

Lose the loop: Entanglements of Steller sea lions, *Eumetopias jubatus*, in marine debris



Oregon State UNIVERSITY Marine Mammal Institute



Kimberly L. Raum-Suryan^{1,4}, Lauri A. Jemison², Kenneth W. Pitcher³

¹Marine Mammal Institute, Hatfield Marine Science Center, 2030 SE Marine Science Dr., Newport, OR 97365; kim.raum-suryan@oregonstate.edu

²Alaska Dept. of Fish and Game, Division of Wildlife Conservation, Box 110024, Juneau, AK 99811; lauri.jemison@alaska.gov

³Alaska Dept. of Fish and Game, Division of Wildlife Conservation, 525 W. 67th Ave., Anchorage, AK 99518

⁴Sea Gypsy Research, 928 NW Cottage St., Newport, Oregon 97365

ABSTRACT*

Entanglement in marine debris is a contributing factor in Steller sea lion (SSL; *Eumetopias jubatus*) injury and mortality. Surveys of SSL haul-outs were conducted from 2000-2007 in Southeast Alaska and northern British Columbia. Objectives were to 1) determine sources of marine debris entangling or ingested by SSLs; 2) estimate the incidence of SSL entanglement and gear ingestion; 3) Determine if the incidence of SSL entanglement or ingestion varies by age or sex; and 4) estimate population level effects. We recorded 386 individuals as being either entangled in marine debris or having ingested fishing gear. We documented 48.5% (n = 190) of SSLs with entangling debris around their necks, while 50% (n = 194) had interacted with sport or commercial fisheries and had ingested fishing gear. Packing bands were the most common neck entangling material (55%), followed by rubber bands (30%), rope (7%), net (7%), and monofilament line (2%). Ingested fishing gear included salmon fishery flashers (lures; 80%), longline gear (12%), hook and line (4%), spinners/spoons (2%), and bait hooks (2%). Entanglement incidence was 0.26% (SD = 0.0064, n = 69 sites). Juveniles were the most frequently entangled age class (28%), followed by adult females (24%), adult males (19%) and subadult males (17%). These results highlight the importance of continued documentation of SSL entanglements to fully assess the impact of marine debris on the vital rates and population trends of SSLs in the North Pacific. Incentives should be made to the fishing industry to implement simple solutions that could decrease entanglement incidence, particularly regarding plastic packing bands and rubber bands. "Lose the Loop!" Simple procedures such as cutting entangling loops of synthetic material and eliminating the use of packing bands can prevent entanglements.

THE PROBLEM: ENTANGLED STELLER SEA LIONS

OBJECTIVES

1. Determine sources of marine debris entangling or ingested by Steller sea lions (SSLs)
2. Estimate the incidence of SSL entanglement and gear ingestion
3. Determine if the incidence of SSL entanglement or ingestion varies by age or sex

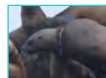


METHODS

Entanglement data were collected by boat or shore at haul-outs and rookeries in Southeast Alaska and northern British Columbia from 2000-2007. Data collected included: Date, location, count, sex, age class, behavior, entanglement type, and entanglement material.

SOURCES OF NECK ENTANGLEMENTS

• **PACKING BANDS:** containers/boxes/bait boxes



• **RUBBER BANDS:** Sport and commercial crab pot gear/fisher's gear



• **NET/ROPE:** Gillnetting or seining for salmon; trawlers (e.g. pollock)



• **TIRES/LOOPS OF LINE:** Garbage/items lost or discarded



Drawings by Ashley Dean, Alaska Fish and Game, Division of Commercial Fisheries, fv_ak1pg.pdf

SOURCES OF INGESTED FISHING GEAR

• **HOOK & LINE &/or FLASHER:** Sport and commercial salmon fishing (trolling, mooching)



• **GANGION (hook & line):** Commercial longliners



Drawings by Ashley Dean, Alaska Fish and Game, Division of Commercial Fisheries, fv_ak1pg.pdf

Figure 1. Sources of Steller sea lion neck entanglements and ingested fishing gear observed in Southeast Alaska and northern British Columbia.

RESULTS

- There were two main entanglement types: 1) Neck entanglements (49%; n = 190); and 2) Ingested fishing gear (50%; n = 194) (Figs. 2 & 3)
- The most common neck entanglements included plastic packing bands and rubber bands (Figs. 1 & 2)
- The most commonly ingested fishing gear (i.e., hooks) included salmon fishery flashers and longline gear (Figs. 1 & 3)
- Entanglement incidence was 0.26% (SD = 0.0064, n = 69 sites) (Fig. 4)
- Juveniles were the most frequently entangled age class, although all age classes and both sexes were affected (Fig. 5)

NECK ENTANGLEMENTS

Percentage of identifiable (44 of 190) neck entanglement materials

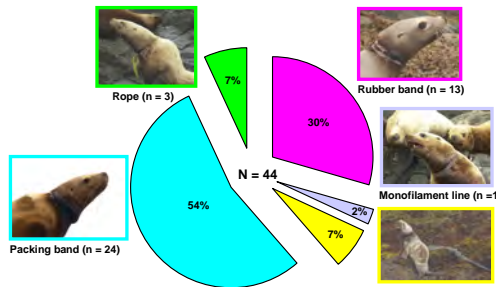


Figure 2. Percentage of identifiable (23%; n = 44) neck entanglements. Many (77%) neck entanglements were too deeply embedded to determine entangling material.

INGESTED FISHING GEAR

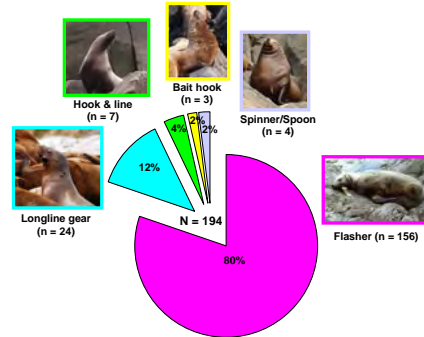


Figure 3. Percentage of Steller sea lions with ingested fishing gear (n = 194).

ENTANGLEMENT INCIDENCE

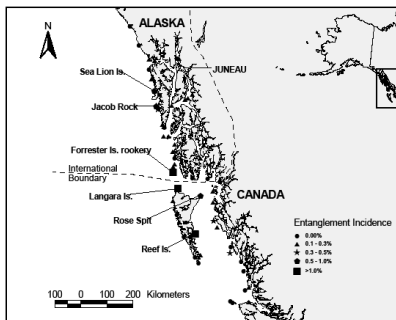


Figure 4. Map of Southeast Alaska and northern British Columbia indicating entanglement incidence by haul-out or rookery.

ENTANGLEMENTS/INGESTION BY AGE CLASS AND SEX

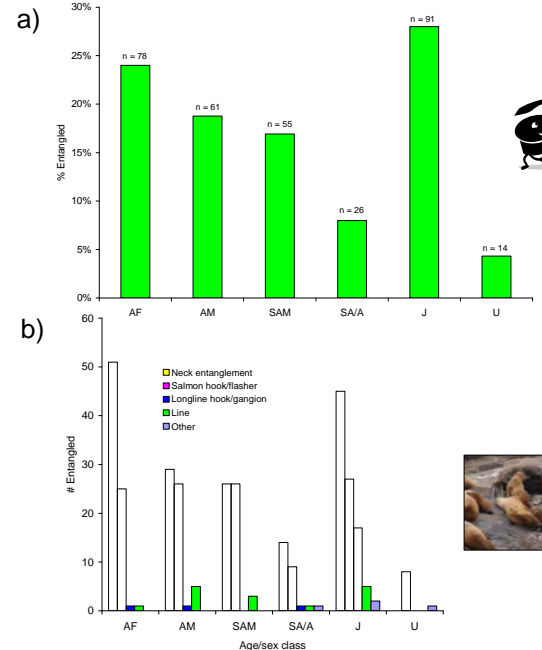


Figure 5. Percentage of SSLs with entanglements/ingested fishing gear by age class and sex (a) and number of SSLs entangled by type, age class, and sex (b) (AF = adult female, AM = adult male, SAM = subadult male, SA/A = subadult/adult, J = juvenile, U = unknown).

SOLUTIONS TO REDUCE ENTANGLEMENTS



CONCLUSIONS

- Entanglements of SSLs are a greater problem than previously recognized
- Most of the identifiable entangling/ingested debris appears to be fishery-based
- Entanglement incidence is underestimated because 1) the likelihood of observing all entangled individuals is poor; 2) sea lions may die at sea as a result of their entanglement without first being observed on land; and 3) external evidence of entanglement may not exist or may be lost over time
- Additional effort should be made to document SSL entanglements during ongoing research projects

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PAPER - *Raum-Suryan, K.L., Jemison, L.A., Pitcher, K.P. 2009. Entanglement of Steller sea lions (*Eumetopias jubatus*) in marine debris: identifying causes and finding solutions. Marine Pollution Bulletin 58:1487-1495.

***VIDEO AVAILABLE -** Entanglement of Steller sea lions (*Eumetopias jubatus*) in marine debris: identifying causes and finding solutions (Alaska Dept. Fish & Game, Sea Gypsy Research, Moore and Moore Films and Marni Productions) - an 11-minute educational video that describes how sea lions become entangled, the most common sources of entangling debris, and possible solutions - see <http://www.multimedia.adfg.alaska.gov/> or lauri.jemison@alaska.gov for DVD.