2020 Southern Sea Otter (*Enhydra lutris nereis*) Stranding Report

Prepared by Colleen Young and Mike Harris

California Department of Fish and Wildlife

Office of Spill Prevention and Response

Marine Wildlife Veterinary Care and Research Center

Santa Cruz, CA

October 2021

Executive Summary

The number and distribution of stranded southern sea otters in 2020 (n=277) were distinctly different than recent years. Monthly stranding numbers were markedly lower than the previous 3-year average (2017-2019) for all months except October and November, with the greatest disparity occurring in March. The geographic spread of strandings was also reduced in 2020 compared to the previous year. There were 4 extralimital strandings (2 to the north, 2 to the south), defined as occurring outside of the established geographic range of regularly occupied habitat. Causes of strandings (COS) were fairly consistent with recent years, though reduced necropsy resources in 2020 may have contributed to under-detection of COS that are difficult to diagnose grossly. Possible effects of the COVID-19 pandemic, wildfires, and other factors on reporting, recovery, and examination of stranded sea otters are also discussed.

Background

Stranded (live sick or injured and dead beachcast or floating) southern sea otters (*Enhydra lutris nereis*) have been systematically recorded, recovered, and examined since 1968. This effort was initiated by the California Department of Fish and Wildlife (CDFW) and has since expanded to include collaborators in the Sea Otter Stranding Network: the Monterey Bay Aquarium (MBA), The Marine Mammal Center (TMMC), and the U.S. Geological Survey (USGS), with support from other organizations. The MBA and TMMC lead rehabilitation efforts. Necropsies are conducted by CDFW and TMMC.

Reports of stranded sea otters are called in by the public, beach officials, biologists, and community science volunteers. Each report is investigated, and if confirmed to be a sea otter, is given a sequential sea otter number (SO#). Most reported stranded otters are recovered and receive a basic or detailed necropsy.

Annual and Monthly Strandings

During 2020, 277 stranded southern sea otters were confirmed, which represented a 35% decrease in strandings compared to 2019 (n=427) and 2018 (n=428) and a 40% drop compared to 2017 (n=467) and record-setting 2016 (n=474). The last time that annual strandings were below 300 was in 2009. Ninety percent (n=251/277) of the 2020 cases were recovered (unrecovered cases were verified by photographs or came from trusted sources), which is consistent with recent years.

Monthly strandings in 2020 were considerably lower for nearly every month compared to recent years and previous 3-, 5-, and 10-year averages, with March 2020 having the most substantial drop of more than 75% compared to March 2019 (Table 1).

Condition of Stranded Sea Otters

The condition of each animal is assessed at recovery. Condition codes are defined as:

Alive: moribund, injured, or abandoned.

Fresh: freshly dead; fur does not pull out easily, may or may not be in rigor.

Moderate: moderately decomposed; not in rigor, fur pulls out when tugged.

Advanced: advanced decomposition; fur sloughing or easily removed from skin, accumulation of gases in cavity and tissues (bloated), tissues liquefying, maggots likely present.

Mumm/Skel: mummified, fragmented, or skeletal remains; old dried carcass.

Unknown: condition of carcass unknown (generally because carcass was not recovered).

The most common condition of stranded sea otters in 2020 was fresh dead (30.0%, n=83), followed by advanced decomposition (28.2%, n=78), alive (17.3%, n=48), moderate decomposition (17.0%, n=47), mummified/fragmented (5.4%, n=15), and unknown (2.2%, n=6). This breakdown is very similar to 2019 and other recent years.

Sex and Age Class Composition of Stranded Sea Otters

Age class and sex is determined for each stranded sea otter, when possible. Sex is determined by genitalia, or when needed/possible, through examination of internal organs and/or pelvic morphology. Age class is determined using dentition, total length (TL), pelage, and skull characteristics and are defined as:

Pup: all or most teeth are deciduous, TL 40-90cm, natal pelage, no sagittal crest, all skull sutures open; age range 0-3 months.

Immature: some deciduous and some permanent teeth present, TL 80-105cm, all or nearly all natal pelage shed; age range 4-11 months.

Subadult: all deciduous teeth shed and little to no tooth wear evident, TL 95-115cm (females)/100-125cm (males), full adult pelage, Basioccipital-basisphenoid suture open but most other sutures closed; age range 1-3 years.

Adult: slight to obvious tooth wear, TL >105cm (females)/>115cm (males), pelt with some grizzle (typically), sutures closed, Lambdoidal and Sagittal crests developing; age range 4-9 years.

Aged Adult: severe tooth wear, TL same as adult category, pelt generally with extensive grizzle, Lambdoidal and Sagittal crests well developed; age range ≥10 years.

Unknown: age class could not be determined, generally due to missing skeletal components or because the carcass was not recovered.

In 2020, more stranded sea otters were male (56.3%, n=156) than female (33.2%, n=92; Table 2), which is common, having occurred 40 out of the last 53 years of data collection. However,

similar to 2019, 2020 also had a large percentage of cases where sex could not be determined (10.4%, n=29). This is likely a result of an increase in photographs accompanying stranding reports, which has increased species verification of cases that cannot be recovered, but rarely allows for confirmation of sex.

The composition of stranded sea otters by age class in 2020 was similar to 2019 (Table 2). There was a greater percentage of younger otters (pup, immature, and subadult; 56.3%, n=156) than adult (adult and aged adult; 38.6%, n=107) animals, which is a shift from previous years (2009-2018) when older otters accounted for more than 50% of all strandings.

Geographic Distribution of Strandings

The location of each stranded sea otter is recorded and assigned an As-The-Otter-Swims (ATOS) number. ATOS values are consecutive numbers representing geographic points every 0.5 kilometers on a smoothed 5-fathom bathymetric contour line along the coast of California. The nearest ATOS point is determined for each stranded sea otter location using ATOS maps or is calculated from GPS coordinates. This geographic reference system was initiated prior to the widespread use of GPS. Continued use of this system allows for analyses of current and historic data on comparable spatial scales.

The distribution of strandings by region was similar to 2019, with the greatest numbers occurring between Capitola and Rocky Point (Monterey County) in the north, and between Cayucos and Pt. Sal in the south (Table 3). These are the regions of the southern sea otter range with greatest public use of the coast, presumably resulting in a greater proportion of stranded animals being found and reported. Strandings were lower in 2020 than 2019 in 12 of the 15 geographic regions, with decreases ranging from 15.9-78.6%. The percentage of cases north of Cape San Martin, the historical dividing line of the range, was consistent with previous years (54.2%; Table 3).

The geographic spread of strandings was reduced during most months in 2020 compared to 2019. The majority (273/277) of strandings occurred within the established southern sea otter range in 2020 (Fig. 1), with 4 extralimital strandings, 2 to the north of the established range, and 2 to the south (Table 4). Two of the extralimital animals were males; sex of the other 2 could not be determined.

Cause of Strandings

Cause of stranding (COS) is determined by conducting a necropsy (animal autopsy). These COS data are preliminary and subject to change as necropsy investigations are finalized. Here, only primary COS is reported, though many otters have one or multiple contributing COS. Contributing COS are important to consider for detailed sea otter health and population analyses but are beyond the scope of this report. Some COS may be under-represented in this report because diagnosis requires histopathology and/or testing, which are in progress, and

because necropsy and histopathology effort was reduced in 2020 due to COVID-related staffing shortages and safety precautions. During 2020, 10 animals received a full diagnostic necropsy, 4 received detailed postmortem examinations with limited sampling, and the remaining 237 recovered animals received brief external and/or internal field-level examinations. Causes of strandings are grouped into the following categories for this summary:

Unknown: primary COS and presence/absence of trauma could not be determined, usually due to severity of decomposition, scavenging, or because the carcass was not recovered. This category includes dead dependent pups observed with their mothers.

Unknown, with trauma: primary COS could not be determined, but some form of trauma was evident (this includes lacerations of unknown origin and dependent pups with trauma).

Unknown, no trauma: primary COS could not be determined, but no trauma was evident (and carcass condition was suitable to determine presence of trauma).

Shark bite: primary COS was suspected or confirmed shark bite (as indicated by multiple stab-like wounds, shark tooth fragments, or diagnostic white shark tooth scratch patterns on bones).

Anthropogenic: primary COS was confirmed or suspected to be directly human-related such as gunshot, fishing line entanglement, boat strike, net- or trap-drowned, research-related, or oil spill-related.

Dependent animal: primary COS for pups and smaller immature otters (TL<95cm) for which maternal separation is the most likely COS (no trauma or other apparent COS).

Misc: primary COS does not fall into other categories (shark bite, dependent animal); COS in this category include conditions such as acanthocephalan peritonitis, end lactation syndrome, mating trauma, intraspecific fight trauma, cardiomyopathy, domoic acid toxicosis, toxoplasmosis, sarcosystosis, coccidioidomycosis, gastric torsion, and natural seep oiling (source confirmed or suspected).

Shark bite continued to be the most common primary COS in 2020 (35.7%, n=99/277; Fig. 2). Of the immature and older age classes from which the presence/absence of trauma could be discerned, and the source of trauma identified, 67.3% (n=99/147) of the cases stranded with shark bite wounds. The next most common stranding category was unknown (29.2%, n=81/277), then dependent animals (14.8%, n=41/277). Additional COS findings are summarized in Fig. 2.

Discussion

The cause of the decrease in reported sea otter strandings during 2020 may have been caused by a myriad of factors including the COVID-19 pandemic, wildfires and poor air quality, a decrease in the number of stranded sea otters, and/or other unidentified reasons. The effect of the COVID-19 pandemic and subsequent shelter in place/stay at home orders in California on

sea otter stranding reports is difficult to measure. For example, some counties enacted beach closures, which limited public access, but at the same time beach officials were conducting routine patrols and reported and facilitated collection of stranded sea otters. As the year progressed, beach visitation returned to or exceeded normal levels as the public increased outdoor activities; however, many flocking to outdoor spaces were first-time visitors, likely unaware of stranded sea otter reporting guidelines. Conversely, many State Parks and CDFW employees, beach officials, and snowy plover monitors, who routinely report stranded sea otters, continued their work at normal or near-normal levels in 2020. Stranding numbers at those beaches decreased by similar proportions in 2020 to those beaches with an unknown level of search effort. Systematic beach surveys conducted by BeachCOMBERS and BeachWatch volunteers were variable throughout the year, with many canceled surveys due to COVID-19. An additional factor that affected beach access, and likely affected systematic surveys and reporting by the general public, were the unprecedented wildfires and resulting poor air quality that started in August and persisted into October. It is also unknown whether possible changes in human disturbance to sea otters in 2020 affected sea otter survival. Overall, it is unclear to what extent the decline in reported strandings in 2020 is attributable to the COVID-19 pandemic, wildfires, and other factors and to what extent the number of strandings may have actually declined.

Acknowledgements

The continued monitoring of sea otter stranding and mortality patterns in California is only possible due to the commitment and dedication of the staff and volunteers of the stranding network partner organizations. Special thanks to TMMC for conducting additional necropsies in 2020. Continued thanks to staff and volunteers at CDFW, our core partners at the Monterey Bay Aquarium, and the staff and volunteers from TMMC. We would also like to acknowledge the contributions of personnel from the Channel Islands Marine & Wildlife Institute, California State Parks, Point Blue Conservation Science, Elkhorn Slough National Estuarine Research Reserve, The Nature Conservancy–Dangermond Preserve, Vandenberg Air Force Base, Harbor Patrol/Harbor Districts of Santa Cruz, Moss Landing, Monterey, Morro Bay, and Port San Luis, BeachCOMBERS, BeachWatch, PG&E-Diablo Canyon, Tenera Environmental, California Academy of Sciences, UC Santa Cruz, Moss Landing Marine Labs, other members of the NOAA Marine Mammal Health and Stranding Response network, Sea Otter Savvy, the U.S. Geological Survey, the U.S. Fish and Wildlife Service, and other organizations that contribute to this effort. We would also like to thank the general public for reporting stranded sea otters in California, and to California taxpayers for supporting research and conservation efforts by donating to the California Sea Otter Voluntary Tax Contribution Fund.

Data Availability and Use

Southern sea otter stranding data and stranding summaries from 2019 onward can be downloaded here. The downloadable Excel data file includes a tab of metadata explaining the

data fields. Please read the metadata carefully to understand the limitations of these data. Note that cause of stranding category assignment is based on assessment at gross necropsy and may change after microscopic examination or other tests are completed. In many cases animals have multiple factors that contribute to the cause of stranding; here only the primary cause of stranding category, as determined during gross necropsy, is reported.

Users of this dataset should contact CDFW if they have any questions or prior to any use of these data in scientific studies. Information on causes of mortality from detailed necropsies conducted at the MWVCRC can be found on our Sea Otter Necropsy Program page. General information on sea otters stranding in California prior to 2019 can be found at the USGS sea otter stranding page.

Table 1. Monthly number of stranded southern sea otters for 2020 (bottom row), with 2017-2019 data and 3-, 5-, and 10-year averages for comparison. The total number of strandings also is expressed as a percentage of the spring count and the population index (3-year average), which are available at https://pubs.usgs.gov/ds/1118/ds1118.pdf, for years that a count was conducted (there was no count in 2020). Bolded numbers indicate highest recorded values (1968-2020).

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	% of spring count	% of spring 3-yr avg
Highest recorded	**38**	**51**	**68**	**63**	**58**	**49**	**63**	**54**	**55**	**42**	**29**	**29**	**474**	**17.4**	**14.7**
10 yr avg (2010-2019)	25.7	32.9	41.4	38.0	38.4	29.7	37.7	37.1	37.2	30.3	21.8	21.3	391.5	12.9	13.1
5 yr avg (2015-2019)	25.2	37.6	47.2	45.0	51.4	38.2	46.2	40.8	34.2	27.2	22.4	20.4	435.8	13.8	14.0
3 yr avg (2017-2019)	28.7	42.3	53.7	50.3	55.3	42.3	40.7	35.7	31.3	20.3	22.7	17.3	440.7	14.9	14.3
2017	34	43	52	46	**58**	41	46	48	33	21	26	19	467	**17.4**	**14.7**
2018	22	33	41	46	52	**49**	51	33	30	24	27	20	428	13.9	13.7
2019	30	**51**	**68**	59	56	37	25	26	31	16	15	13	427	13.7	14.4
2020	23	24	16	33	44	29	25	18	13	17	23	12	277	n/a	n/a

Table 2. Age class and sex of stranded southern sea otters in 2020. 2019 and 2018 data are provided for reference. F=female, M=male, Unk=unknown. PUP=pup (estimated age 0-3 months), IMM=immature (estimated age 4-11 months), SUBAD=subadult (estimated age 1-3 years), ADULT=adult (estimated age 4-9 years), AGED AD.=aged adult (estimated age ≥10 years), UNK=unknown.

	2020					2019					2018				
Age Class	**F**	**M**	**Unk**	**Total**	**% of Total**	**F**	**M**	**Unk**	**Total**	**% of Total**	**F**	**M**	**Unk**	**Total**	**% of Total**
PUP	13	23	8	44	15.9	36	28	5	69	16.2	24	27	8	59	13.8
IMM	11	40	2	53	19.1	33	35	3	71	16.6	30	38	1	69	16.1
SUBAD	14	42	3	59	21.3	44	68	4	116	27.2	24	61	4	89	20.8
ADULT	44	46	4	94	33.9	71	46	6	123	28.8	83	92	6	181	42.3
AGED AD.	8	4	1	13	4.7	16	3	1	20	4.7	9	9	0	18	4.2
UNK	2	1	11	14	5.1	2	3	23	28	6.6	0	2	10	12	2.8
Total	**92**	**156**	**29**	**277**		**201**	**183**	**43**	**427**		**170**	**229**	**29**	**428**	

Table 3. Number of stranded southern sea otters by month and geographic area in 2020 (bold numbers). Totals are provided for 2018 and 2019 for comparison. The shaded area of the table represents the areas north of Cape San Martin, the historical north-south dividing line of the sea otter range.

	Month														
Geographic Region	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**2020 Total**	**2019 Total**	**2018 Total**
N of Pt. Año Nuevo	0	0	1	0	1	1	1	2	0	0	0	1	**7**	10	13
Año Nuevo - Capitola	2	1	1	2	2	0	4	3	3	4	2	1	**25**	25	18
Capitola - Moss Landing	1	1	2	4	5	3	1	1	0	1	0	2	**21**	42	34
Moss Landing - Monterey Wharf #2	6	6	3	5	2	8	3	1	1	1	2	1	**39**	71	66
Monterey Wharf # 2 - Cypress Pt.	6	6	2	0	3	2	6	2	2	3	3	2	**37**	44	28
Cypress Pt. - Rocky Pt.	0	0	1	3	5	1	3	0	2	0	2	0	**17**	35	32
Rocky Pt. - Salmon Creek	0	2	0	0	0	1	0	1	0	0	0	0	**4**	7	2
Salmon Creek - Cambria	4	1	0	0	2	1	0	1	0	0	5	3	**17**	26	22
Cambria - Cayucos	0	0	0	1	1	0	0	0	0	1	3	0	**6**	13	8
Cayucos - Hazard Canyon	1	5	3	7	7	3	2	2	2	1	3	1	**37**	60	77
Haz. Canyon - Pismo Pier	2	1	1	7	6	4	3	2	1	2	3	1	**33**	37	50
Pismo Pier - Pt. Sal	1	1	2	4	9	5	2	3	1	1	0	0	**29**	40	66
Pt. Sal - Pt. Conception	0	0	0	0	0	0	0	0	1	2	0	0	**3**	14	10
SE of Pt. Conception	0	0	0	0	1	0	0	0	0	1	0	0	**2**	2	2
San Nicolas Island	0	0	0	0	0	0	0	0	0	0	0	0	**0**	1	0
Total	**23**	**24**	**16**	**33**	**44**	**29**	**25**	**18**	**13**	**17**	**23**	**12**	**277**	**427**	**428**
% North of Cape San Martin (shaded)	65.2	66.7	62.5	42.4	40.9	55.2	72.0	55.6	61.5	52.9	39.1	58.3	**54.2**	54.8	45.1

Table 4. Extralimital sea otter strandings during 2020. ATOS values less than 162 indicate northern extralimitals (n=2) and ATOS values greater than 1154 indicate southern extralimitals (n=2). Range boundaries are based on the 2019 census because no census was conducted in 2020. ATOS values are consecutive numbers representing geographic points every 0.5 kilometers on a smoothed 5 fathom line along the coast of California. M=male, U=unknown.

SO#	Date	County	ATOS	Condition	Sex	Age Class	Primary Cause of Stranding
9683-20	17-May-20	SANTA BARBARA	1215	MUMMIFIED/SKELETAL	U	ADULT	UNKNOWN
9696-20	29-May-20	SAN MATEO	156	ALIVE	M	ADULT	SHARK BITE
9725-20	25-Jun-20	MARIN	-46	MUMMIFIED/SKELETAL	U	SUBADULT	UNKNOWN
9793-20	18-Oct-20	SANTA BARBARA	1176	ADVANCED DECOMPOSITION	M	UNKNOWN	UNKNOWN

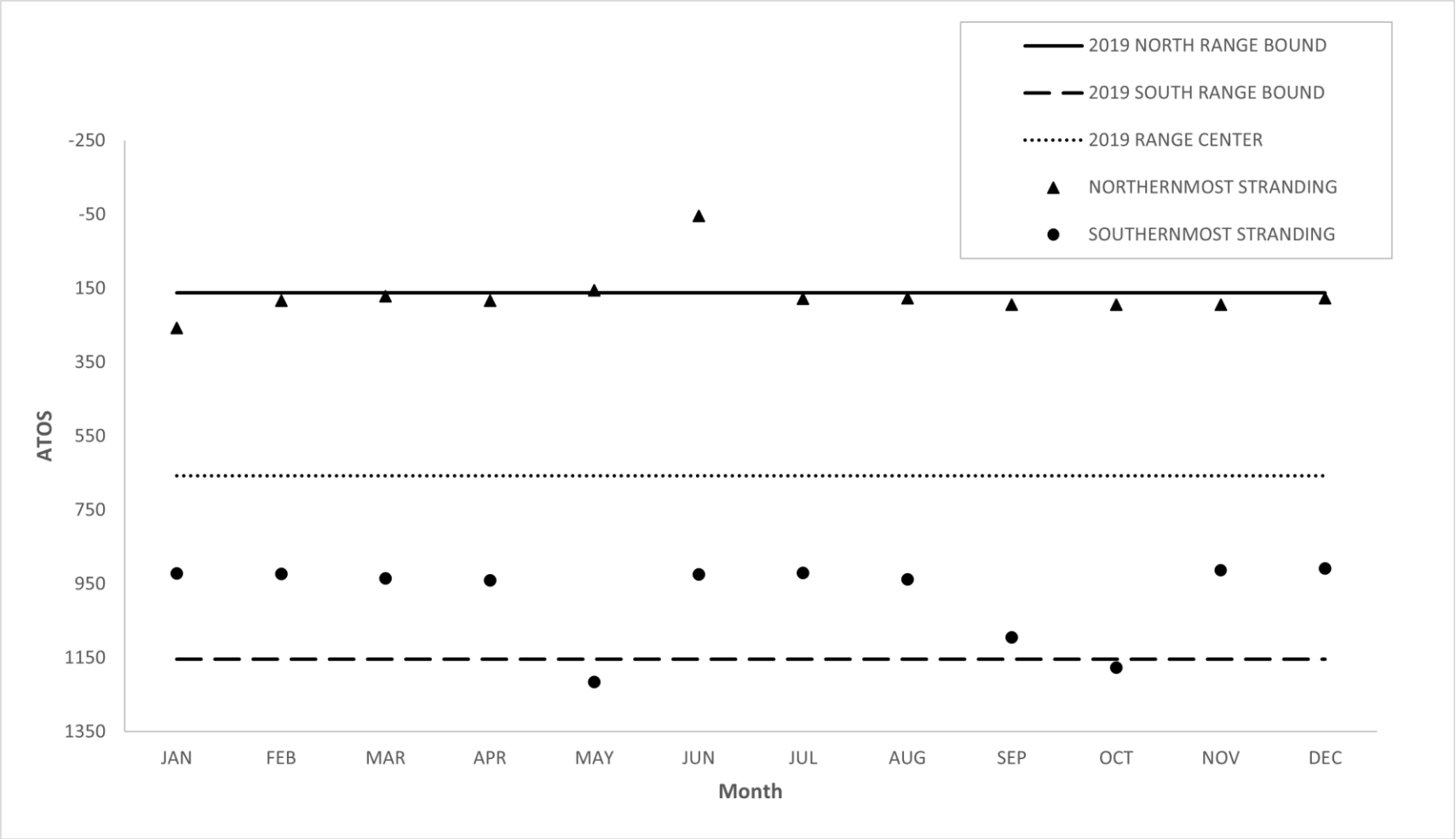

Figure 1. Monthly geographic spread of southern sea otter strandings during 2020, represented by the northernmost (triangle) and southernmost (circle) ATOS point for each month. ATOS values are consecutive numbers representing geographic points every 0.5 kilometers on a smoothed 5 fathom line along the coast of California. The official 2019 sea otter northern range boundary (ATOS 162; solid line), southern range boundary (ATOS 1154; dashed line), and the range center (ATOS 658; dotted line) are plotted for reference. No survey was conducted in 2020, so 2019 range boundary data were used. Range data were provided by USGS.

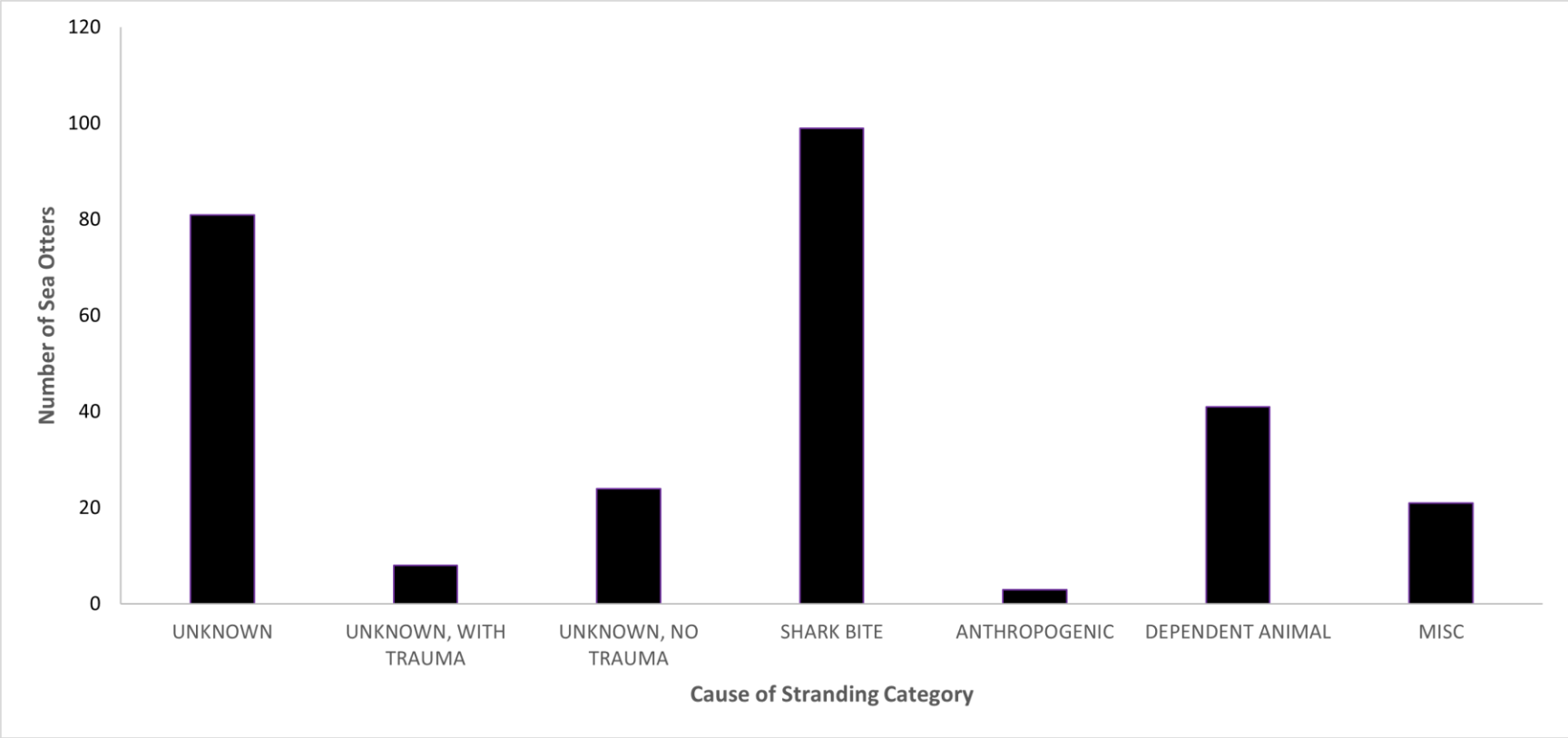

Figure 2. Primary causes of stranding (COS) of southern sea otters during 2020 (n=277). These data are preliminary and subject to change as cases are finalized. Cases coded with a suspect or pending qualifier are included with confirmed cases. Cases are grouped by related COS; categories are defined in the main text of this report. In many cases more than one health condition contributed to stranding. Here only the primary cause is represented.