statistical analysis.
- Hook type was determined based on measurements of various parts of the hook anatomy.
- Monofilament netting was measured based on line test, diameter and mesh area. Attempted were made to determine type of monofilament netting used, but proved difficult due to only having a small segment of the original netting.



GEAR COLLECTION

The Marine Mammal Center's rescue personnel and veterinary staff collect gear from pinnipeds in a variety of ways. Remote sedation via dart gun is an option for large, alert and aggressive pinnipeds. Personnel are also trained to enter major haul-outs when animals are surrounded by conspecifics. Deeply embedded marine debris must also be surgically removed under anesthesia in a controlled hospital or field environment. Haul-out patterns are tracked for individual entangled animals until they become accessible for a rescue crew to disentangle. All gear is retained to be cataloged and classified later.

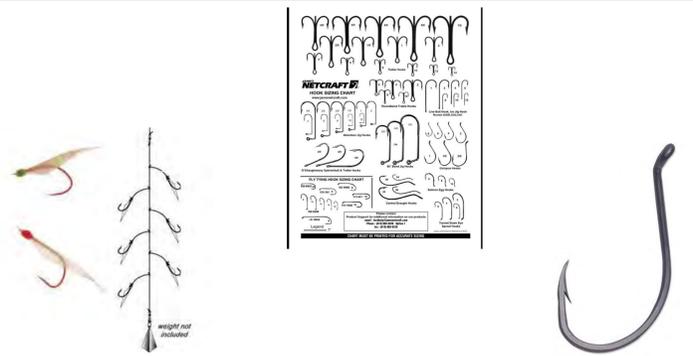


A California sea lion has a deeply embedded packing strap surgically removed under anesthesia (left) and a northern elephant seal is injected with sedatives (right) to assist with disentanglement due to the size and strength of the animal. Animals are routinely assessed for haul-out patterns in the Monterey Bay until they become accessible, such as a California sea lion (below) on an offshore rock.



GEAR IDENTIFICATION

- Hook anatomy and distinguishing features, i.e. string, foiling and beading, were used to identify hook type based on Jann's Netcraft Hook Sizing Chart (below).
- Once a hook was identified, location on the body where hooks were embedded and mortality of the entanglement were calculated.



Sabiki Rig Hooks

Octopus Hooks

-Saltwater, typically fished off boat, jetties, piers
 -Mackerel, herring, smelt
 -6-10 hooks, inches apart
 -28% Mortality Rate, 60% embedded in flippers

- Saltwater/Freshwater, but common for bass fishing
 -Live bait fishing
 -Known for durability and strength
 -70% Mortality Rate, 56% embedded in mouth or esophagus

RESULTS

	CSL	ES	HS	NFS	GFS	Total
Crab Pot Gear	5	1	0	0	0	6
Fishing Hook, Lure or Line Combination	198	4	15	3	1	221
Monofilament Netting	172	4	4	1	3	184
Nylon Netting	13	2	0	1	4	20
Entanglement Scar (unknown source)	18	2	2	0	1	23
Packing strap	16	22	0	0	0	33

Figure 3. Fisheries Gear Categories, All Species 1975-2013

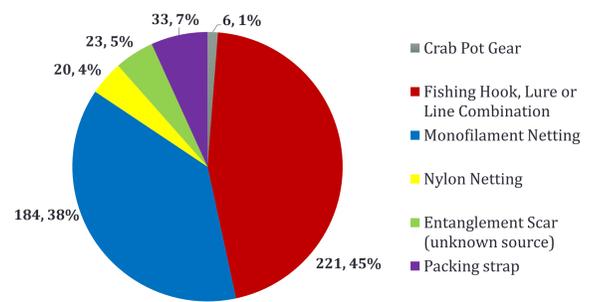


Table 1 and Figure 3 above show frequency of gear type and the species affected. The most common entanglement seen for California sea lions are fishing hook (n=198) or monofilament line (n=172), while packing straps are most common for elephant seals (n=22). Figure 4 and 5 below show the frequency of hook type seen, Sabiki and octopus being the most common hook seen, with many of the hooks being freshwater use. The most prevalent monofilament netting entanglement was green, 80 lb test, .9mm diameter, and 10.5 cm x 10.5 cm mesh.

Figure 4. Hook Type

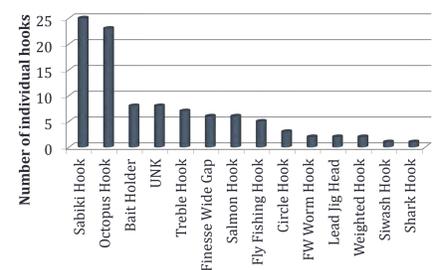
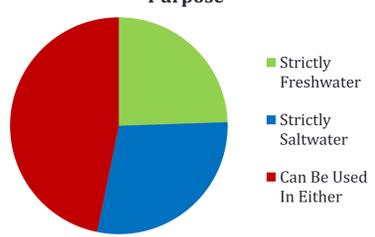


Figure 5. Hook Water Type and Purpose



CONCLUSIONS

- Prevalence of entanglements were centered in Monterey Bay and many strands were near freshwater river inlets or major haul outs (i.e. San Lorenzo River, Salinas River, Monterey Harbor, Santa Cruz Harbor)
- Promoting Circle hooks vs. Octopus hooks – circle hooks reduce mortality for fish and ingestion for pinnipeds (Prince et al 2002)
- Photography Campaigns and Public Outreach



TMMC's education program promotes simple solutions for the general public such as responsible disposal of trash, i.e. cutting packing straps or bands. Previous efforts to expose imagery of entangled animals proved effective in reducing marine debris.

REFERENCES

Hanni, K.D., & Pyle, P. (2000). Entanglement of pinnipeds in synthetic materials at south-east Farallon Island, California, 1976-1998. *Marine Pollution Bulletin*, 40 (12), 1076-1081.

Harcourt, R., Aurioles, D. & Sanchez, J. (1994) Entanglement of California sea lions at Los Islotes, Baja California Sur, Mexico. *Marine Mammal Science*, 10, 122-125.

Prince ED, Ortiz M, Venizelos A. 2002. A comparison of circle hook and "J" hook performance in recreational catch-and-release fisheries for billfish. *American Fisheries Society Symposium* 30:66-79.

Stewart, B.S., & Yochem, P.K. (1987) Entanglement of pinnipeds in synthetic debris and fishing net and line fragments at San Nicolas and San Miguel Islands, California, 1978-1986. *Marine Pollution Bulletin*, 18, 336-339.

Zavala-Gonzalez, A. & Mellink, E. (1997) Entanglement of California sea lions, *Zalophus californianus californianus*, in fishing gear in the central-northern part of the Gulf of California, Mexico. *Fishery Bulletin*, 95, 180-184.

NOAA. (2012a). Marine Mammal Entanglement: Pinniped. Retrieved 21 April 2014 from <http://www.fakr.noaa.gov/protectedresources/entanglement/whales.htm>