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Virginia Sea Turtle & Marine Mammal Stranding Network 2021 Grant Report

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Virginia Sea Turtle and Marine Mammal Stranding Network 2021 Grant Report

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The mission of the Virginia Aquarium & Marine Science Center is to inspire conservation of the marine environment through education, research and sustainable practices. The Aquarium is operated by the City of Virginia Beach in cooperation with the Virginia Aquarium Foundation (VAQF).

The Virginia Aquarium Research & Conservation Section is responsible for directing the organization's efforts in these areas. With primary support from the VAQF, the Section's Stranding Response Program is dedicated to conservation of marine animal species through stranding response, research, rehabilitation and education.

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Introduction

All marine mammals and sea turtles are designated as protected species by the Marine Mammal Protection Act (1972) and/or the Endangered Species Act (1973). The Virginia Aquarium & Marine Science Center Stranding Response Program (VAQS) holds permits from state and federal authorities for all activities in this report related to marine mammal and sea turtle stranding response and research. VAQS has been responding to marine mammal and sea turtle strandings (more than 9,750) in Virginia since 1987. The Aquarium and the Darden Marine Animal Conservation Center are located in Virginia Beach, VA. VAQS responds to all marine mammal strandings in Virginia and currently maintains the state marine mammal stranding database. In addition, VAQS and their cooperators coordinate the Virginia Sea Turtle Stranding and Salvage Network throughout Virginia. All sea turtle stranding data are recorded by VAQS into the state sea turtle stranding database. For the purposes of this report, VAQS uses the following definition: *Sometimes marine animals wash ashore sick, injured or dead. At other times, they become entrapped or entangled and are unable to return to their natural habitats without assistance. These events are known as Strandings*.

VAQS uses staff, volunteers and cooperating organizations to report, record, document, recover, examine and/or rehabilitate stranded animals. The organization and training of primary response cooperators is crucial to the stranding network. Rapid response to strandings can result in the rescue of live animals and the collection of valuable data from dead animals that may otherwise be lost due to decomposition and/or scavenging. Formed in 1991, the VAQS Stranding Response Team (Team) is composed of staff and volunteers trained to respond to stranded animals. VAQS staff provides training programs for approximately 50 Team volunteers and personnel from cooperating agencies and organizations. Instruction in biology, ecology and both live and dead stranding response protocols are provided for marine mammal and sea turtle species found in Virginia. These cooperative training efforts have included the U.S. Coast Guard, U.S. Fish and Wildlife Service (USFWS), NOAA Fisheries Service (NMFS), The Nature Conservancy, Virginia Marine Resources Commission, Virginia Department of Game and Inland Fisheries (VDGIF), Virginia Institute of Marine Science (VIMS), state parks, national wildlife refuges, regional law enforcement authorities and lifeguards. As a result of these long-standing efforts, VAQS continues to maintain and improve statewide marine animal stranding response networks.

Marine mammal groups and species found in Virginia include cetaceans (dolphins, porpoises and whales), pinnipeds (seals) and sirenians (manatees) (Appendix V: Virginia Species Lists). Marine mammal strandings occur in all months of the year. During the 1990s, Virginia averaged 63 marine mammal strandings per year with a high of 106 in 1994. Since then, stranding numbers have increased dramatically. For the years 2000-2012, Virginia averaged 100

marine mammal strandings per year. This could represent increasing marine mammal mortality, though it also may partially be the result of an improved state-wide stranding response network. The years since 2012 have continued with high numbers of marine mammal strandings in Virginia, including the historic total from 2013 (427 strandings) that included a bottlenose dolphin unusual mortality event (UME), and an annual average of 96 strandings for 2014-2021 (Figure 1).

It is important for organizations such as VAQS to examine stranded marine mammals because these species are very challenging to study in the wild. Stranding trends, including probable causes of marine mammal mortalities, are monitored through stranding records. Little is known about the natural history of many marine mammal species and strandings provide a rare opportunity to thoroughly examine these animals. With the advent of new techniques such as molecular genetic analyses, stranded animals provide a wealth of information about wild populations that are difficult and very costly to study *in situ*. In some species, such as pygmy/dwarf sperm whales and beaked whales, data collected from stranded animals often provides the best and only information available on the species' natural history. Stranding records can represent viable measures of the biological diversity and the spatial and temporal changes that are occurring in adjacent waters, especially when long-term datasets are developed and maintained (Pyenson 2010; Pyenson 2011; Pikesley *et al* 2012). In addition, stranding data can indicate seasonal trends in presence and suggest areas of high concentration of marine mammal species such as bottlenose dolphins and harbor porpoises (Read and Murray, 2000). Spatial and temporal trends in marine mammal mortalities, such as those caused by unusual mortality events and/or fisheries interactions, can also be monitored from stranding records. Each stranded marine mammal is thoroughly examined, whenever possible, including body measurements, external appearance and internal condition (via necropsy). Data and tissues are collected for life history, histology, bacteriology, virology and toxicology studies. Samples are collected by VAQS and have been supplied to the Smithsonian Institution, Armed Forces Institute of Pathology, NMFS, and numerous other research organizations.

In addition to dead strandings, the VAQS Team responds to live marine mammals each year. The level of response depends on the type of animal. Sick or injured baleen whales and toothed whales larger than eight feet in length are virtually impossible for VAQS to rescue and often must be humanely euthanized. Some smaller cetaceans can be relocated and released or rescued if found quickly and in suitable condition. They must be supported in water as soon as possible and treated for shock. Successful cetacean rehabilitation requires large tanks, experienced personnel and access to sophisticated equipment. VAQS is not equipped to conduct long-term rehabilitation of a cetacean. As soon as possible, animals that are good candidates for rehabilitation are transferred to other qualified facilities. Pinnipeds (seals), on the other hand, are amphibious animals and can be transported in dry containers such as

canine kennels. The VAQS Darden Marine Animal Conservation Center has a seal triage room for short-term stabilization of a seal, and a seal rehabilitation room with deep in-ground pool and raised haul-out area capable of long term holding of one adult pinniped. Both the seal triage and rehab rooms are currently being completed and should be ready for federal inspection and use prior to the fall 2022-winter 2023 season. The VAQS Team also responds to live marine mammal emergencies in neighboring states. The most recent example was August 2021 when NOAA requested VAQS respond to Delaware to lead the humane euthanasia and postmortem examination of an endangered fin whale.

Five species of sea turtles (loggerhead, Kemp's ridley, leatherback, green, and hawksbill) have been recorded in Virginia (Appendix V: Virginia Species Lists). Sea turtle strandings occur primarily in the late spring, summer and fall. The VAQS Team responded to an average of 86 sea turtle strandings per year during the 1990s. Since then, strandings have increased dramatically. Since 2000, Virginia has recorded approximately 6,000 live and dead sea turtle strandings, with an average of 255 per year for the last ten years.

Sea turtles are examined in much the same way as marine mammals. Data are recorded for all strandings, and necropsies are performed on many stranded carcasses. Sea turtle stranding trends, including probable causes of mortalities, are monitored through stranding records. Stranded sea turtles are checked for flipper and PIT tags and results are reported to NMFS. A small number of sea turtles nest on Virginia beaches each year, primarily loggerheads, though several green and Kemp's ridley sea turtles have been recorded nesting recently in Virginia. The VAQS Team participates in a nesting beach monitoring program in Virginia Beach with the USFWS, Back Bay National Wildlife Refuge, and VDGIF. Live strandings of sea turtles have also increased and the VAQS Team has successfully rehabilitated and released many of the stranded turtles. In recent years, VAQS developed the Virginia Pier Partner Program to better respond to the large numbers of sea turtles that are incidentally caught by pier anglers each year. This program has been very successful in promoting safe handling, recovery and rehabilitation of hooked sea turtles and providing outreach to anglers and pier owners about proper hooked sea turtle response techniques. The program has also allowed for the collection of data on fishing practices that are associated with hooked sea turtles. As a result of its success, other stranding network organizations in the region are contacting VAQS to learn more about the program. From 2000-2012, an average of 11.5 live sea turtle strandings were recorded in Virginia each year. Since that time and the development of the Pier Partner Program, Virginia has averaged 61 live strandings per year, with a peak of 92 live sea turtle strandings in 2017. In addition, VAQS Team expertise in sea turtle rehabilitation has resulted in many turtles (more than 65) that have stranded outside Virginia being transferred to VAQS for rehabilitation and release. In 2021, 61 sea turtles stranded alive in VA and were reported to VAQS, which was almost double the reported live strandings of the previous year (n=34). Of

those, 12 are currently in rehabilitation, 16 were not able to be recovered, eight died in rehabilitation, and 25 were successfully rehabilitated and released. Two additional turtles rescued in 2020 were successfully released in 2021. Fourteen of the sixteen live turtles unable to be recovered were hooked turtles that either broke the fishing line or were released by the fisher who hooked them.

In addition to stranding response, VAQS conducts research on marine mammals and sea turtles. Photo-identification is a non-invasive technique that takes advantage of naturally occurring marks on animals. Photo-ID is used to study both bottlenose dolphins and large whales, primarily humpback whales, in the nearshore waters of Virginia and North Carolina. VAQS has also been conducting research on loggerhead sea turtles since 1990. Early research involved the study of growth potentials of loggerhead hatchlings in *ex-situ* controlled environments. Post-release satellite tracking of young, aquarium-reared loggerheads was initially conducted with the help of VIMS in the 1990s and continues today under the guidance of Aquarium staff and other research collaborators. Growth and nutritional studies continue with hatchling loggerheads and non-releasable loggerhead, Kemp's ridley and green sea turtles. With the support of additional grants and donations in recent years, VAQS has been able to conduct numerous satellite and acoustic tagging projects with yearling loggerheads and rehabilitated sea turtles.

VAQS Team staff and volunteers present the results of their research at national and regional workshops, at professional meetings, and in numerous publications (Appendix I: Professional and Education Activities). In addition, VAQS research has been presented to more than 16 million people through innovative Aquarium exhibits and public programs. In 2015, a major new exhibit area, *Stranded*, devoted to the stranding response program opened at the Aquarium. Staff and volunteers present educational programs for the public related to stranding events and provide outreach on response and research throughout the year during active stranding response efforts. On a continual basis, staff provide training/assistance and gain valuable experience in live animal rehabilitation and response by cross-training and working with staff at other stranding network facilities. VAQS staff also serves on federal management and scientific teams studying the interactions of protected species with commercial fisheries and other potentially threatening human activities. They regularly use their expertise and data to comment on projects that may have an impact on regional marine mammal and sea turtle populations, including a proposed naval undersea training range off Virginia's eastern shore, the potential to open mid-Atlantic areas to offshore oil and gas drilling, and offshore wind energy development. Virginia stranding data was included in the mid-Atlantic Ocean data portal developed to support the Mid-Atlantic Ocean Action Plan. Finally, public and private organizations conducting natural resource surveys and environmental

assessments routinely utilize the VAQS stranding database and expertise for information regarding protected species in Virginia.

Stranding Response Methods

When examining dead stranded marine mammals and sea turtles, the VAQS Team follows data collection protocols developed by NMFS (Appendix IV: Stranding Network Datasheets) and by VAQS staff. For marine mammals, Level A data are collected on all strandings and recorded in the marine mammal stranding database. Level A data include:

- observer
- date
- location
- species
- total body length
- gender
- condition
- weight
- findings of human interaction *
- sample collection and dissemination
- disposition of carcass

(* Findings of human interaction consist of clues on a carcass that the animal had previously interacted with humans or human activities, sometimes resulting in injuries and/or the death of the animal. The most common types of human interactions are fishery entanglements, vessel strikes, and marine debris ingestion. Special data collection protocols and forms have been developed by VAQS for assessing human interactions in marine mammal and sea turtle strandings).

Level B and C data are collected from fresh to moderately decomposed carcasses. Level B and C data are recorded on specialized data sheets and are often shared with other collaborating research organizations. These more involved data can include:

- age
- extensive body measurements
- descriptions and photographs of external & internal appearance
- parasite and pathology occurrence
- stomach contents
- reproductive status
- genetic information

- tissue contaminant levels
- information for specific research

In order to provide timely, accurate, and usable information, VAQS compiles these data in a relational database. The computer system, database, and software allow for analytical study of the data, including GIS mapping. When combined with the extensive VAQS photo and video catalogs, the long-term marine mammal stranding database can be an invaluable tool for scientists, natural resource managers, and other state and federal agencies.

Sea turtle data are collected in much the same manner as for marine mammals (Appendix IV: Stranding Network Datasheets). In addition to the Level A, B, and C data listed above, the VAQS Team also examines sea turtle carcasses for several types of tags. PIT tags and wire tags require specialized equipment in order to be detected. Fresh to moderately decomposed turtles are examined for stomach contents, gender, and findings of human interaction.

Live marine mammals and sea turtles have become an increasing part of stranding response for the VAQS Team. Live stranding response is quite different from responding to dead animals. While time is important when responding to a fresh dead stranding, timely response is crucial to the welfare and survivability of live stranded animals. Once a live stranding is confirmed, staff and volunteers respond as quickly as possible. Cooperating agencies, especially on Virginia's eastern shore, have immensely improved the VAQS Team's ability to efficiently respond to live strandings. Whenever possible, live stranded animals that are candidates for rehabilitation are brought to the Darden Marine Animal Conservation Center where they are immediately treated for life-threatening conditions. VAQS veterinary staff and live animal care personnel have developed protocols and data sheets for live animal response and rehabilitation. VAQS staff have established an excellent working relationship with medical diagnostic service companies and with local vet clinics that provide valuable support services in the form of blood and sample analyses, diagnostic imaging, and supplies of less common drugs. In addition, the medical team works with several specialized veterinarians and technicians, including eye specialists and advanced diagnostic technicians, on special cases.

VAQS' sea turtle rehabilitation experience has been put into action on many occasions, including during response to the BP Deepwater Horizon Oil Spill in the Gulf of Mexico in 2010 and the mass cold-stun events in the northeast since 2014. VAQS staff were deployed over a total period of more than six weeks to assist sea turtle recovery and rehabilitation efforts in Louisiana and Florida from the oil spill, and for more than six weeks in Massachusetts for the 2014-15 event. In 2016, trained staff were deployed to southern California to assist with the ongoing issue of large numbers of stranded, juvenile California sea lions. In spring of 2019, VAQS staff were requested by The Marine Mammal Center in Sausalito, CA, to assist with a

prolonged sea lion mortality event. VAQS staff deployed to CA and provided their expertise for two weeks.

Discussion of 2021 Stranding Data

Marine Mammals

A total of 77 marine mammal strandings were recorded during 2021 (Table 1). In the past ten years, the number of marine mammal strandings has varied from 75 (2012) to 116 (2019), not including the historic year of 2013, when Virginia experienced the highest number of marine mammal strandings in the state's history due to a bottlenose dolphin Unusual Mortality Event (UME) (Figure 1). Temporally, marine mammal strandings occur in all months of the year, but numbers typically drop in late fall and winter. Some marine mammal species (*i.e.* large whales, harbor porpoises, common dolphins and seals) tend to strand seasonally, while others (*i.e.* bottlenose dolphins) can occur at any time of the year (Figure 2) with, but peak in spring and summer. Bottlenose dolphins comprise the majority of the marine mammals that strand each year, but the Virginia stranding database is very diverse and now includes 32 species (Appendix V: Virginia Species Lists). In 2021, bottlenose dolphin strandings were slightly less than average, but due to slightly decreased numbers of overall strandings, they still comprised 68% of total marine mammal strandings (Figure 3). Spatially, marine mammal strandings occur throughout Virginia's ocean and bay waters. Strandings most commonly occur along Virginia's eastern shore, the southern shore of the Chesapeake Bay mouth, and the southern Atlantic coast (Figure 4). Strandings in 2021 followed those patterns, with eastern shore strandings more focused along the southern tip (e.g. Fisherman's Island and Kiptopeke State Park) and northeast coastlines of the eastern shore. Pictures and descriptions of notable marine mammal strandings from 2021 are included in Appendix II: Highlights of the Year – Marine Mammals.

Marine mammals are divided into nine data groups for analyses. These data groups are: (1) bottlenose dolphin – the most common marine mammal in Virginia, (2) harbor porpoise – a common small cetacean that occurs in late winter and spring, (3) common dolphin – a primarily oceanic species, (4) large whales – primarily baleen whales such as humpback, fin, minke, and North Atlantic right whales, (5) other delphinids – primarily oceanic species with low stranding rates such as pilot whales, and pelagic dolphins, (6) other kogiid and ziphiid – pygmy and dwarf sperm whales, and beaked whale species, (7) unknown delphinids – used when decomposition, scavenging or other factors precludes identification, (8) pinnipeds – harbor, harp, hooded, and gray seals, (9) manatees – these animals have previously been rare sightings with limited seasonal presence, however recent increases in stranding occurrences may indicate range

expansion for this species. Live stranded animals are included in these analyses and are also addressed separately below.

Live strandings

In 2021, Virginia had 8 known live marine mammal strandings (Table 2). These strandings occurred throughout the year and included two entangled humpback whales, a harbor seal, a gray seal, a Risso's dolphin, a dwarf sperm whale, and two common dolphins. The very first stranded animal documented in 2021 was a live humpback whale that was observed carrying ~30 ft of line with an attached red bullet buoy. Despite extensive observations, the location and nature of the entanglement was not directly observed. However, the body, right pectoral flipper, peduncle, and flukes appeared free of line so the entanglement was suspected to involve the mouth and/or left pectoral flipper. After consultations with many partners, it was decided to continue to observe the animal, but not attempt disentanglement at that time. The animal was later observed with no visible gear, so it is suspected to have shed the gear naturally as hoped. The final stranded marine mammal documented in 2021 was also a live humpback whale that was observed carrying blue line. Caller photos show that the entangling line had made deep lacerations and abrasions cranial and caudal to the dorsal fin, with the line partially embedded in the cranial insertion of the dorsal fin. The line appeared to extend both cranioventrally and caudoventrally along the sides of the animal. However, caller photos only showed the dorsum and the whale was not re-sighted. A live harbor seal was observed with a fishing lure embedded in the left commissure of the mouth. The animal was admitted into rehabilitation and diagnostics revealed likely aspiration pneumonia, possibly a result of the animal attempting to rub at the area to dislodge the gear. Unfortunately, despite emergency treatment, the animal died naturally in rehabilitation. Later that month a gray seal stranded, which was humanely euthanized due to its poor condition and prognosis as well as lack of rehabilitation facility options. Two common dolphins stranded alive in 2021, one in March on Wallops Island and another in Back Bay National Wildlife Refuge in May. Both animals were humanely euthanized and full necropsies indicated they had both likely stranded due to natural infectious processes. A dwarf sperm whale stranded on the beach in September 2021, but was pushed back out into the water multiple times by the public before swimming off and was not re-sighted. The animal did not have any obvious external abnormalities except for presumptive live stranding abrasions on the rostrum, ventrum, and appendages. An emaciated Risso's dolphin calf stranded alive on the beach in October 2021. The animal was humanely euthanized and frozen for later necropsy. See Appendix II: Highlights of the Year – Marine Mammals for additional information and necropsy findings.

Bottlenose dolphin

Bottlenose dolphins (*Tursiops truncatus*) are the most common marine mammals sighted in Virginia waters. They are also the most commonly stranded marine mammal in the state. Historically, most bottlenose dolphins have stranded from April to October, which is concurrent with their seasonal appearance in Virginia coastal waters (Barco *et al*. 1999; Figure 2). In recent years, bottlenose dolphin strandings have occurred in all months of the year. In 2021, 52 bottlenose dolphin strandings were recorded in Virginia (Figure 5). Bottlenose dolphin strandings occurred in every month of the year except March and October. This is a lower than average number of strandings for a single year in Virginia and significantly less than the UME years of 1987 and 2013. The UME that began in 2013 impacted bottlenose dolphins from New York to Florida and continued into April of 2015. Bottlenose dolphin strandings in 2021 occurred primarily along the Atlantic Ocean, lower Chesapeake Bay, and southern half of the eastern shore (Figure 4). Of the 52 bottlenose dolphin strandings in 2021, 33% (n=17) of the strandings occurred in Virginia Beach, 29% (n=15) on the eastern shore, 12% (n=6) in Norfolk, and 27% (n=14) in other parts of the Chesapeake Bay. Sex was determined for 28 of the stranded dolphins. Females comprised 25% (n=7) and males comprised 75% (n=21) of the known sex animals (n=24 could not be determined). This male bias could possibly be explained by the fact that male reproductive organs can sometimes be more easily visualized in caller photos. Of the 34 stranded dolphins with recorded lengths (including estimated lengths), 38% (n=13) were less than 160 cm (known as “young of the year”, YOY), the approximate size of a one-year old dolphin (Figure 5; Urian *et al.* 1996). A historical review occurred this year that resulted in inclusion of additional YOY cases during previous years, to include cases for which length was not determined but the presence of perinatal characteristics was confirmed. Past examination of YOY has revealed evidence of infanticide in the form of broken bones, hemorrhaging and organ damage (Dunn *et al.* 2002). This was a higher proportion of YOY animals compared to the previous year, which was 20%. In dolphins that were moderately decomposed or fresher (n=47), signs of human interaction could not be determined in 74% (n=35), were positive in 15% (n=7), and were not observed in 11% (n=5). Of the seven human interaction cases, five were positive for fisheries interaction, one was entangled (fishery interaction status could not confidently determined), and one appeared to have been mutilated postmortem.

Harbor porpoise

Harbor porpoises (*Phocoena phocoena*) were observed only occasionally in Virginia stranding records during the 1980s. Increases in harbor porpoise strandings occurred along the mid-Atlantic coast in 1993-1994, and the increases were most dramatic in Virginia (Cox *et al.* 1998, Swingle *et al.* 1995). In some years, harbor porpoises have been the second most

commonly stranded marine mammals in Virginia. Harbor porpoises typically strand in late winter and early spring (Figure 2), and occur along the ocean shorelines (Figure 4). During 1999, 40 harbor porpoise strandings were recorded in Virginia, but in 2000, that number dropped precipitously to only four. Strandings increased again in 2001 with 30 strandings, followed by only six harbor porpoise strandings in 2002. Subsequent years have seen the numbers vary widely, from a high of 22 strandings in 2005, to a low of two strandings in 2011 and 2012. There were five harbor porpoise strandings in Virginia in 2017, one in 2018, six in 2019 and none in 2020 (Figure 6). In 2021, there were no identified harbor porpoise strandings. How these stranding patterns relate to fluctuations in abundance of the population or stocks, threats that are cyclical in nature (such as potential fisheries bycatch), or other factors is constantly under review.

Large whales

Large whales strand in Virginia on an annual basis. With the exception of the sperm whale, large whales are typically baleen whales such as humpback, fin, or minke. Some of the large whales normally found in Virginia are endangered species. Because of the logistics involved in examinations of large whales, an extensive large whale response protocol was created (Blaylock *et al.* 1996). The protocol was developed in response to increased strandings of humpback whales in Virginia and North Carolina in the early 1990s (Swingle *et al.* 1993, Barco *et al.* 2002). The response protocol has since been further modified and is specifically applied to North Atlantic right whales (McLellan *et al.* 2004).

Overall, an average of two large whale strandings occurred in Virginia between 1991 and 2015, while 8.4 large whale strandings have occurred annually in Virginia between 2016 and 2020 (Figure 7). In 2017, VAQS responded to eight humpback whales, one fin whale, and two minke whales in Virginia. This number of large whale strandings (n=11) represents the record year for Virginia. As a result of the number of humpback whales stranding in 2016 and 2017 throughout the northeast region, Unusual Mortality Events were declared by the National Oceanic and Atmospheric Administration for multiple large whale species. In 2018, Virginia had eight large whale strandings recorded, including a North Atlantic right whale (*Eubalaena glacialis*) and in 2019, Virginia had nine large whale strandings. In 2020, Virginia had eight large whale strandings that occurred in winter, spring and fall; they consisted of four humpback whales (*Megaptera novaeangliae*) and four minke whales (*Balaenoptera acutorostrata*). In 2021, there were four large whale strandings; three occurred in the winter, and one occurred in the fall. Two were live, free-swimming, entangled humpback whales (see above). One was a dead humpback whale found on the Eastern Shore of Virginia. However, only a clean partial skeleton was found, so the cause of stranding/death is unknown. The final large whale stranding was a dead minke whale that was found severely decomposed and scavenged on the

Eastern Shore of Virginia. Cooperators from The Nature Conservancy responded to gather photos and estimate length (~17 feet), but a cause of stranding/death could not be determined.

Though large whale stranding numbers were lower in 2021 compared to the previous five years, the reported strandings highlight continued anthropogenic threats to large whales. These strandings, combined with previous years', highlight the importance of funding for management of costly events such as necropsy, monitoring, and disentanglement, as well as the need for a statewide logistics plan for dealing with such events (e.g. towing/landing sites, disposal, etc.). While UME federal funds have helped offset some of the costs associated with these responses, those federal funds are temporary and only cover reimbursement of expenses unrelated to salary. In addition to costly equipment rentals and purchases, large whale strandings require considerable human capital to manage competently and safely. Therefore, the financial and workload burdens associated with this trend in large whale strandings are alarming.

Large whale strandings also occasionally involve live, free-swimming entangled large whales to which VAQS staff also respond. VAQS staff have been qualified to respond to entangled whales by the Center for Coastal Studies (CCS) in MA. Specialized whale disentanglement gear and supplies are stored at the VAQS Darden Marine Animal Conservation Center for use in the mid-Atlantic region. This equipment and training have been essential in the successful disentanglement of humpback whales in the waters off Virginia Beach, as well as for smaller cetacean and sea turtle disentanglement efforts. Though there was one entangled whale at the beginning on 2021, after consultation with CCS and NOAA, it was decided to delay intervention to see if the animal was able to shed the gear naturally, which occurred.

Other delphinids / kogiids & ziphiids

Other delphinid species generally include pelagic delphinids (e.g. pilot whale, spotted dolphin, Risso's dolphin, common dolphin, etc.). Kogiid and ziphiid species includes all *Kogia* and beaked whale species. These strandings typically occur along the ocean and lower bay shorelines and sometimes involve live animals. In 2021, four animals stranded in these categories, all of which stranded alive. Other delphinids included two common dolphins and one Risso's dolphin, and kogiids and ziphiids accounted for one dwarf sperm whale (*Kogia sima*).

Pinnipeds

Pinniped strandings have generally increased in Virginia since the early 1990s, and 2021 was an average year compared to the prior 10 years for pinniped strandings. There were five pinniped strandings recorded in Virginia during 2021 (Figure 2 & Figure 8). The pinniped species

stranded in Virginia in 2021 included four harbor seals (*Phoca vitulina*) and one gray seal (*Halichoerus grypus*). Of these, the gray seal and one of the harbor seals stranded alive; the remaining harbor seals stranded deceased.

Regular sightings of seals in Virginia continue to be common occurrences in winter and early spring and there is current interest in studying the growing winter aggregations of pinnipeds. Improved education and training of stranding network personnel have decreased the unwarranted interference with otherwise healthy seals which have hauled-out to rest on Virginia shorelines, piers, jetties and rock islands. Harbor and gray seals were included in the Northeast U.S. Pinniped Unusual Mortality Event declared in 2018. The UME declaration was based in part on significantly elevated harbor and gray seal stranding numbers, as well as coinfections with morbillivirus (a form of distemper) and avian influenza virus. The UME is currently "non-active" and pending closure, as the spike in related pinniped strandings returned to roughly baseline numbers in 2020.

Manatees

Florida manatees (*Trichechus manatus)* have been sighted seasonally, typically mid-summer to early fall, in Virginia waters since the early 1990s. Frequency and volume of reported sightings has increased over the last decade, with an average of 10 reported sightings annually from 2010 through 2020. Seasonality of presence is also broadening, as recent year sightings have occurred as early as March and as late as December. Though sightings data implies an increased presence in Virginia waters, manatee strandings had been infrequent occurrences. This trend may be changing, however.

In October 2018, Virginia conducted its first stranded manatee necropsy in over 30 years. The necropsy exam revealed that the cause of death for this animal was likely blunt trauma inflicted via impingement by the gate of a canal lock. In early November 2019, a manatee stranded "out of habitat" by persistent presence in the warm water effluent of a power plant in the Elizabeth River. A rescue team from SeaWorld mobilized to attempt to capture and relocate the animal due to concern for its susceptibility to cold stress, but were unsuccessful. The animal was no longer sighted in the area and its final disposition is unknown. In December 2019, a manatee was sighted for several consecutive days in Lake Wesley, Virginia Beach and was reported as lethargic and traveling minimal distances. VAQS staff responded to the animal to document it, observe behavior, and monitor for visible cold stress lesions. The animal's respiration rate and activity level were normal and there were no visible signs of cold stress despite the ambient water temperature. Due to inability to capture without out of state resources (special equipment and trained crews), VAQS did not immediately intervene. VAQS contacted USFWS and Florida-based manatee rescue crews to discuss a capture plan, however, while discussing plans, the manatee was never re-sighted. Unfortunately, scar patterns

matched this animal to a deceased manatee reported on January 10, 2020. This year, though sightings continued, no manatees were reported stranded.

These mortalities in conjunction with sightings reports in VA strongly suggest that manatees are expanding their range to include regular seasonal residence in VA. Due to the rapid temperature drops and unfamiliar territory, manatees traveling to VA are likely to experience regular challenges related to cold stress. Additionally, state laws and practices in VA do not incorporate measures to reduce manatee morbidity and mortality. As a threatened species under the Endangered Species Act, increasing and prolonged presence of manatees in Virginia's waterways may lead to significant conflicts between manatees and human activity.

Sea Turtles

During 2021, there were an average number of sea turtle strandings (212) in Virginia (Table 3). Since 2000, Virginia has experienced both extremely high (531 in 2003) and relatively low (173 in 2011) numbers of sea turtle strandings. With an average of 251 annually in the last ten years, Virginia remains an area of high sea turtle mortality as measured by strandings (Figure 9). The VAQS Team handled 200 sea turtle strandings during 2021 and an additional 12 strandings were reported by stranding network cooperators trained by VAQS (Table 3). Cooperators' reports are entered into the state sea turtle stranding database and the responder's affiliation is listed. This year, cooperators from Chincoteague National Wildlife Refuge, Eastern Shore National Wildlife Refuge, The Nature Conservancy, and VDWR responded to strandings, with additional reports from Back Bay National Wildlife Refuge, Kiptopeke State Park and False Cape State Park.

Similarly to the previous year, June was the busiest month of 2021 with 58 strandings (27% of the year's total), followed by May with 42 (20%), November with 25 (12%), and August with 20 (9%). Strandings in 2021 were mostly within two standard deviations of the 5-year average, with one exception during a week in early April that saw one stranding in 2021 and zero strandings from 2016-2020. The overall 2021 stranding season showed a bimodal distribution similar to the historic patterns.

Loggerheads (*Caretta caretta*, n=119) continued to be the most common sea turtle species to strand in Virginia. This was followed by Kemp's ridleys (*Lepidochelys kempii*, n=63). After experiencing an abnormally high year in 2019, green turtle strandings (*Chelonia mydas*, n=14) continued to decrease in 2021. Additionally, leatherbacks (*Dermochelys coriacea*, n=1), and individuals unidentified to species (n=15) were reported stranded in 2021 (Figure 11). The distribution of strandings was primarily along the southern eastern shore, southern ocean-facing beaches, and lower bay shorelines (Figure 12 & Figure 13). Improved efforts by VAQS to recruit and train cooperators have greatly enhanced stranding response on the eastern shore of

Virginia, which was where 24% (n=50) of the statewide sea turtle strandings were found. Accomack County accounted for 4% (n=9) and Northampton County for 19% (n=41) of the statewide total. Strandings in Virginia Beach, Norfolk and other southside counties in Hampton Roads contributed to 49% (n=104) of the total. The remaining 27% (n=58) originated from the western shores of the Chesapeake Bay north of the James River.

Additionally, VAQS has continued to prioritize the recognition and documentation of human interaction in stranded sea turtles. In 2021, signs of human interaction were documented in 42% of cases (n=89), not present in 11% (n=23), and could not be determined in 47% (n=100). Documentation of some types of human interaction, most notably evidence of entanglements, can be more challenging to assess in sea turtles due to their hard shells and keratinized skin. In some cases, carcasses were fresh enough to conduct thorough necropsies, during which time vessel, dredge, or entanglement lesions can be thoroughly investigated. Necropsies of stranded turtles sometimes reveal internal signs of human interaction in the form of fish lures, hooks, line and plastic debris in the gastrointestinal tract. Fishing equipment can be from recreational or commercial (such as long-line) gear and may have been actively fishing or "ghost" gear. Further understanding the impacts that recreational and commercial fishing have on turtles is needed.

Turtles for which probable causes of stranding could be determined (n=122) consisted of human induced stranding (n=81, 66%) and natural caused stranding (n=42, 34%). Human induced strandings were almost entirely made up of recreationally hooked turtles (n=38, 47%) and turtles with acute anthropogenic trauma, such as from a watercraft vessel or dredge (n=41, 51%). Other human causes included chronic hooking and entrapment in a manmade structure. Natural caused strandings were made up of 74% cold stunning cases (n= 31), but also included infectious/disease. Pictures and descriptions of some of the notable sea turtle strandings in 2021 are included in Appendix III: Highlights of the Year – Sea Turtles.

Live strandings

In 2021, live strandings of sea turtles dramatically increased (n=61) after 2020 saw the lowest live stranding numbers (n=34) since 2014. One possible explanation for this was the re-opening of Buckroe Fishing Pier, which was closed in 2020, and was the site of 15 live strandings in 2021. Live stranded turtles in 2021 included 27 Kemp's ridleys, 17 loggerheads, 5 greens, and 12 of unidentified species (Table 4). Of these, 45 were successfully recovered for rehabilitation. This includes 25 that were rehabilitated and released by VAQS in 2021, two that were released in January 2022, and 10 that are still undergoing rehabilitation at VAQS. The most common cause of stranding for admitted patients was incidental entanglement via recreational hook and line (n=24), followed by cold stunning (n=12) and infection/disease (n=4). Eight live-stranded

turtles that were admitted to rehabilitation either died during early stages of rehabilitation or were euthanized due to the severity of their injuries or illness/debilitation. These animals stranded due to cold stunning (n=3), acute human trauma (n=2), and disease (n=3), though one disease case was presumed due to aspiration of seawater during a hooking event. Fourteen unrecovered live sea turtles were incidentally hooked by recreational fishers and were subsequently released by the fishers or broke free of the gear before they could be landed. In addition, two sea turtles that stranded in 2020 were released after successful rehabilitation by VAQS. Throughout the year, the VAQS Team spent many hours responding to and performing medical treatments and husbandry tasks for live stranded sea turtles. Though re-strands of previously rehabilitated turtles have occurred previously, 2021 was unique in that two live stranded sea turtles each stranded twice during the summer season. One Kemp's ridley sea turtle VAQS20212015 was hooked in the mouth by a recreational fisher from shore in May 2021. After meeting immediate release criteria, the animal was released and was caught again at a fishing pier four days later. The animal met immediate release criteria once again and has not been resighted. One loggerhead sea turtle VAQS20212120 was also hooked and released twice in 2021. See Appendix III: Highlights of the Year – Sea Turtles for more information.

Despite a record number of hooked turtle reports and admits for each consecutive year between 2014-2018, 2019 and 2020 each brought gradually fewer hooked turtle reports and rehabilitation admits. However, in 2021 there were roughly twice as many hooked turtle reports (n=38) and admits (n=24) compared to 2020. As mentioned previously, this could be at least partially due to the reopening of Buckroe Fishing Pier. We were able to successfully implement our immediate release criteria, initiated in 2017, for several of these animals. This procedure has allowed us to conserve resources and limit rehabilitation time for otherwise healthy hooked turtles. The percentage of rehabilitated hooked turtles that met this criteria were 16% in 2018, 27% in 2019, 25% in 2020, and 33% in 2021.

VAQS Activities During 2021

Due to the ongoing COVID-19 pandemic, VAQS' professional, educational, and outreach activities continued to be modified this year. Activities focused largely on virtual events and in-house trainings. These trainings provide important information to Virginia Aquarium outreach instructors, VAQS Team volunteers, and to other cooperators in the state stranding network including: Back Bay National Wildlife Refuge; Eastern Shore National Wildlife Refuge; Chincoteague National Wildlife Refuge; Kiptopeke and False Cape State Parks; Virginia Beach police, animal control, beach maintenance personnel, and lifeguards; U.S. Coast Guard; Dam Neck and other military base natural resources personnel; personnel from VMRC and VDGIF; The Nature Conservancy and other natural resources groups. Owing to pandemic social distancing guidelines, many of the extramural trainings for were not held but are being planned for 2022 and 2023.

VAQS conducted trainings on biology, ecology and stranding response protocols for sea turtles and marine mammals throughout the entire year. Additionally, lectures were presented on the topics of marine mammal and sea turtle necropsies, stranding response, marine mammal anatomy, sea turtle rehabilitation, findings from sea turtle and marine mammal research, conservation biology, and federal efforts to manage and protect marine mammals. The aforementioned presentations were given to extremely diverse audiences ranging from K-12 groups, to graduate and undergraduate students, church groups, and professional and social groups.

VAQS staff provided either informal or formal (e.g. graduate committee member) guidance to several undergraduate and graduate students, and provided federal consultations for sensitive investigations related to human interactions and large whales. VAQS staff continue to participate as stranding network liaisons and investigative team members on four separate federally managed marine mammal unusual mortality events. Finally, a VAQS senior scientist continued to serve as one of 12 members appointed by the secretaries of Commerce and the Interior to the federal Working Group for Marine Mammal Unusual Mortality Events (WGMMUME), guiding investigations on a national scale. In addition, this staff member has been acting as the Working Group liaison to the Gulf of Mexico's stranding network dealing with the 2017-2022 North Atlantic Right Whale Unusual Mortality Event. Furthermore, this scientist was also requested by NOAA-NMFS as Steering committee member for three separate transboundary (US & Canada) committees related to large whale necropsy leadership, training, and case reviews.

In cooperation with the education department of the Virginia Aquarium, multiple staff members planned and executed a new mock stranding event with high school students. The multi-day event involved extensive collaboration between departments and focused on giving

the students an experiential introduction to the process of responding to live and dead sea turtles using scenarios founded in previous cases. A complete list of all professional, educational, and training activities is included in Appendix I: Professional and Education Activities.

Grant funds were used in conjunction with funds from the Virginia Aquarium Foundation to staff the Aquarium's Darden Marine Animal Conservation Center with a full-time veterinary technician, husbandry and nesting manager, field response and volunteer manager, data and operations manager, stranding response technician, and several part-time stranding assistants. In recognition of the services VAQS provides to the city and state, the City of Virginia Beach's Aquarium budget now includes two VAQS staff, namely the stranding response coordinator who oversees sea turtle and marine mammal stranding response in Virginia, and the staff person responsible for field response. Though 2021 required deviation from our planned volunteer system due to COVID-19, we were still able to use on-call volunteers for assistance with husbandry and field response. Additional specialty responders continue to be trained to provide support and enhance response to special, predictable stranding events with increased logistical demands, such as live sea turtles caught by recreational anglers at fishing piers. Created and managed by the volunteer manager, the on-call system greatly enhances the Team's readiness and rapid response. VAQS Team volunteers logged more than 7,000 hours during 2020, up from 4,300 in 2020. This was due to our ability to re-integrate volunteers into our stranding response and rehabilitation programs while following COVID-19 related guidelines.

VAQS staff continues to conduct advanced necropsies on fresh-dead sea turtles and marine mammals to investigate causes of mortality and to determine baseline health information for regional populations. Cause of death/stranding are being consistently collected, reviewed, and compiled. VAQS staff performed approximately 100 necropsies of marine mammals and sea turtles this past year. VAQS' expertise in large whale strandings was requested when an endangered fin whale stranded alive in Delaware. In addition to consultation and support for the euthanasia, a VAQS staff member served as the necropsy lead for the post-mortem investigation.

Numerous large-scale changes in data management occurred over the past year. Continued efforts were made to increase efficiency and consistency of cause of strand and human interaction data across marine mammals and sea turtles. In early 2021, the National Marine Fisheries Service (NMFS) introduced a new Sea Turtle Stranding and Salvage Network (STSSN) data form and online database, and initiated a new sea turtle stranding reporting process for the Greater Atlantic Region stranding response organizations. This was done to increase objectivity and consistency in data collection and interpretation of exam findings across the national STSSN. This new data form prompts the collection of more robust

information regarding human interaction and presence of external anthropogenic material, injuries, and disease. To facilitate data collection and reporting in this new system, as well as to maintain integrity with our long-standing data set, an entirely new internal sea turtle stranding database was designed. This new system allows us to capture the information requested by NMFS, as well as additional data we feel is important within our state-wide historical stranding database. These data included sex, body condition, epibiota presence, confidence levels for human interaction status, and cause of stranding. In addition, VAQS made some modifications to the new STSSN data form to remove data options not observed in Virginia, as well as add data points we frequently collect, such as sex and necropsy details. The design, creation, and implementation of this new data form, database, and reporting queries required substantial staff effort in 2021. The new database became functional in summer 2021, includes all 2021 data, and allows us to report to NMFS on a bi-weekly basis. Future work will be necessary to efficiently merge previous data fields into the new database design.

In addition to sea turtle data changes, substantial modifications were made to the organization of marine mammal human interaction data (HI) within our state-wide database. Though VAQS has been collecting high-quality data on HI in Virginia for decades, the implementation by NMFS of a nationally adopted HI form and online data collection format necessitated revamping of current database formatting. A significant portion of historical data has been merged into the current format, individual reviews of numerous cases will be necessary to complete the transition.

Summary

Data collected by VAQS and the Virginia stranding network continue to be critical to the long-term monitoring efforts for sea turtle and marine mammal populations in the mid-Atlantic region. Fresh-stranded cetaceans continue to be extensively sampled as part of cooperative research (involving the University of North Carolina at Wilmington, NOAA Fisheries Take Reduction Teams, WGMMUME) to better assess marine mammal health. These studies are crucial to developing a better understanding of the overall health status of marine mammal populations in the wild. Stranding response and data collection from Virginia were crucial to the identification and response to the bottlenose dolphin UME that began in July 2013 along the east coast. Virginia also experienced the highest number of bottlenose dolphin mortalities (n=382) associated with the UME. Studies associated with the vast amount of data and samples collected from stranded marine mammals will continue to help researchers better understand the impact of these mortalities on coastal bottlenose dolphin stocks. In addition, the unprecedented levels of mortalities have also provided a wealth of potential data for further understanding many aspects of the life history of these iconic regional marine mammals.

Marine mammal strandings remain high, and a large portion of the mortalities are related to human activities such as commercial fishing and shipping. Beginning in 2016, VAQS staff noticed previously undescribed internal lesions in bottlenose dolphins. As a result of the dedicated efforts and staff expertise, VAQS identified novel lesions related to entanglement of bottlenose dolphins in fishing gear. These lesions have been combined with other pathologic findings to compose a forensic matrix for increasing confidence in fisheries interaction identification. Historic data from 2016 and 2019 have been analyzed to examine prevalence of such findings in fisheries interaction cases. Results have been presented at national stranding and marine mammal biology conferences in 2017 and 2019 and were published in July 2020 in a peer-reviewed veterinary journal. For these and other reasons, VAQS staff serve as expert members on three federal Take Reduction Teams working to reduce the incidental mortalities of marine mammals in commercial fishing operations. The changes to the rules regulating pound net leaders, supported by VAQS research efforts, are reducing the incidental takes of dolphins and sea turtles in Chesapeake Bay. One staff member is also one of only three federally recognized large whale necropsy team leaders on the Atlantic and Gulf coasts of the U.S and is currently serving as an investigative team member and stranding network liaison for National Marine Fisheries Service on all currently open unusually mortality events (UMEs) (e.g. North Atlantic right whale, minke whale, humpback whale, and seals).

Total sea turtle strandings were low in both 2020 (n=216) and 2021 (n=212). Although there could be an ecological explanation for this, the impacts of the COVID-19 pandemic very likely played a role in how many tourists/residents were out on the beaches and the water reporting strandings. Monitoring Virginia sea turtle strandings in the future will continue to provide valuable information to help understand the causes of sea turtle mortalities and whether these decreasing numbers represent a significant and predictable trend or only a temporary change.

Data collected from strandings provide excellent information on life histories of the many species of marine mammals and sea turtles that inhabit Virginia waters. Stranded animals are the only source of this type of scientific information for many species of marine mammals. The True's beaked whale stranding in 2003, the melon-headed whale strandings in 2008, the Sowerby's beaked whale strandings in 2009, and the pygmy killer whale strandings in 2013 provide excellent examples of the unique opportunities that strandings provide to study rare and previously unknown species from Virginia. Additionally, the January 2018 stranding of a critically endangered North Atlantic right whale resulted in documentation of a fisheries interaction take due to Canadian snow crab fisheries, highlighting the importance of such investigations.

This year brought a major accomplishment for the program with the completion of the Darden Marine Animal Conservation Center. After many years working with the City of Virginia Beach to develop a fully functional 18,000 sq. ft. facility, move in occurred in June of 2021. This state-of-the-art facility will significantly increase response, rehabilitation, necropsy, and research capabilities to enable VAQS to meet the increasing demands of high-quality stranding response.

Managing the Virginia stranding network for federally and state protected marine mammals and sea turtles continues to be a priority for VAQS and is vitally important for the state and federal agencies who depend on this information. Federal funding from NOAA Fisheries for the marine mammal stranding network through the Prescott Stranding Grant Program is insufficient and always under threat of elimination, especially given current federal budget constraints as a result of the COVID-19 pandemic. Unfortunately, the federal UME contingency fund is dwindling and the multiple current and recurring UMEs are sure to deplete it without significant actions. It is possible that this funding stream will disappear unless Congress and NOAA continue to act to maintain the only federal funding available to the national marine mammal stranding network. This is especially concerning since the significant expenses involving large whale stranding events have largely been offset through reimbursements by this fund. Without this fund, annual large whale stranding events costing many tens of thousands of dollars may fall on state and municipal entities to support. At a time when marine mammal strandings are at record levels, and stranding data are crucial to monitoring ocean health and supporting fishery management and ocean resource-use planning efforts, stranding network organizations like VAQS are trying to operate with the continuing threat of declining or eliminated federal financial support. There remains much work to do and it is hoped that management efforts informed by quality stranding data will begin to reduce the high levels of sea turtle and marine mammal mortalities related to human activities in Virginia and elsewhere in the region. Continued monitoring and reporting of trends in strandings of protected species will be priorities for the Virginia Aquarium Stranding Response Program in 2022.

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Tables

*Table 1: Marine mammal strandings in Virginia during 2021, n=77. Notes: length measured in centimeters; * indicates estimated length; ND=not determined; F=female, M=male, U=unknown sex.*

Field Number	Date	Species	City/County	Latitude	Longitude	Condition	Sex	Length
VAQS20211001	1/2/2021	Humpback whale	Virginia Beach	36.91132	-75.94740	live	U	ND
VAQS20211002	1/2/2021	Bottlenose dolphin	Virginia Beach	36.82961	-75.96901	dead	U	232
VAQS20211003	1/16/2021	Minke whale	Northampton	37.31894	-75.76408	dead	U	521*
VAQS20211004	2/23/2021	Bottlenose dolphin	Northampton	37.20265	-76.01207	dead	F	245
VAQS20211005	2/24/2021	Harbor seal	Virginia Beach	36.57806	-75.87333	dead	M	110
VAQS20211006	3/3/2021	Harbor seal	Virginia Beach	36.82008	-75.98592	live	F	101
VAQS20211007	3/14/2021	Common dolphin (short-beaked)	Accomack	37.82963	-75.49074	live	M	227
VAQS20211008	3/21/2021	Harbor seal	Virginia Beach	36.91992	-76.05412	dead	F	ND
VAQS20211009	3/23/2021	Gray seal	Virginia Beach	36.77311	-75.95395	live	M	98
VAQS20211010	4/4/2021	Unidentified small cetacean	Accomack	37.93513	-75.41199	dead	U	ND
VAQS20211011	4/16/2021	Bottlenose dolphin	Northampton	37.14226	-75.87329	dead	U	274
VAQS20211012	4/21/2021	Harbor seal	Accomack	37.83081	-75.48981	dead	F	104
VAQS20211013	4/23/2021	Bottlenose dolphin	Northampton	37.19806	-76.00916	dead	U	ND
VAQS20211014	4/27/2021	Unidentified delphinid	Northampton	37.14306	-75.97361	dead	U	ND
VAQS20211016	5/6/2021	Unidentified small cetacean	Accomack	37.75384	-75.54964	dead	U	107
VAQS20211015	5/7/2021	Bottlenose dolphin	Northampton	37.24697	-76.02025	dead	M	273
VAQS20211017	5/11/2021	Bottlenose dolphin	Virginia Beach	36.72764	-75.93573	dead	M	116
VAQS20211018	5/11/2021	Bottlenose dolphin	Virginia Beach	36.76833	-75.95178	dead	U	101
VAQS20211019	5/11/2021	Bottlenose dolphin	Virginia Beach	36.70467	-75.92706	dead	M	279
VAQS20211020	5/13/2021	Bottlenose dolphin	Virginia Beach	36.91442	-76.06958	dead	F	111
VAQS20211021	5/13/2021	Bottlenose dolphin	Virginia Beach	36.69430	-75.92320	dead	U	104*
VAQS20211022	5/17/2021	Bottlenose dolphin	Virginia Beach	36.82369	-75.96798	dead	F	94
VAQS20211023	5/17/2021	Bottlenose dolphin	Mathews	37.34240	-76.27280	dead	M	ND
VAQS20211024	5/18/2021	Unidentified delphinid	Accomack	37.78546	-75.52986	dead	U	ND
VAQS20211025	5/18/2021	Common dolphin (short-beaked)	Virginia Beach	36.68449	-75.91917	live	M	217
VAQS20211026	5/19/2021	Bottlenose dolphin	Hampton	36.98730	-76.30137	dead	U	ND
VAQS20211027	5/19/2021	Unidentified delphinid	Hampton	36.98730	-76.30137	dead	U	ND
VAQS20211029	5/19/2021	Bottlenose dolphin	Northampton	37.44123	-75.97954	dead	M	272
VAQS20211031	5/19/2021	Bottlenose dolphin	Norfolk	36.93580	-76.18400	dead	U	95
VAQS20211030	5/20/2021	Bottlenose dolphin	Norfolk	36.95056	-76.24327	dead	M	237
VAQS20211028	5/22/2021	Bottlenose dolphin	Hampton	37.05650	-76.15572	dead	M	259*
VAQS20211032	5/23/2021	Bottlenose dolphin	Newport News	36.98853	-76.44778	dead	U	ND
VAQS20211033	5/25/2021	Bottlenose dolphin	Virginia Beach	36.57627	-75.87291	dead	F	197
VAQS20211034	5/25/2021	Unidentified delphinid	Gloucester	37.24588	-76.50302	dead	U	ND
VAQS20211035	5/27/2021	Bottlenose dolphin	Northampton	37.50156	-75.95805	dead	U	203*
VAQS20211036	5/31/2021	Bottlenose dolphin	Middlesex	37.61341	-76.53677	dead	F	120
VAQS20211037	6/5/2021	Bottlenose dolphin	Accomack	37.67600	-75.83980	dead	U	ND
VAQS20211038	6/8/2021	Bottlenose dolphin	Northampton	37.32466	-76.01665	dead	U	ND
VAQS20211039	6/12/2021	Bottlenose dolphin	Northumberland	37.73392	-76.30793	dead	U	ND
VAQS20211040	6/13/2021	Bottlenose dolphin	Lancaster	37.61960	-76.30102	dead	U	ND

Field Number	Date	Species	City/County	Latitude	Longitude	Condition	Sex	Length
VAQS20211041	6/14/2021	Bottlenose dolphin	Virginia Beach	36.92021	-75.99520	dead	U	ND
VAQS20211042	6/15/2021	Bottlenose dolphin	Hampton	37.07052	-76.27962	dead	M	182
VAQS20211043	6/15/2021	Bottlenose dolphin	Virginia Beach	36.86296	-75.97772	dead	U	ND
VAQS20211044	6/20/2021	Unidentified delphinid	Northampton	37.35268	-75.99639	dead	U	ND
VAQS20211045	6/26/2021	Bottlenose dolphin	James City	37.23848	-76.83367	dead	U	ND
VAQS20211053	6/27/2021	Bottlenose dolphin	Lancaster	37.74200	-76.31100	dead	U	ND
VAQS20211046	7/1/2021	Bottlenose dolphin	Northampton	37.26704	-76.02425	dead	U	120
VAQS20211047	7/2/2021	Unidentified delphinid	Lancaster	37.62026	-76.28106	dead	U	ND
VAQS20211048	7/5/2021	Bottlenose dolphin	Northampton	37.23417	-76.05133	dead	U	ND
VAQS20211049	7/9/2021	Bottlenose dolphin	Virginia Beach	36.91442	-76.07884	dead	M	258
VAQS20211050	7/10/2021	Bottlenose dolphin	Norfolk	36.93325	-76.33170	dead	F	249
VAQS20211051	7/17/2021	Bottlenose dolphin	Northampton	37.15790	-75.97770	dead	M	204
VAQS20211052	7/20/2021	Bottlenose dolphin	Virginia Beach	36.92535	-76.05467	dead	M	247
VAQS20211054	7/30/2021	Unidentified delphinid	Hampton	37.00178	-76.37284	dead	U	ND
VAQS20211055	8/3/2021	Bottlenose dolphin	Newport News	36.98667	-76.44333	dead	F	256
VAQS20211056	8/6/2021	Bottlenose dolphin	Virginia Beach	36.85938	-75.97608	dead	U	255*
VAQS20211057	8/8/2021	Bottlenose dolphin	Norfolk	36.96360	-76.26517	dead	M	155
VAQS20211058	8/11/2021	Bottlenose dolphin	Accomack	38.00941	-75.25698	dead	M	264*
VAQS20211059	8/13/2021	Unidentified cetacean	Northampton	37.18687	-76.00270	dead	U	ND
VAQS20211060	8/14/2021	Bottlenose dolphin	Northampton	37.18832	-75.99861	dead	U	ND
VAQS20211061	8/15/2021	Bottlenose dolphin	Lancaster	37.61951	-76.30002	dead	M	152
VAQS20211062	8/22/2021	Bottlenose dolphin	Virginia Beach	36.92258	-75.98250	dead	U	ND
VAQS20211063	8/23/2021	Bottlenose dolphin	Norfolk	36.95925	-76.32698	dead	M	ND
VAQS20211064	8/26/2021	Bottlenose dolphin	Middlesex	37.51947	-76.41666	dead	M	ND
VAQS20211065	9/9/2021	Bottlenose dolphin	Virginia Beach	36.91605	-75.99205	dead	M	116
VAQS20211066	9/17/2021	Humpback whale	Northampton	37.18750	-75.89497	dead	U	1035*
VAQS20211067	9/27/2021	Bottlenose dolphin	Virginia Beach	36.94515	-76.17426	dead	U	ND
VAQS20211068	9/30/2021	Dwarf sperm whale	Virginia Beach	36.73260	-75.93804	live	U	ND
VAQS20211069	10/8/2021	Risso's dolphin	Virginia Beach	36.81886	-75.96676	live	M	163
VAQS20211070	10/15/2021	Unidentified delphinid	Suffolk	36.91836	-76.48451	dead	U	ND
VAQS20211071	10/28/2021	Unidentified small cetacean	Virginia Beach	36.82950	-75.96908	dead	U	ND
VAQS20211072	11/4/2021	Bottlenose dolphin	Norfolk	36.93383	-76.17765	dead	M	275
VAQS20211073	11/17/2021	Bottlenose dolphin	Accomack	37.91679	-75.32448	dead	M	199
VAQS20211074	12/2/2021	Bottlenose dolphin	Virginia Beach	36.61471	-75.88388	dead	U	157.5*
VAQS20211075	12/2/2021	Bottlenose dolphin	Accomack	37.85057	-75.38344	dead	M	213*
VAQS20211076	12/19/2021	Bottlenose dolphin	Suffolk	36.87036	-76.52419	dead	M	273
VAQS20211077	12/29/2021	Humpback whale	Virginia Beach	36.69481	-75.91988	live	U	ND

Table 2: Live stranded marine mammals recorded by VAQS in Virginia in 2021, n=8.

Field Number	Species	Strand Date	State	Final Disposition
VAQS20211001	Humpback whale	1/2/2021	VA	Left free-swimming, naturally shed entangling gear
VAQS20211006	Harbor seal	3/3/2021	VA	Died naturally in rehab, full necropsy
VAQS20211007	Common dolphin	3/14/2021	VA	Euthanized, full necropsy
VAQS20211009	Gray seal	3/23/2021	VA	Euthanized, full necropsy
VAQS20211025	Common dolphin	5/18/2021	VA	Euthanized, full necropsy
VAQS20211068	Dwarf sperm whale	9/30/2021	VA	Unknown, pushed back out by public
VAQS20211069	Risso's dolphin	10/8/2021	VA	Euthanized, frozen, pending necropsy
VAQS20211077	Humpback whale	12/29/2021	VA	Left free-swimming, presumed still entangled

*Table 3: Sea turtle strandings in Virginia during 2021, n=212. Notes: length measured in centimeters, * indicates estimated length; ND=not determined; F=female, M=male, U=unknown sex.*

Field Number	Strand Date	Species	Location	Latitude	Longitude	Condition	Sex	Length
VAQS20212001	01/08/2021	Kemp's ridley sea turtle	Norfolk	36.843816	-76.262577	dead	F	26.5
VAQS20212002	01/10/2021	Loggerhead sea turtle	Portsmouth	36.840761	-76.298239	live	ND	60.7*
VAQS20212003	01/26/2021	Loggerhead sea turtle	Northampton	37.39686	-75.96791	dead	M	63
VAQS20212004	01/29/2021	Loggerhead sea turtle	Northampton	37.212602	-76.01303	dead	ND	ND
VAQS20212005	02/07/2021	Loggerhead sea turtle	Northampton	37.22992	-76.00238	dead	ND	79.8
VAQS20212006	02/16/2021	Loggerhead sea turtle	Northampton	37.35798	-75.99332	dead	F	52
VAQS20212007	03/10/2021	Loggerhead sea turtle	Northampton	37.099205	-75.941789	dead	ND	ND
VAQS20212008	04/16/2021	Green sea turtle	Northampton	37.15985	-75.856932	dead	ND	ND
VAQS20212009	05/04/2021	Loggerhead sea turtle	Virginia Beach	36.831	-75.59183	dead	ND	ND
VAQS20212010	05/08/2021	Kemp's ridley sea turtle	Hampton	37.002599	-76.314895	live	ND	ND
VAQS20212011	05/10/2021	Kemp's ridley sea turtle	Virginia Beach	36.988	-76.162783	live	F	55
VAQS20212012	05/11/2021	Kemp's ridley sea turtle	Norfolk	36.9307	-76.1866	dead	F	52.6
VAQS20212013	05/11/2021	Loggerhead sea turtle	Norfolk	36.903611	-76.301944	dead	ND	51*
VAQS20212014	05/07/2021	Loggerhead sea turtle	Virginia Beach	36.91386	-75.48669	dead	ND	ND
VAQS20212015	05/15/2021	Kemp's ridley sea turtle	Virginia Beach	36.720742	-75.933186	live	ND	32.7
VAQS20212015.1	05/19/2021	Kemp's ridley sea turtle	Hampton	37.035988	-76.289528	live	ND	32.7
VAQS20212016	05/15/2021	Kemp's ridley sea turtle	Norfolk	36.960955	-76.260526	live	ND	39.3
VAQS20212017	05/17/2021	Loggerhead sea turtle	Virginia Beach	36.658083	-75.903944	dead	ND	ND
VAQS20212018	05/17/2021	Kemp's ridley sea turtle	Virginia Beach	36.843776	-75.969783	live	ND	23.2
VAQS20212019	05/17/2021	Kemp's ridley sea turtle	Virginia Beach	36.84611	-75.9725	dead	M	40
VAQS20212020	05/17/2021	Kemp's ridley sea turtle	Hampton	37.036014	-76.289602	live	ND	36.9
VAQS20212021	05/18/2021	Kemp's ridley sea turtle	Virginia Beach	36.843773	-75.969847	live	ND	30.2
VAQS20212022	05/18/2021	Kemp's ridley sea turtle	Hampton	37.035997	-76.289566	live	ND	33.9
VAQS20212023	05/19/2021	Kemp's ridley sea turtle	Hampton	37.035997	-76.289566	live	ND	39.1
VAQS20212024	05/19/2021	Kemp's ridley sea turtle	Virginia Beach	36.921772	-76.136679	dead	F	48.9
VAQS20212025	05/20/2021	Loggerhead sea turtle	Accomack	37.864653	-75.391139	dead	ND	67.3
VAQS20212026	05/20/2021	Kemp's ridley sea turtle	Virginia Beach	36.79205	-75.959567	dead	F	40.7
VAQS20212027	05/20/2021	Loggerhead sea turtle	Virginia Beach	36.931587	-76.033776	dead	F	77*
VAQS20212028	05/21/2021	Loggerhead sea turtle	Middlesex	37.612897	-76.437538	dead	M	72.5

Field Number	Strand Date	Species	Location	Latitude	Longitude	Condition	Sex	Length
VAQS20212029	05/22/2021	Loggerhead sea turtle	Virginia Beach	36.75338	-75.9453404	dead	F	80
VAQS20212030	05/22/2021	Loggerhead sea turtle	Virginia Beach	36.913403	-76.076471	dead	ND	ND
VAQS20212031	05/22/2021	Loggerhead sea turtle	Accomack	37.887553	-75.344975	dead	F	39.4
VAQS20212032	05/23/2021	Loggerhead sea turtle	Northampton	37.461103	-75.965853	dead	ND	ND
VAQS20212033	05/24/2021	Loggerhead sea turtle	Norfolk	36.93393	-76.201675	dead	F	61.1
VAQS20212034	05/24/2021	Loggerhead sea turtle	Norfolk	36.969102	-76.293232	dead	M	67.4
VAQS20212035	05/25/2021	Loggerhead sea turtle	Hampton	37.083101	-76.274145	dead	F	67
VAQS20212036	05/26/2021	Loggerhead sea turtle	Gloucester	37.252886	-76.455022	dead	ND	71.8
VAQS20212037	05/27/2021	Kemp's ridley sea turtle	Virginia Beach	36.929403	-76.010125	dead	M	37.6
VAQS20212038	05/27/2021	Loggerhead sea turtle	Northampton	37.0966203	-75.9800878	dead	ND	80*
VAQS20212039	05/27/2021	Loggerhead sea turtle	Northampton	37.0877213	-75.9782739	dead	ND	83.8*
VAQS20212040	05/27/2021	Loggerhead sea turtle	Virginia Beach	36.8225087	-75.9675947	dead	F	95*
VAQS20212041	05/27/2021	Loggerhead sea turtle	Northampton	37.070717	-75.980117	dead	ND	ND
VAQS20212042	05/28/2021	Loggerhead sea turtle	Virginia Beach	36.78035	-75.955997	dead	ND	61.5
VAQS20212043	05/28/2021	Loggerhead sea turtle	Northumberland	37.839191	-76.249788	dead	ND	ND
VAQS20212044	05/29/2021	Loggerhead sea turtle	Northumberland	37.87941	-76.24014	dead	ND	ND
VAQS20212045	05/30/2021	Loggerhead sea turtle	Middlesex	37.572886	-76.362047	dead	M	71.6
VAQS20212046	05/30/2021	Loggerhead sea turtle	Mathews	37.51542	-76.291775	dead	F	61
VAQS20212047	05/30/2021	Loggerhead sea turtle	Norfolk	36.93157	-76.19219	dead	F	ND
VAQS20212048	05/31/2021	Loggerhead sea turtle	Virginia Beach	36.578611	-75.873611	dead	ND	ND
VAQS20212049	06/01/2021	Loggerhead sea turtle	Virginia Beach	36.923638	-76.143945	dead	F	96.2
VAQS20212050	06/01/2021	Loggerhead sea turtle	Northampton	37.492671	-75.959885	dead	F	70.4
VAQS20212051	06/01/2021	Loggerhead sea turtle	Mathews	37.410185	-76.250023	dead	ND	ND
VAQS20212052	06/01/2021	Loggerhead sea turtle	Northampton	37.327942	-76.015174	dead	ND	ND
VAQS20212053	06/02/2021	Leatherback sea turtle	Northampton	37.65374	-75.59631	dead	ND	ND
VAQS20212054	06/02/2021	Unidentified sea turtle	Virginia Beach	36.8437659	-75.9697622	live	ND	ND
VAQS20212055	06/02/2021	Loggerhead sea turtle	Northampton	37.327942	-76.015174	dead	M	73.3
VAQS20212056	05/31/2021	Loggerhead sea turtle	Northumberland	37.867148	-76.244812	dead	ND	ND
VAQS20212057	06/05/2021	Loggerhead sea turtle	Mathews	37.303533	-76.176633	dead	ND	ND
VAQS20212058	06/05/2021	Loggerhead sea turtle	Northumberland	37.9264315	-76.3013115	dead	M	97.7
VAQS20212059	06/05/2021	Loggerhead sea turtle	Middlesex	37.534974	-76.328944	dead	ND	ND

Field Number	Strand Date	Species	Location	Latitude	Longitude	Condition	Sex	Length
VAQS20212060	06/06/2021	Kemp's ridley sea turtle	Virginia Beach	36.8437	-75.970491	live	ND	25.1
VAQS20212061	06/07/2021	Kemp's ridley sea turtle	Lancaster	37.6238	-76.34337	dead	ND	39*
VAQS20212062	06/07/2021	Loggerhead sea turtle	Hampton	37.002554	-76.320784	live	ND	ND
VAQS20212063	06/07/2021	Kemp's ridley sea turtle	Virginia Beach	36.843782	-75.969751	live	ND	25.3
VAQS20212064	06/08/2021	Loggerhead sea turtle	Northampton	37.252232	-76.023428	dead	M	87.1
VAQS20212065	06/08/2021	Kemp's ridley sea turtle	Hampton	37.035954	-76.289544	live	ND	27.5
VAQS20212066	06/08/2021	Loggerhead sea turtle	Hampton	37.035954	-76.289544	live	ND	56
VAQS20212067	06/10/2021	Loggerhead sea turtle	Northampton	37.250556	-76.0225	dead	ND	ND
VAQS20212068	06/10/2021	Unidentified sea turtle	Virginia Beach	36.843779	-75.969752	live	ND	ND
VAQS20212069	06/11/2021	Loggerhead sea turtle	Northumberland	37.935581	-76.318785	dead	ND	ND
VAQS20212070	06/12/2021	Loggerhead sea turtle	Norfolk	36.956872	-76.253487	dead	ND	61.6*
VAQS20212071	06/12/2021	Loggerhead sea turtle	Virginia Beach	36.756225	-75.946974	dead	F	51.9
VAQS20212072	06/13/2021	Kemp's ridley sea turtle	Norfolk	36.935993	-76.210545	dead	ND	55.5
VAQS20212073	06/13/2021	Loggerhead sea turtle	Mathews	37.4998656	-76.276613	dead	ND	ND
VAQS20212074	06/13/2021	Kemp's ridley sea turtle	Virginia Beach	36.830675	-75.968469	dead	ND	67*
VAQS20212075	06/13/2021	Kemp's ridley sea turtle	Hampton	37.0359543	-76.289646	live	ND	25.2
VAQS20212076	06/14/2021	Loggerhead sea turtle	Virginia Beach	36.86143	-75.977008	dead	F	99.2
VAQS20212077	06/14/2021	Loggerhead sea turtle	Mathews	37.512437	-76.285988	dead	ND	ND
VAQS20212078	06/15/2021	Kemp's ridley sea turtle	Newport News	36.984786	-76.441819	dead	M	44.8
VAQS20212079	06/15/2021	Kemp's ridley sea turtle	Lancaster	37.597263	-76.298889	live	ND	47.4
VAQS20212080	06/16/2021	Kemp's ridley sea turtle	Norfolk	36.958228	-76.255639	dead	M	39
VAQS20212081	06/17/2021	Loggerhead sea turtle	Norfolk	36.938245	-76.222252	dead	ND	ND
VAQS20212082	06/15/2021	Kemp's ridley sea turtle	Mathews	37.425067	-76.252648	dead	ND	ND
VAQS20212083	06/13/2021	Unidentified sea turtle	Mathews	37.435982	-76.252648	dead	ND	ND
VAQS20212084	06/17/2021	Loggerhead sea turtle	Northumberland	37.8839752	-76.240093	dead	ND	ND
VAQS20212085	06/17/2021	Kemp's ridley sea turtle	Norfolk	36.96183	-76.259559	live	ND	ND
VAQS20212086	06/17/2021	Kemp's ridley sea turtle	Norfolk	36.93676	-76.213767	live	M	33.5
VAQS20212087	06/17/2021	Kemp's ridley sea turtle	Virginia Beach	36.92413	-76.14833	dead	M	46
VAQS20212088	06/17/2021	Kemp's ridley sea turtle	Hampton	37.05687	-76.2832	dead	F	54.1
VAQS20212089	06/19/2021	Unidentified sea turtle	Norfolk	36.962267	-76.259238	live	ND	ND
VAQS20212090	06/19/2021	Loggerhead sea turtle	Northampton	37.264415	-76.01948	live	ND	71.1

Field Number	Strand Date	Species	Location	Latitude	Longitude	Condition	Sex	Length
VAQS20212091	06/19/2021	Loggerhead sea turtle	Northampton	37.153963	-75.976291	dead	ND	53.7*
VAQS20212092	06/21/2021	Loggerhead sea turtle	Northampton	37.0851753	-75.9689423	dead	ND	53.25
VAQS20212093	06/23/2021	Kemp's ridley sea turtle	Virginia Beach	36.587021	-75.87581	dead	ND	40.2*
VAQS20212094	06/23/2021	Loggerhead sea turtle	Virginia Beach	36.924256	-76.148743	dead	ND	76.5*
VAQS20212095	06/23/2021	Loggerhead sea turtle	Hampton	37.100212	-76.279215	dead	ND	ND
VAQS20212096	06/23/2021	Kemp's ridley sea turtle	Virginia Beach	36.924069	-76.149176	dead	F	54.5
VAQS20212097	06/23/2021	Unidentified sea turtle	Hampton	37.0007458	-76.3070639	live	ND	ND
VAQS20212098	06/23/2021	Loggerhead sea turtle	York	37.219994	-76.422783	dead	ND	ND
VAQS20212099	06/24/2021	Loggerhead sea turtle	Virginia Beach	36.683733	-75.918166	dead	ND	ND
VAQS20212100	06/23/2021	Loggerhead sea turtle	Virginia Beach	36.9258	-76.1588	dead	ND	ND
VAQS20212101	06/24/2021	Kemp's ridley sea turtle	Hampton	37.086608	-76.271617	live	ND	36
VAQS20212102	06/24/2021	Kemp's ridley sea turtle	Norfolk	36.93814	-76.218719	dead	ND	ND
VAQS20212103	06/24/2021	Loggerhead sea turtle	Mathews	37.495001	-76.274095	dead	ND	ND
VAQS20212104	06/27/2021	Kemp's ridley sea turtle	Virginia Beach	36.843781	-75.970012	live	ND	32
VAQS20212105	06/28/2021	Kemp's ridley sea turtle	James City	37.3914532	-76.6905674	dead	ND	ND
VAQS20212106	06/29/2021	Kemp's ridley sea turtle	Norfolk	36.936928	-76.214788	dead	ND	ND
VAQS20212107	06/29/2021	Kemp's ridley sea turtle	Hampton	37.036388	-76.290833	live	ND	42
VAQS20212108	07/01/2021	Unidentified sea turtle	Virginia Beach	36.8437659	-75.9697622	live	ND	ND
VAQS20212109	07/04/2021	Kemp's ridley sea turtle	Northampton	37.2458619	-76.0194546	dead	ND	ND
VAQS20212110	07/04/2021	Kemp's ridley sea turtle	Hampton	37.035975	-76.289572	live	ND	48.3
VAQS20212111	07/05/2021	Kemp's ridley sea turtle	York	37.175694	-76.394476	dead	F	40.3*
VAQS20212112	07/09/2021	Unidentified sea turtle	Virginia Beach	36.6943127	-75.9219076	live	ND	ND
VAQS20212113	07/11/2021	Loggerhead sea turtle	Northampton	37.165866	-75.986457	dead	M	96.2*
VAQS20212114	07/10/2021	Unidentified sea turtle	Norfolk	36.963913	-76.257425	live	ND	ND
VAQS20212115	07/11/2021	Kemp's ridley sea turtle	Hampton	37.035984	-76.289574	live	ND	31.1
VAQS20212116	07/12/2021	Green sea turtle	Norfolk	36.961943	-76.259506	live	ND	28.2
VAQS20212117	07/12/2021	Unidentified sea turtle	Mathews	37.3713949	-76.3543037	dead	ND	ND
VAQS20212118	07/20/2021	Loggerhead sea turtle	York	37.258968	-76.517975	live	F	62
VAQS20212119	07/23/2021	Kemp's ridley sea turtle	Norfolk	36.933854	-76.203621	dead	ND	ND
VAQS20212120	07/27/2021	Loggerhead sea turtle	Hampton	37.035964	-76.289536	live	ND	51.5
VAQS20212120.1	08/19/2021	Loggerhead sea turtle	Hampton	37.036708	-76.291651	live	ND	52.1

Field Number	Strand Date	Species	Location	Latitude	Longitude	Condition	Sex	Length
VAQS20212121	07/29/2021	Loggerhead sea turtle	Hampton	36.980833	-76.332633	dead	ND	ND
VAQS20212122	07/30/2021	Loggerhead sea turtle	Virginia Beach	36.903465	-75.9888375	dead	ND	ND
VAQS20212123	08/04/2021	Green sea turtle	Norfolk	36.929959	-76.188149	dead	F	26.7
VAQS20212124	08/02/2021	Loggerhead sea turtle	Accomack	37.723236	-75.567911	dead	ND	ND
VAQS20212125	08/05/2021	Kemp's ridley sea turtle	Virginia Beach	36.665808	-75.908572	dead	ND	ND
VAQS20212126	08/05/2021	Loggerhead sea turtle	Virginia Beach	36.921704	-76.0519546	dead	ND	77*
VAQS20212127	08/05/2021	Loggerhead sea turtle	Virginia Beach	36.950833	-76.0048	dead	ND	ND
VAQS20212128	08/05/2021	Loggerhead sea turtle	Virginia Beach	36.727299	-75.935794	dead	F	65
VAQS20212129	08/06/2021	Loggerhead sea turtle	Middlesex	37.5805	-76.274383	live	ND	59.3
VAQS20212130	08/08/2021	Green sea turtle	Virginia Beach	36.888814	-76.015109	dead	M	27.8
VAQS20212131	08/08/2021	Loggerhead sea turtle	Virginia Beach	36.920483	-76.06415	dead	M	62.9
VAQS20212132	08/13/2021	Kemp's ridley sea turtle	Northampton	37.13653	-75.972035	live	ND	ND
VAQS20212133	08/17/2021	Loggerhead sea turtle	Accomack	38.024137	-75.244659	dead	M	ND
VAQS20212134	08/20/2021	Loggerhead sea turtle	Virginia Beach	36.914589	-76.069025	dead	ND	ND
VAQS20212135	08/19/2021	Kemp's ridley sea turtle	Lancaster	37.62448	-76.332357	dead	ND	66*
VAQS20212136	08/25/2021	Loggerhead sea turtle	Virginia Beach	36.99175	-76.1194	dead	ND	ND
VAQS20212137	08/29/2021	Kemp's ridley sea turtle	Virginia Beach	36.83083	-75.96872	dead	F	68.8*
VAQS20212138	08/31/2021	Kemp's ridley sea turtle	Virginia Beach	36.9217	-76.078383	dead	ND	ND
VAQS20212139	08/31/2021	Loggerhead sea turtle	Norfolk	36.932462	-76.196685	dead	ND	ND
VAQS20212140	08/31/2021	Unidentified sea turtle	Hampton	37.036344	-76.290526	live	ND	ND
VAQS20212141	08/31/2021	Kemp's ridley sea turtle	Virginia Beach	36.901667	-76.058167	dead	ND	52.5*
VAQS20212142	09/02/2021	Loggerhead sea turtle	Virginia Beach	36.845979	-75.972506	dead	M	92.2
VAQS20212143	09/02/2021	Loggerhead sea turtle	Lancaster	37.676196	-76.33713	live	F	61.3
VAQS20212144	09/06/2021	Unidentified sea turtle	Norfolk	36.963288	-76.258142	live	ND	ND
VAQS20212145	09/07/2021	Loggerhead sea turtle	Northampton	37.430346	-75.98089	dead	ND	ND
VAQS20212146	09/08/2021	Kemp's ridley sea turtle	Hampton	37.01415	-76.298835	dead	F	34.4
VAQS20212147	09/11/2021	Loggerhead sea turtle	Norfolk	36.969543	-76.289901	dead	ND	ND
VAQS20212148	09/12/2021	Loggerhead sea turtle	Virginia Beach	36.671977	-75.911504	dead	ND	75
VAQS20212149	09/16/2021	Kemp's ridley sea turtle	Hampton	37.036415	-76.290594	live	ND	31.6
VAQS20212150	09/18/2021	Loggerhead sea turtle	Northampton	37.08615	-76.09433	dead	ND	ND
VAQS20212151	09/19/2021	Unidentified sea turtle	Norfolk	36.963763	-76.257618	live	ND	ND

Field Number	Strand Date	Species	Location	Latitude	Longitude	Condition	Sex	Length
VAQS20212152	09/19/2021	Loggerhead sea turtle	Virginia Beach	36.721215	-75.933849	live	ND	50.2
VAQS20212153	09/19/2021	Loggerhead sea turtle	Virginia Beach	36.950231	-76.150214	dead	ND	78.7*
VAQS20212154	09/25/2021	Unidentified sea turtle	Norfolk	36.962444	-76.259003	live	ND	ND
VAQS20212155	09/29/2021	Loggerhead sea turtle	Norfolk	36.936457	-76.212478	dead	ND	ND
VAQS20212156	10/04/2021	Kemp's ridley sea turtle	Northampton	37.1614412	-75.9801096	live	M	52.6
VAQS20212157	10/06/2021	Loggerhead sea turtle	Virginia Beach	36.89071	-75.98448	dead	F	60.3*
VAQS20212158	10/11/2021	Green sea turtle	Virginia Beach	36.77784	-75.95534	dead	F	29
VAQS20212159	10/13/2021	Kemp's ridley sea turtle	Virginia Beach	36.9103	-76.10121	dead	F	44
VAQS20212160	10/13/2021	Kemp's ridley sea turtle	Norfolk	36.943792	-76.232469	dead	ND	ND
VAQS20212161	10/14/2021	Loggerhead sea turtle	Hampton	37.090391	-76.271895	dead	M	ND
VAQS20212162	10/15/2021	Kemp's ridley sea turtle	Hampton	37.036447	-76.290785	live	ND	31.1
VAQS20212163	10/18/2021	Kemp's ridley sea turtle	Norfolk	36.962489	-76.271762	live	ND	49.6
VAQS20212164	10/18/2021	Unidentified sea turtle	Norfolk	36.937499	-76.216129	dead	ND	ND
VAQS20212165	10/19/2021	Loggerhead sea turtle	Northampton	37.487677	-75.9611	dead	ND	ND
VAQS20212166	10/23/2021	Unidentified sea turtle	Norfolk	36.96286	-76.258535	live	ND	ND
VAQS20212167	10/23/2021	Loggerhead sea turtle	Hampton	37.001	-76.307055	dead	ND	ND
VAQS20212168	10/24/2021	Loggerhead sea turtle	Virginia Beach	36.924442	-76.149543	dead	ND	84.5
VAQS20212169	10/24/2021	Loggerhead sea turtle	Virginia Beach	36.782083	-75.642567	dead	ND	ND
VAQS20212170	10/23/2021	Loggerhead sea turtle	Accomack	37.869117	-75.434667	dead	ND	ND
VAQS20212171	10/28/2021	Kemp's ridley sea turtle	Virginia Beach	36.734369	-75.938618	dead	F	25.5*
VAQS20212172	10/29/2021	Kemp's ridley sea turtle	Virginia Beach	36.82555	-75.96835	dead	M	46.2
VAQS20212173	11/01/2021	Green sea turtle	Norfolk	36.96861	-76.28101	dead	F	30.3
VAQS20212174	11/02/2021	Green sea turtle	Norfolk	36.936929	-76.214543	dead	M	31.9
VAQS20212175	11/04/2021	Loggerhead sea turtle	Norfolk	36.941382	-76.331962	dead	ND	ND
VAQS20212176	11/06/2021	Loggerhead sea turtle	Northampton	37.290171	-76.015597	dead	F	91
VAQS20212177	11/08/2021	Kemp's ridley sea turtle	Virginia Beach	36.826463	-75.968713	dead	M	37.5
VAQS20212178	11/08/2021	Loggerhead sea turtle	Poquoson	37.141985	-76.375751	dead	M	81.7
VAQS20212179	11/08/2021	Loggerhead sea turtle	Virginia Beach	36.9274211	-76.1664676	live	ND	66.5
VAQS20212180	11/12/2021	Green sea turtle	Hampton	37.0173	-76.29704	dead	F	27.6
VAQS20212181	11/12/2021	Kemp's ridley sea turtle	Virginia Beach	36.8490004	-75.9734362	dead	M	26.1
VAQS20212182	11/13/2021	Loggerhead sea turtle	Northampton	37.3233554	-76.0162594	live	F	85.7

Field Number	Strand Date	Species	Location	Latitude	Longitude	Condition	Sex	Length
VAQS20212183	11/14/2021	Kemp's ridley sea turtle	Virginia Beach	36.9204	-76.13345	dead	F	33.9
VAQS20212184	11/15/2021	Loggerhead sea turtle	Virginia Beach	36.5925	-75.876944	dead	ND	ND
VAQS20212185	11/16/2021	Loggerhead sea turtle	Northampton	37.42194	-75.98299	live	ND	51.9
VAQS20212186	11/16/2021	Loggerhead sea turtle	Northampton	37.326699	-76.015461	live	F	55.9
VAQS20212187	11/19/2021	Loggerhead sea turtle	Northampton	37.352354	-75.996685	live	F	61.4
VAQS20212188	11/20/2021	Loggerhead sea turtle	Northampton	37.42442	-75.9823	live	ND	75
VAQS20212189	11/21/2021	Loggerhead sea turtle	Norfolk	36.93356	-76.20132	dead	F	75.9
VAQS20212190	11/22/2021	Kemp's ridley sea turtle	Virginia Beach	36.724487	-75.934986	dead	F	27.7
VAQS20212191	11/24/2021	Green sea turtle	Norfolk	36.958494	-76.256254	dead	ND	29
VAQS20212192	11/24/2021	Loggerhead sea turtle	Northampton	37.32989	-76.01361	dead	M	60.1
VAQS20212193	11/27/2021	Green sea turtle	Accomack	37.867404	-75.36296	live	ND	26.4
VAQS20212194	11/27/2021	Loggerhead sea turtle	Northampton	37.137252	75.972099	dead	M	78.2
VAQS20212195	11/27/2021	Green sea turtle	Accomack	37.867125	-75.364475	live	ND	28.7
VAQS20212196	11/28/2021	Loggerhead sea turtle	Northampton	37.43963	-75.97841	dead	ND	64.3
VAQS20212197	11/30/2021	Loggerhead sea turtle	Northampton	37.490366	-75.960489	dead	ND	ND
VAQS20212198	12/01/2021	Loggerhead sea turtle	Accomack	37.870289	-75.359649	live	ND	48.7
VAQS20212199	12/02/2021	Loggerhead sea turtle	Norfolk	36.880028	-76.324827	dead	ND	ND
VAQS20212200	12/03/2021	Loggerhead sea turtle	Accomack	37.85203	-75.37935	dead	ND	ND
VAQS20212201	12/04/2021	Green sea turtle	Virginia Beach	36.8988	-76.04591	dead	F	30.6
VAQS20212202	12/04/2021	Loggerhead sea turtle	Hampton	37.005229	-76.31375	dead	ND	ND
VAQS20212203	12/11/2021	Green sea turtle	Norfolk	36.937832	-76.329671	live	ND	28
VAQS20212204	12/13/2021	Loggerhead sea turtle	Northampton	37.32894	-76.01447	dead	F	72.8
VAQS20212205	12/15/2021	Loggerhead sea turtle	Northampton	37.307199	-76.020872	dead	F	56.4
VAQS20212206	12/17/2021	Loggerhead sea turtle	Northampton	37.47651	-75.96274	dead	F	87
VAQS20212207	12/19/2021	Green sea turtle	Norfolk	36.931536	-76.192981	live	F	26.5
VAQS20212208	12/26/2021	Loggerhead sea turtle	Northampton	37.15493	-75.976647	dead	ND	ND
VAQS20212209	12/26/2021	Loggerhead sea turtle	Northampton	37.486185	-75.936007	dead	ND	ND
VAQS20212210	12/31/2021	Loggerhead sea turtle	Virginia Beach	36.66215	-75.90615	dead	ND	ND

Table 4: Live stranded sea turtles recorded by VAQS in 2021, n=61. Notes: Sea turtles that stranded in 2020 with a disposition in 2021 are also listed, n=2.

Field Number	Strand Date	Species	Location	Disposition	Disposition Date
VAQS20202177	10/18/2020	Loggerhead	Dam Neck Base	Rehabilitated and released	5/19/21
VAQS20202199	11/19/2020	Loggerhead	Exmore	Rehabilitated and released	5/19/21
VAQS20212002	01/10/2021	Loggerhead	Tidewater Yacht Marina, Dock C	Rehabilitated and released	5/19/21
VAQS20212010	05/08/2021	Kemp's ridley	Fort Monroe Pier	Unable to recover	
VAQS20212011	05/10/2021	Kemp's ridley	Thimble Shoals Channel, Chesapeake Bay	Died at rehab facility	5/10/21
VAQS20212015	05/15/2021	Kemp's ridley	Sandbridge, Whiting Lane	Rehabilitated and released	5/15/21
VAQS20212015.1	05/19/2021	Kemp's ridley	Buckroe Fishing Pier	Rehabilitated and released	5/20/21
VAQS20212016	05/15/2021	Kemp's ridley	Oceanview Fishing Pier	Rehabilitated and released	5/16/21
VAQS20212018	05/17/2021	Kemp's ridley	Virginia Beach Fishing Pier	Rehabilitated and released	5/17/21
VAQS20212020	05/17/2021	Kemp's ridley	End of Buckroe Fishing Pier	Rehabilitated and released	6/20/21
VAQS20212021	05/18/2021	Kemp's ridley	Little Island Fishing Pier	Rehabilitated and released	7/6/21
VAQS20212022	05/18/2021	Kemp's ridley	James T. Wilson Fishing Pier	Rehabilitated and released	5/25/21
VAQS20212023	05/19/2021	Kemp's ridley	Buckroe Fishing Pier	Rehabilitated and released	5/19/21
VAQS20212054	06/02/2021	Unidentified	Virginia Beach Fishing Pier	Unable to recover	
VAQS20212060	06/06/2021	Kemp's ridley	VBFP	Rehabilitated and released	6/25/21
VAQS20212062	06/07/2021	Loggerhead	man-made lagoon from HRBT expansion	Unable to recover	
VAQS20212063	06/07/2021	Kemp's ridley	Virginia Beach Fishing Pier	Rehabilitated and released	6/17/21
VAQS20212065	06/08/2021	Kemp's ridley	Buckroe Beach, James T. Wilson FP	Rehabilitated and released	7/13/21
VAQS20212066	06/08/2021	Loggerhead	Buckroe Beach, James T. Wilson FP	Rehabilitated and released	6/17/21
VAQS20212068	06/10/2021	Unidentified	VBFP	Unable to recover	
VAQS20212075	06/13/2021	Kemp's ridley	Buckroe Fishing Pier	Rehabilitated and released	6/15/21
VAQS20212079	06/15/2021	Kemp's ridley	Chesapeake Bay, mouth of Rappahannock River	Rehabilitated and released	7/9/21
VAQS20212085	06/17/2021	Kemp's ridley	Oceanview FP	Unable to recover	
VAQS20212086	06/17/2021	Kemp's ridley	East Ocean View	Euthanized at rehab facility	6/17/21
VAQS20212089	06/19/2021	Unidentified	Ocean View Fishing Pier	Unable to recover	

Field Number	Strand Date	Species	Location	Disposition	Disposition Date
VAQS20212090	06/19/2021	Loggerhead	Cape Charles Marina Dock A	Taken to rehab facility	
VAQS20212097	06/23/2021	Unidentified	Engineer Wharf Fishing Pier	Unable to recover	
VAQS20212101	06/24/2021	Kemp's ridley	Grandview Nature Preserve	Rehabilitated and released	6/25/21
VAQS20212104	06/27/2021	Kemp's ridley	Virginia Beach Fishing Pier	Rehabilitated and released	6/27/21
VAQS20212107	06/29/2021	Kemp's ridley	Buckroe Fishing Pier	Rehabilitated and released	6/30/21
VAQS20212108	07/01/2021	Unidentified	Virginia Beach Fishing Pier	Unable to recover	
VAQS20212110	07/04/2021	Kemp's ridley	Buckroe FP	Rehabilitated and released	7/17/21
VAQS20212112	07/09/2021	Unidentified	Little Island Fishing Pier	Unable to recover	
VAQS20212114	07/10/2021	Unidentified	Oceanview Fishing Pier	Unable to recover	
VAQS20212115	07/11/2021	Kemp's ridley	Buckroe FP	Rehabilitated and released	8/26/21
VAQS20212116	07/12/2021	Green	Oceanview Fishing Pier, at first awning	Rehabilitated and released	7/13/21
VAQS20212118	07/20/2021	Loggerhead	York River	Euthanized at rehab facility	7/30/21
VAQS20212120	07/27/2021	Loggerhead	Buckroe Fishing Pier	Rehabilitated and released	8/2/21
VAQS20212120.1	08/19/2021	Loggerhead	Buckroe Fishing Pier	Rehabilitated and released	12/17/21
VAQS20212129	08/06/2021	Loggerhead	Mouth of Rappahannock River	Rehabilitated and released	12/17/21
VAQS20212132	08/13/2021	Kemp's ridley	Cape Charles KOA campground	Unable to recover	
VAQS20212140	08/31/2021	Unidentified	James T. Wilson Fishing Pier	Unable to recover	
VAQS20212143	09/02/2021	Loggerhead	White Stone; Lee's Cove in Dimer Creek	Died at rehab facility	9/13/21
VAQS20212144	09/06/2021	Unidentified	Oceanview Fishing Pier	Unable to recover	
VAQS20212149	09/16/2021	Kemp's ridley	Buckroe Fishing Pier	Taken to rehab facility	
VAQS20212151	09/19/2021	Unidentified	Oceanview Fishing Pier	Unable to recover	
VAQS20212152	09/19/2021	Loggerhead	Sandbridge Beach, behind 3064 Sandpiper Rd.	Taken to rehab facility	
VAQS20212154	09/25/2021	Unidentified	Oceanview Fishing Pier	Unable to recover	
VAQS20212156	10/04/2021	Kemp's ridley	Kiptopeke State Park	Euthanized at rehab facility	10/11/21
VAQS20212162	10/15/2021	Kemp's ridley	Buckroe Fishing Pier	Rehabilitated and released	10/15/21
VAQS20212163	10/18/2021	Kemp's ridley	Willoughby Bay	Taken to rehab facility	

Field Number	Strand Date	Species	Location	Disposition	Disposition Date
VAQS20212166	10/23/2021	Unidentified	Oceanview Fishing Pier	Unable to recover	
VAQS20212179	11/08/2021	Loggerhead	Little Creek Base	Taken to rehab facility	
VAQS20212182	11/13/2021	Loggerhead	Savage Neck Dunes Nature Preserve	Taken to rehab facility	
VAQS20212185	11/16/2021	Loggerhead	Vaucluse Shores	Rehabilitated and released	1/26/22
VAQS20212186	11/16/2021	Loggerhead	Savage Neck Beach	Died at rehab facility	12/4/21
VAQS20212187	11/19/2021	Loggerhead	Wilkins Beach, north of Savage Neck Preserve	Died at rehab facility	11/29/21
VAQS20212188	11/20/2021	Loggerhead	Vaucluse Shores, south of beach access	Taken to rehab facility	
VAQS20212193	11/27/2021	Green	Tom's Cove Beach, Chincoteague NWR	Taken to rehab facility	
VAQS20212195	11/27/2021	Green	Tom's Cove Beach, Chincoteague NWR	Taken to rehab facility	
VAQS20212198	12/01/2021	Loggerhead	CNWR, Tom's Cove	Rehabilitated and released	1/26/22
VAQS20212203	12/11/2021	Green	Norfolk Naval Base, Pier 3	Taken to rehab facility	
VAQS20212207	12/19/2021	Green	21st Bay, East Ocean View	Died at rehab facility	12/22/21

Figures

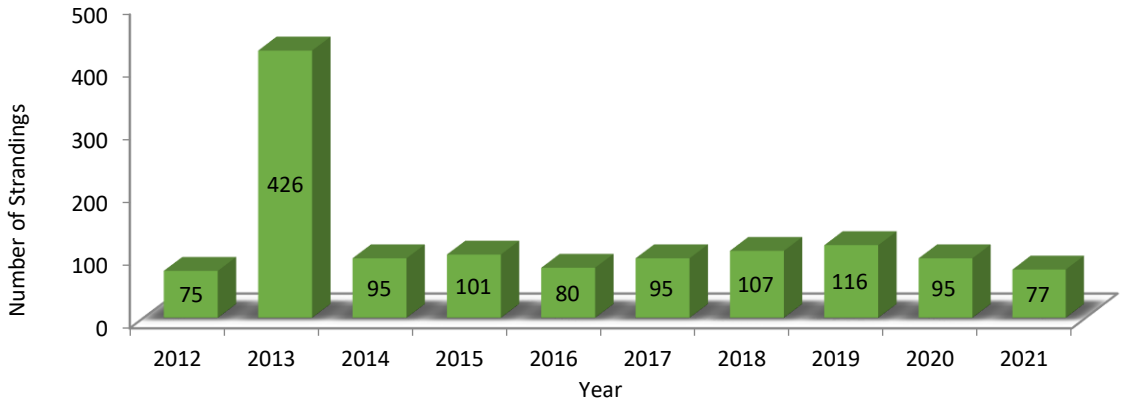


Figure 1: Yearly frequency of marine mammal strandings in Virginia, 2012-2021.

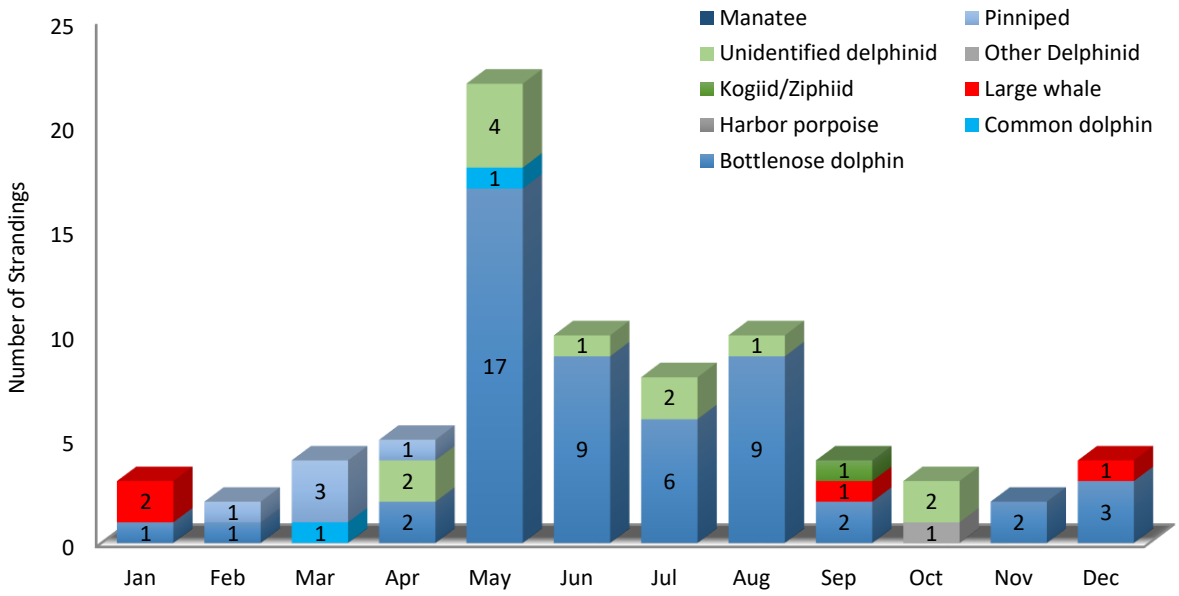


Figure 2: Monthly frequency of marine mammal strandings by species group in Virginia during 2021.

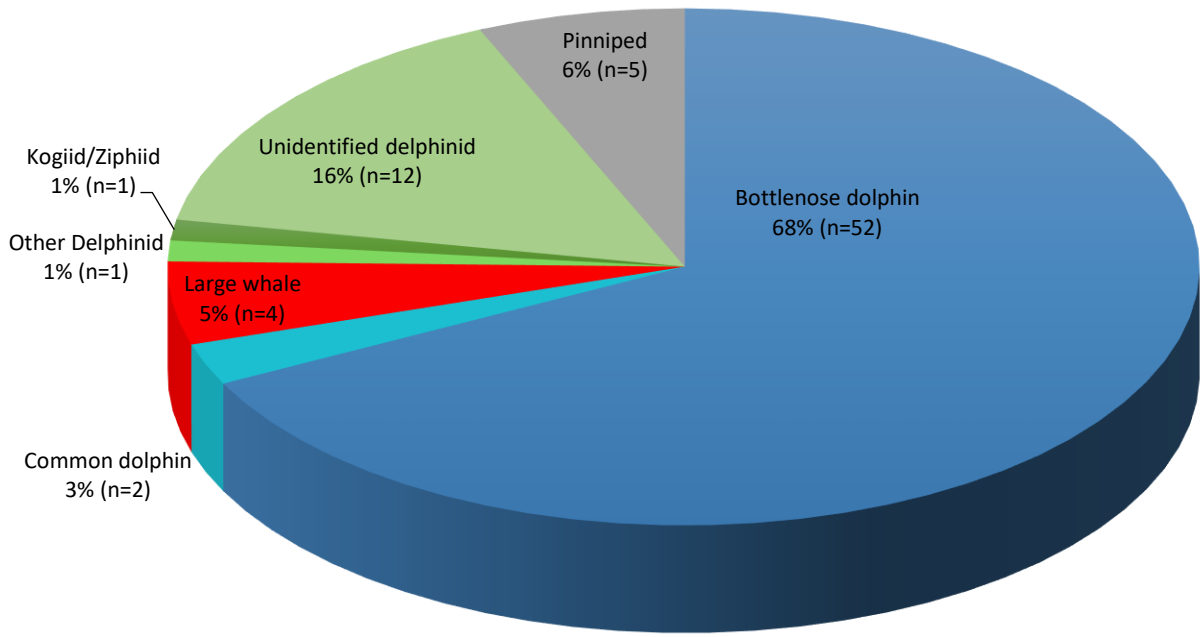


Figure 3: Marine mammal stranding groups in Virginia during 2021.

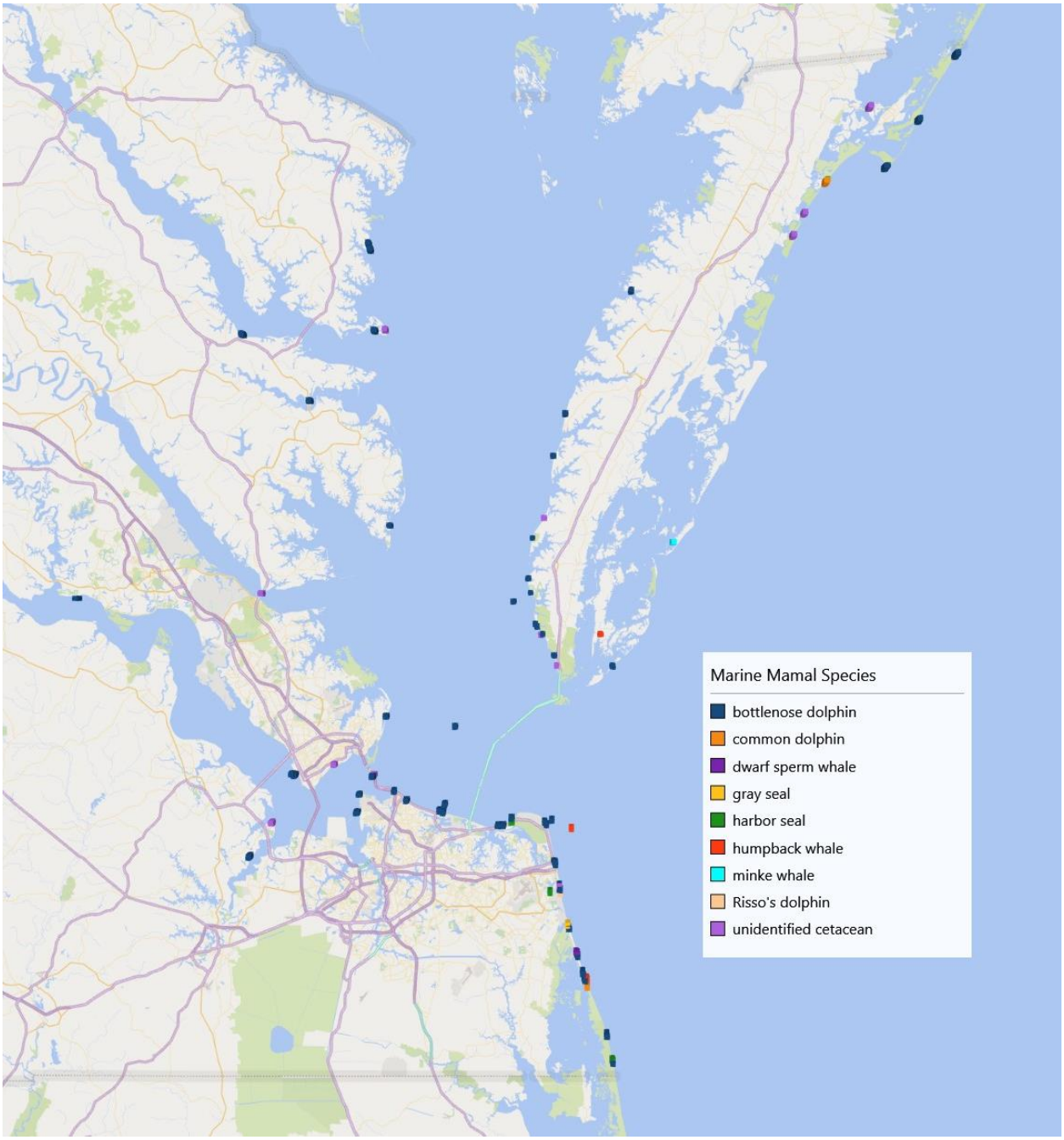


Figure 4: Locations of Virginia marine mammal strandings in 2021.

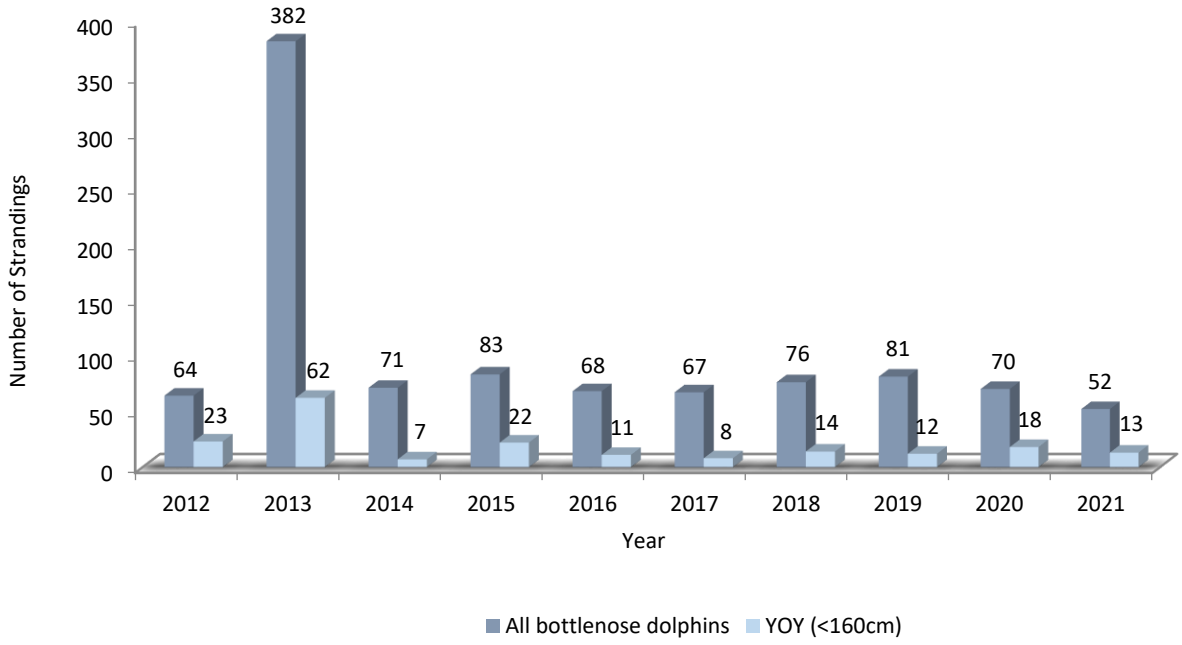


Figure 5: Yearly stranding frequency of bottlenose dolphin in Virginia, 2012-2021 (YOY = young of the year).

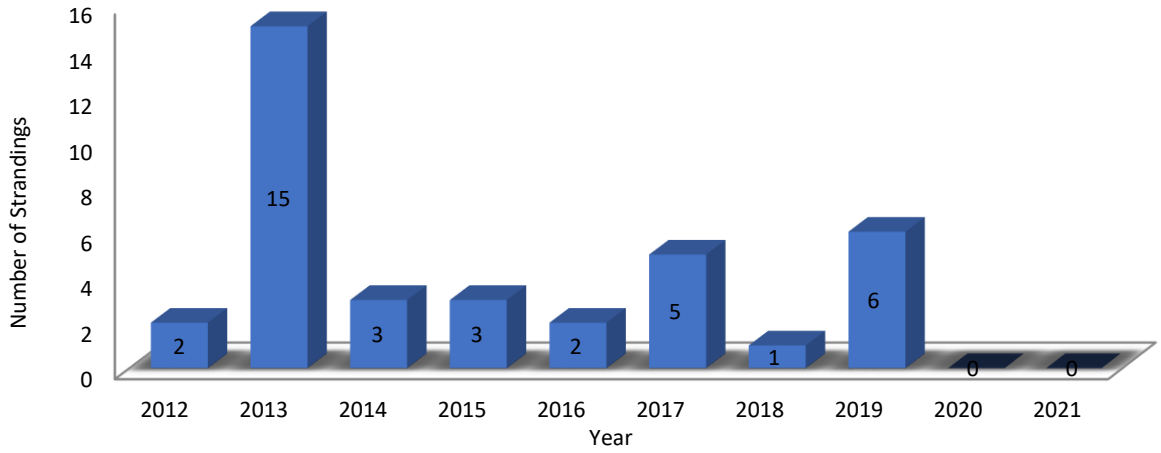


Figure 6: Yearly stranding frequency of harbor porpoise in Virginia, 2012-2021.

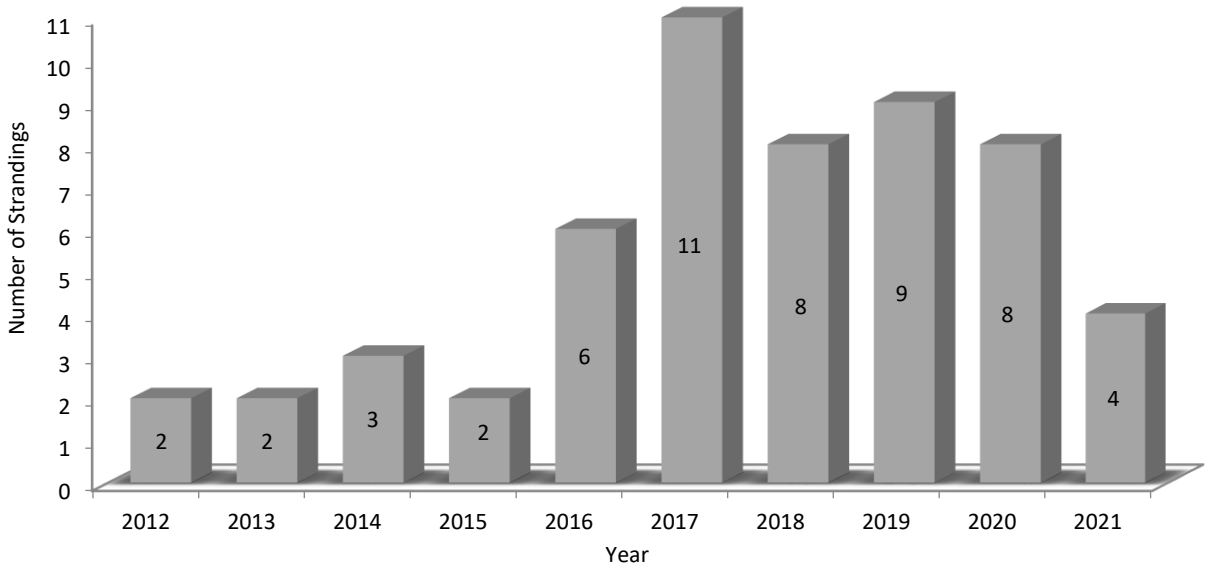


Figure 7: Yearly stranding frequency of large whales in Virginia, 2012-2021.

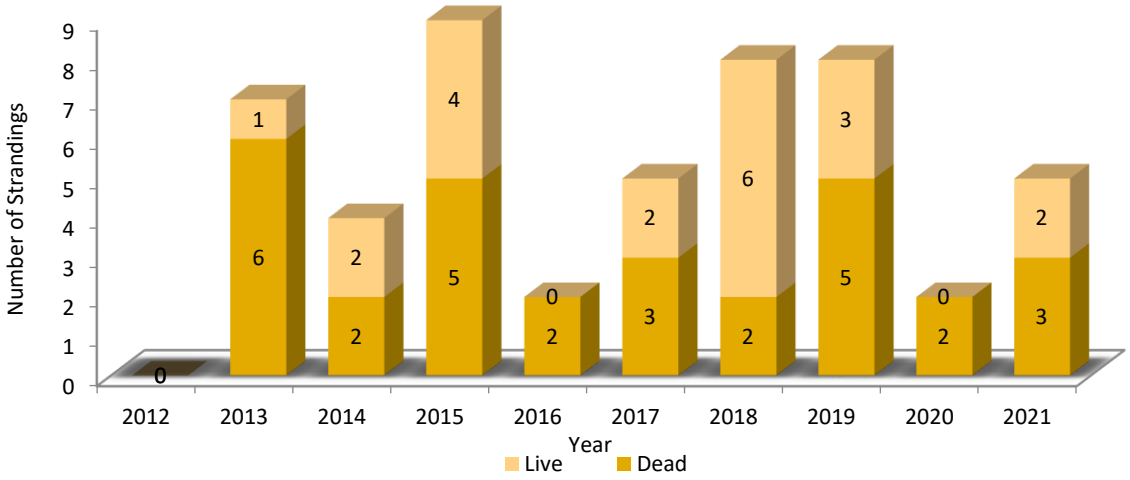


Figure 8: Yearly stranding frequency of pinnipeds in Virginia, 2012-2021.

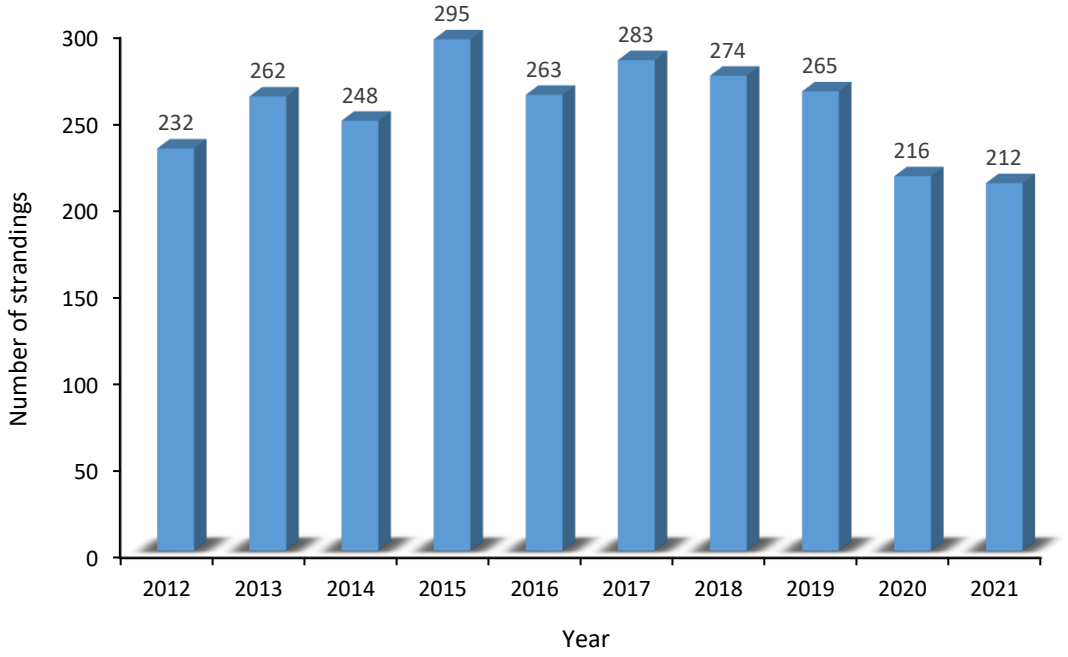


Figure 9: Yearly frequency of sea turtle strandings in Virginia, 2012-2021.

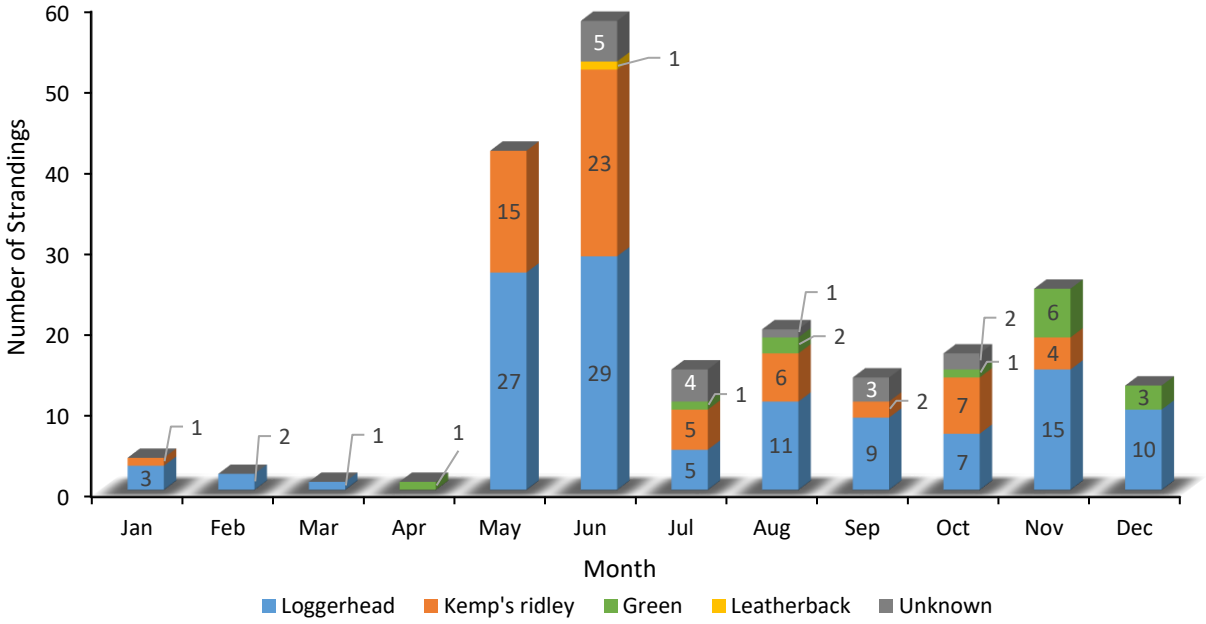


Figure 10: Monthly frequency of sea turtle strandings by species in Virginia during 2021.

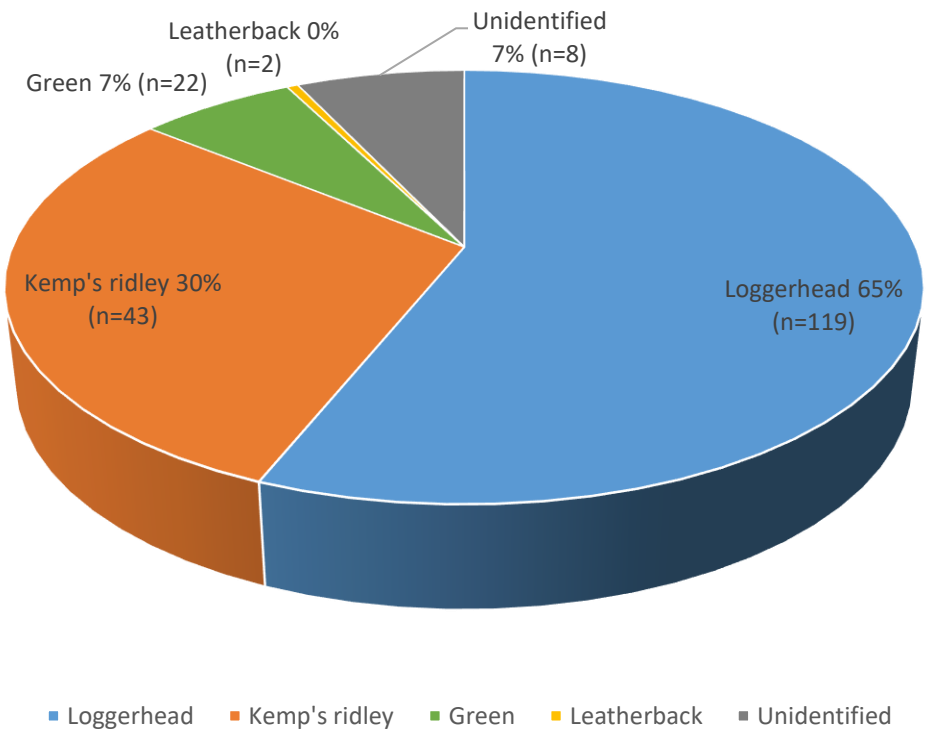


Figure 11: Frequency of sea turtle species among Virginia strandings in 2021.

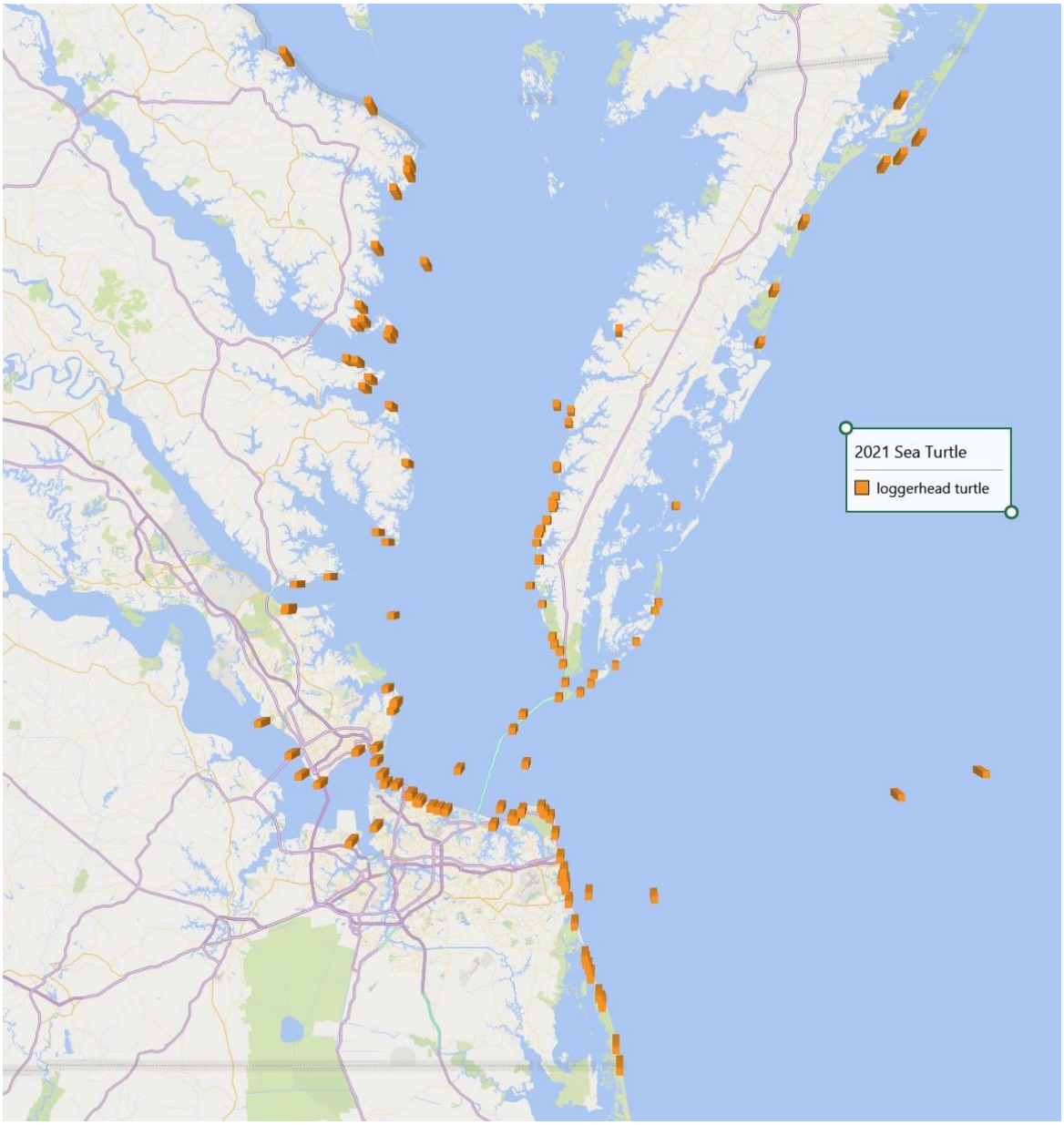


Figure 12: Locations of loggerhead sea turtle strandings in Virginia in 2021.

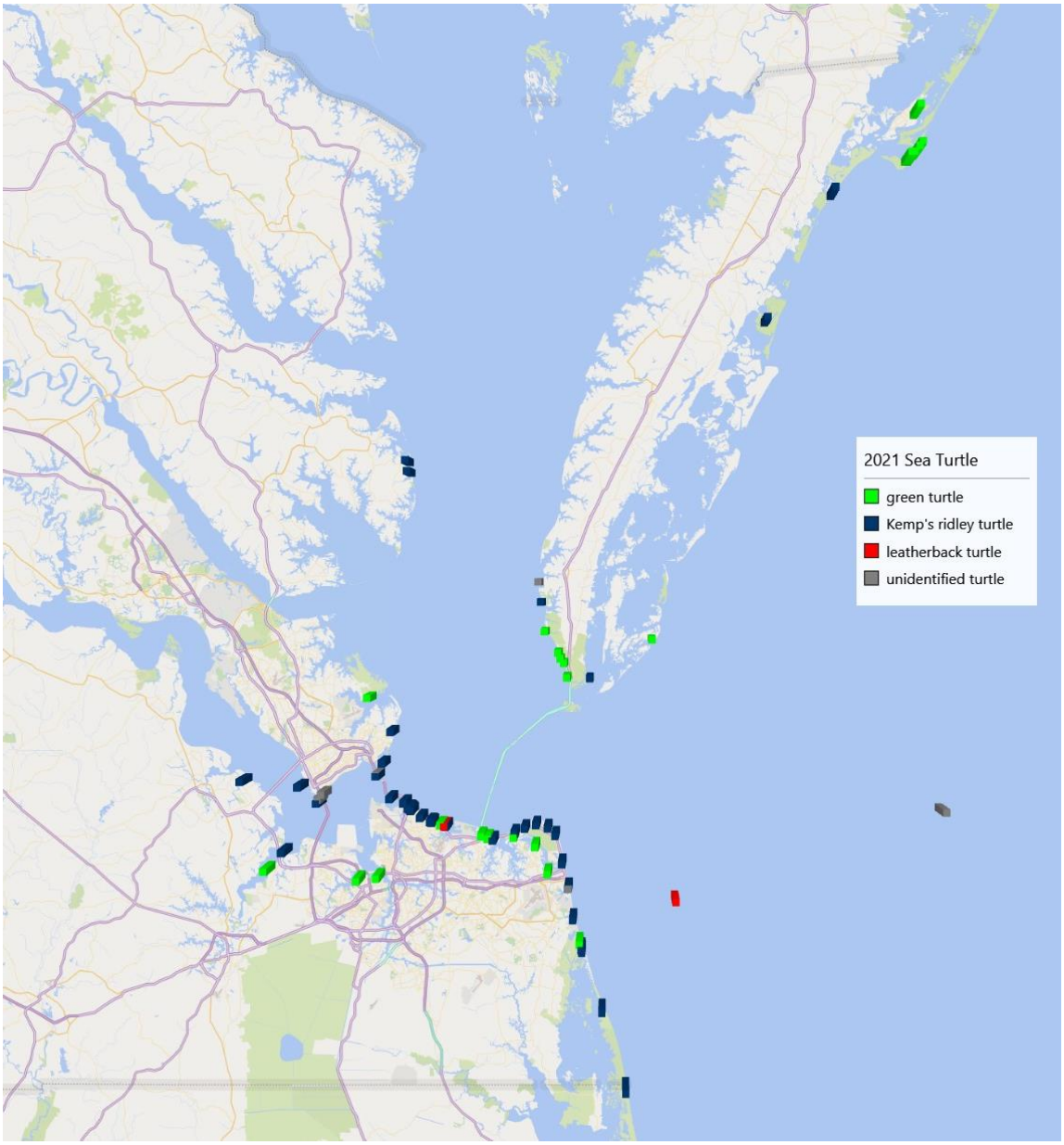


Figure 13: Locations of Virginia sea turtle strandings in 2021, excluding loggerheads.

Appendix I: Professional and Education Activities

Educational Activities	Date	Attendance	Location
Volunteer Lunch & Learn - Marine Mammals & Threats in VA	2/12/21	37	Virtual
Virginia Wesleyan University STEM career event	3/10/21	Unknown	Virtual

Outreach Opportunities	Date	Attendance	Location
Mock Stranding (high school students)	12/3, 12/8, & 12/10/21	19	Main Aquarium

Public Presentations	Date	Attendance	Location
Rotary Club of Town Center Virginia Beach, R&C Presentation	2/17/21	14	Virtual
Cape Henry Rotary Club, R&C Presentation	6/2/21	24	Virtual
Cookie Cutter Collectors Club National Convention, R&C Presentation	6/5/21	97	Virginia Beach
East Beach Forum, R&C Presentation	10/3/21	70	Norfolk
Baylake Assisted Living Center, R&C Presentation	11/13/21	20	Virginia Beach

Stranding Center Tours & Group Presentations	Date	Attendance	Location
GARSCON DMACC tour	4/13/21	~25	Virtual
VBPD Officer Tour	6/27/21	3	DMACC
VBFD tour	7/14/21	~7	DMACC
Greg Silber student necropsy training	8/3/21	12	DMACC

Conferences and Meetings	Date	Attendance	Location
Sea Turtle SAFE Program Annual Meeting	2/4, 2/12, 3/24	16	Virtual
AZA Mid-Year Meeting, Sea Turtle SAFE Program Update	3/25/21	60	Virtual
AZA Annual Conference, Sea Turtle SAFE Program Presentation	9/9/21	60	Virtual
Virgina CZM Program, Virginia's Coastal and Ocean Future, Presentation	11/17/21	50	Virtual

Staff Training	Date	Attendance	Location
Ezy-lift training (interns/fellows)	6/14/21	2	DMACC
Ezy-lift training and theory of pulleys (interns/fellows)	6/21/21	3	DMACC
Gross morphology and osteology of dolphins	6/29/21	3	DMACC
Necropsy training (interns/fellows)	7/22/21	3	DMACC
Introduction to marine mammal morphology	7/19/21	3	DMACC
Beach driving training (interns/fellows)	6/28/21	2	DMACC

Stranding Response Team & Cooperator Meetings & Trainings	Date	Attendance	Location
Cold Stun Sea Turtle and Live Seal Training (volunteers)	11/29/21	37	Virtual
Husbandry Training (volunteers)	6/1/21	23	DMACC
Response Training (volunteers)	6/1/21	30	DMACC
Sea Turtle Nest Training	5/1/21	12	MACC
Pier Partner Training	5/15 & 5/19/21	5	MACC

Other	Date	Attendance	Location
Expert panelist-NROC/MARCO Offshore Wind Transmission Webinar Series #1	1/29/21	414	Virtual
Expert panelist-NROC/MARCO Offshore Wind Transmission Webinar Series #2	2/5/21	368	Virtual
Expert panelist-NROC/MARCO Offshore Wind Transmission Webinar Series #3	2/12/21	417	Virtual
5 year Ocean strategy planning event VA-DEQ	2/25/21	Unknown	Virtual
NROC/MARCO Marine Life Data Working Group invited expert	2/25/21	35	Virtual
Talk with advanced biology class for Dianna Muler (former staff)	4/21/21	18	Virtual
TNC Fish, habitat, & OSW - VA science discussion	4/21/21	14	Virtual
Loggerhead turtle high use areas in NW Atlantic & Med	3/22 & 4/21/21	27 & 17	Virtual
ALWTRT webinar	1/7/21	70	Virtual
ALWTRP Public Comments	2/10/21	N/A	Virtual
ALWTRT webinar	2/25/21	70	Virtual
ALWTRT Research caucus call	3/2/21	7	Virtual
ALWTRT NARW Population update	3/11/21	~30	Virtual
ALWTRT Pot/Trap Decision Support Tool update review	3/18/21	~25	Virtual
ALWTRT NARW Calving update	3/25/21	~30	Virtual
ALWTRT NARW Entanglement summary update	4/1/21	~30	Virtual
ALWTRT Canadian NARW management measures update	4/8/21	~40	Virtual
ALWTRT NE NARW Monitoring update	4/15/21	~30	Virtual
ALWTRT Gillnet Decision Support Tool review (Research Caucus)	4/22/21	7	Virtual
Atlantic Large Whale Take Reduction Team meeting (Gillnets Mid-Atlantic Focus)	4/29/21	60	Virtual
UNCW Graduate student oral exam	4/30/21	7	Virtual

University of Padova (Italy) & Universitad Politecnica de Catalunya (Spain) PhD thesis defense judge	6/17/21	6	Virtual
UME Working group panel on knots in lines and their threat to large whales	7/14/21	~23	Virtual
VA windfarm construction planning and monitoring call (Dominion)	7/12/21	7	Virtual
UME Working group panel on knots in lines and their threat to large whales	7/29/21	~23	Virtual
UME Working group panel on knots in lines and their threat to large whales	7/30/21	~23	Virtual
NOAA/SRG Consultation on how to apportion NARW mortalities and SI	8/12/21	3	Virtual
NOAA consultation on how to deal with wound chronicity in Serious Injury determinations	9/8/21	7	Virtual
Delaware fin whale euthanasia consultation and necropsy lead	8/26-8/27	10	Virtual & Delaware
NOAA consultation on preparation of questionnaire on knots and NARW for TRT & UME working group expert elicitation	9/9/21	2	Virtual
US Navy consultation on delphinid peripheral cranial nerve anatomy in preparation for surgical procedure on Navy dolphin	8/12/21	4	Virtual
Large whale euthanasia techniques consultation for Australian govt	11/3/21	9	Virtual
WGMMUME annual meeting	11/15-11/17	29	Virtual
Regional PAM deployment coordination team	Monthly since Aug	10	Virtual
Regional Wildlife Science Entity (RWSE) kickoff meeting	7/22/2021	100+	Virtual
Regional Wildlife Science Entity (RWSE) Marine Mammal Subcommittee kickoff meeting	9/30/2021	75	Virtual
Regional Wildlife Science Entity (RWSE) Marine Mammal Subcommittee meeting	12/10/2021	28	Virtual
CZM Virginia Ocean Planning meeting	10/21/2021	15	Charles City, VA
UME Annual working group meeting	11/16-11/18	~30	Virtual
Cooperative training workshop on seal-fisheries interactions for fishermen, scientists, stranding network personnel and managers (panel members)	12/9-12/10	~50	Virtual
NOAA ALWTRT Gear Advisory Panel assignment	11/19/2021	7	Virtual
NOAA Transboundary NARW necropsy leads steering committee meeting	12/14/2021	11	Virtual
NOAA Virtual Large Whale Necropsy Training Module steering committee	12/16/2021	9	Virtual
NOAA NARW Virtual Case Review steering committee	12/17/2021	11	Virtual

Book Chapters, Scientific Papers and Presentations (VAQ staff in bold)

Publications

- Robinson N, Garcia-Parraga D, Stacy B, **Costidis A**, Blanco G, Clyde-Brockway C, Hynna Hass H, Harms C, Patel S, Stacy N, Fahlman A. 2021. A baseline model to estimate risk of gas embolism in sea turtles during routine dives. Frontiers in Physiology. doi: 10.3389/fphys.2021.678555
- **Rowlands C**, McLellan W, Rommel S, **Costidis A**, Yopak K, Koopman H, Glandon H, Pabst D. 2021. Comparative morphology of the spinal cord and associated vasculature in shallow versus deep diving cetaceans. Journal of Morphology. doi: doi.org/10.1002/jmor.21395
- Keenan T, McLellan W, Rommel S, **Costidis A**, Harms C, Thewissen H, Rotstein D, Gay M, Potter C, Taylor A, Wang Y, Pabst D. 2021. Gross and histological morphology of the cervical gill slit gland of the pygmy sperm whale (*Kogia breviceps*). Anatomical Record. doi: doi.org/10.1002/ar.24707

Presentations (as Primary Presenter)

- **Costidis A**. Circulatory Anatomy of Marine Mammals. UNCW Marine Mammal class lecture. 2021. Virtual (Invited Speaker).
- **Rowlands C**. Comparative Morphology of the Spinal Cord and Associated Vasculature in Shallow Versus Deep Divers. UNCW Marine Mammal class lecture. 2021. Virtual (Invited Speaker).

Presentations (as Coauthor)

- Deming A, **Costidis A**, et al. Exposure to low salinity waters identified as cause of the 2019 Northern Gulf of Mexico Bottlenose Dolphin Unusual Mortality Event. 2021 Wildlife Disease Association & European Wildlife Disease Association Joint Conference.
- Fauquier D, **Costidis A,** et al. 2017-2021 (as of 16 August) North Atlantic Right Whale Unusual Mortality Event. 2021 Right Whale Consortium.

Scientific Review Work

- **Costidis A**: Scientific Reports (Zhang et al. Occipital-dural muscle: A specialized myodural bridge in narrow-ridge finless porpoise (*Neophocaena asiaorientatlis*)); February 2021.
- **Costidis A**: Diseases of Aquatic Organisms (Weisbrod et al. Manatee calf mortality in Florida: A retrospective review of pathology data from cases admitted from 2009-2017); April 2021.
- **Costidis A, Rowlands C**: Journal of Morphology (DaSilva et al. Morphology and growth of the ventricular myocardium of *Sotalia guianensis* (van Benèdèn, 1864)); August 2021.

Appendix II: Highlights of the Year – Marine Mammals

A juvenile harbor seal was first reported in March as active and free-swimming in Owl Creek, Virginia Beach with a fishing lure hanging from its mouth. The following day, the animal was extremely lethargic and was easily captured via hoop net from the side of a vessel. The fishing lure and hook were visible embedded near the the mouth, with monofilament leader and braided fishing line attached and dangling loosely (Figure 14). The animal received supportive treatment and the hook was successfully removed. The following day, the animal presented in much poorer condition and diagnostics suggested aspiration pneumonia. Despite medical intervention throughout the day the animal went into respiratory arrest. Necropsy revealed pulmonary emphysema, mucopurulent exudate in airways, and severe pulmonary congestion (Figure 15). The gastrointestinal tract was mostly empty, except for a mild to moderate parasitic infection. The rapid decline of the animal in the field and following admission, clinical values (acidosis), and gross pulmonary findings suggest this animal died due to aspiration pneumonia. The original cause of the aspiration is unknown and may be linked to the depredation incident. The empty gastrointestinal tract and mild to moderate parasitic infection may suggest chronic debilitation or failure to thrive.

Figure 14: Lure and hook visible embedded in the left commissure of the mouth

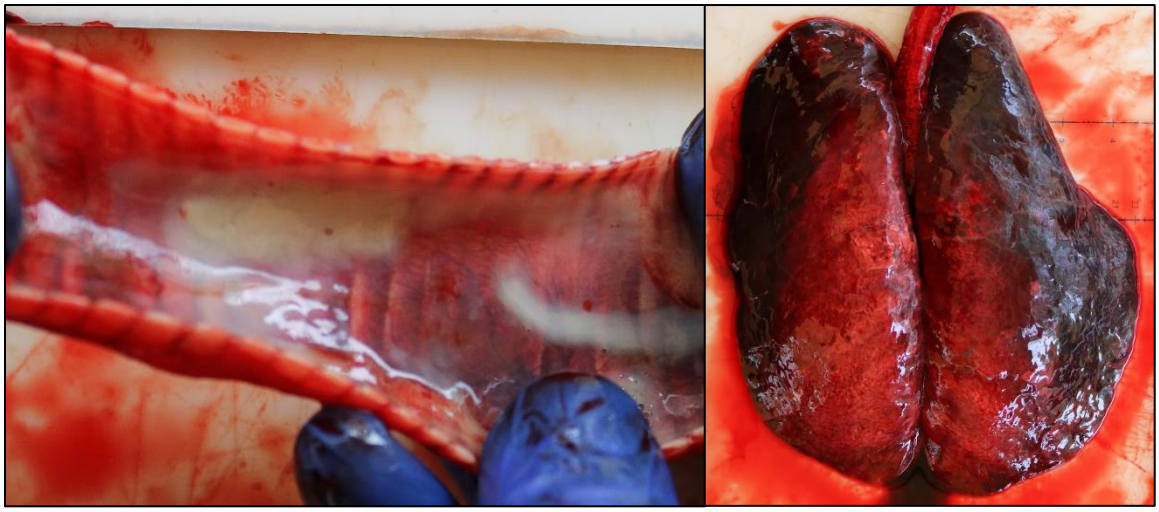


Figure 15: Airways contained moderate white mucopurulent froth (left). Lungs exhibited extensive purple coloration along cranial and ventral margins consistent with congestion (right).

VAQS continues to expertly document evidence of entanglements. One example was a bottlenose dolphin that stranded deceased in Grandview in June. This animal presented with extensive evidence of monofilament net impressions and lacerations on the rostrum/mandible, ventrum, and all appendages (Figure 16). Froth in the lungs, perivascular edema, emphysematous lungs, and peritoneal herniations found during necropsy are all potential sequellae of peracute underwater entrapment (Epple 2020). Another bottlenose dolphin stranded deceased in White Stone in August with evidence of twisted twine impressions on the rostrum and mandible (Figure 17). The animal exhibited rib fractures, bloody lymph fluid draining to the pulmonary marginal lymph nodes, perivascular edema, locally extensive staining, and bloody fluid between the right scapula and periosteum. Many of these findings are consistent with peracute underwater entrapment. The severity of the entanglement impressions as well as the internal findings support that both of these animals likely stranded and died due to the gear entanglements.

Figure 16: Lacerations and impressions on rostrum (top left, top middle), flukes (top right), pectoral flippers (bottom left) and dorsal fin (bottom right).

Figure 17: Twisted twine ligature impressions around rostrum and mandible, detail on right.

In addition to net entanglements, a deceased bottlenose dolphin entangled in pot gear was reported on 22 May 2021 and officers with Virginia Marine Resources Commission (VMRC) responded that day. On 24 May 2021, VMRC and VAQS staff responded again and found the animal and gear in the same location, presumably anchored to the bottom. One bullet buoy was wrapped tightly around the peduncle and a group of five other buoys floated ~20 ft behind the carcass (Figure 18). During the response, the line between the animal and the group of 5 buoys got wrapped in a propeller prompting VMRC to cut the line. VAQS then cut the line near the animal to retrieve Buoy 4 and free the carcass from the boat. The group of 5 buoys freed

itself from the propeller shortly after leaving the carcass. There was a group of four tangled lines and two taught lines; the two taught lines needed to be cut to haul the gear. In total, four cuts were made while retrieving the gear. Six pots were recovered, but there could have been up to nine on the animal in total. The pots were all actively baited, contained live crabs, and exhibited almost no biofouling, indicating they were likely actively fished pots and not ghost gear. The gear consisted of a variety of materials and configurations, and all pot material, knot types, warp details, and buoy descriptions and markings were well documented (Figure 18). After consultation with the NOAA bottlenose dolphin Take Reduction Team coordinator, we believe this is the largest number of pots involved in a single bottlenose dolphin entanglement event.

Figure 18: Left: Carcass during VAQS/VMRC response on 24 May 2021. Buoy 4 was wrapped around the animal's peduncle and a group of 5 other buoys floated ~20 ft behind the carcass. Right: All six recovered pots, line, and buoys.

Two live common dolphins stranded in 2021 with similar findings. The first dolphin stranded in March on Wallops Island (Figure 19). This animal reportedly circled near the shore for ~2 hours prior to stranding, and was then pushed back out by members of the public twice before VAQS was contacted. The second dolphin stranded in May at Back Bay National Wildlife Refuge with evidence of shark predation. In both cases, the animals exhibited unstable vitals in the field and expired after administration of pre-euthanasia sedatives. Necropsy findings in both revealed trauma presumptively associated with the stranding itself (i.e. ventral erythema, scapular hemorrhages, sediment in airways), as well as additional pathology for which it was difficult to determine if they were pre-existing or were related to the stranding event (ex: pancreatic hemorrhages, lung pathology). In addition, both cases exhibited parasitic infections within the pterygoid sinuses. Though the presence of parasites is not uncommon in this species, their severity combined with the pre-stranding behaviors suggests that a neurological component is a possible cause of the strandings. However, due to the lack of significant findings presumptively present prior to the stranding, the causes of stranding could not be confidently determined.

Figure 19: Staff evaluating live common dolphin that stranded in Wallops Island (top). Shark predation present on live common dolphin that stranded in Back Bay National Wildlife Refuge (bottom).

Appendix III: Highlights of the Year – Sea Turtles

The large volume of reported dredge takes of sea turtles in 2020 tapered off at the beginning of 2021. One dead presumed take was reported to VAQS in February, and one live sea turtle was found on the overflow screen of an active dredge in May. Protected species observers onboard the vessel reported the incidental take to VAQS and the animal was admitted into rehabilitation (Figure 20). The animal was apneic, bradycardic, and lethargic upon admit and was found dead later that day. Necropsy findings included fractures to the carapace, plastron, and front flipper; a presumptive inertial tear of the liver with associated hemorrhage into the coelom; retrocoelomic hemorrhage; and a pulmonary hematoma.

Figure 20: 2021 live dredge take at admit (left) and necropsy (right).

In June 2021 a loggerhead sea turtle was incidentally trapped inside a human-created lagoon at the Hampton Roads Bridge Tunnel expansion construction project site (Figure 21). This turtle was reported to VAQS by the construction contractor, which led to a multi-day effort to coordinate the restraint and either capture or release of the turtle. Due to the water depth, size of the lagoon, turbidity, and evasiveness of the turtle, capture attempts were not undertaken. The turtle was ultimately freed from the lagoon via a temporary gap created in the rock wall specifically for that purpose. This case illustrated concerns regarding permitting and mitigation for this type of construction project in our region; Sea turtles were reportedly not addressed as part of the environmental mitigation plan, and no takes were allowed as part of the construction. Construction plans initially called for the 'lagoon' to remain open-ended as it was filled in, but the Army Corps of Engineers recommended enclosing the lagoon to reduce turbidity during the filling process. Authority to capture and handle the turtle and means of paying for capture efforts were unclear and were not resolved before the contractor, who was threatened with continued work shut-down, decided to re-open the lagoon. Though this was not a true "stranding", this case took significant time and effort from VAQS staff and volunteers and brought to light concerns for similar projects in the future.

Figure 21: Left: Aerial image of a bridge-tunnel expansion construction project. The star indicates the man-made lagoon in which a loggerhead turtle was trapped. Right: Loggerhead turtle trapped in man-made lagoon at Hampton Roads Bridge Tunnel expansion project site.

One final interesting sea turtle stranding case was loggerhead sea turtle "Rhinoceros Beetle". This was one of two sea turtles that was hooked and recovered for rehabilitation at VAQS two separate times in summer 2021. The turtle was originally hooked at Buckroe Fishing Pier on July 27, 2021. The turtle was found to have had four separate foul hooking interactions. "Rhino" was released on August 2, 2021, but was hooked again at Buckroe Fishing Pier on August 19, 2021, this time with two additional hook interactions. Notably, the turtle had developed osteomyelitis in the bones of the front flipper which lined up with a previous hooking site (Figure 22). This turtle was re-released in December 2021. This case highlights apparent habituation to piers by wild, healthy sea turtles and the instance of multiple strandings by one turtle within one season.

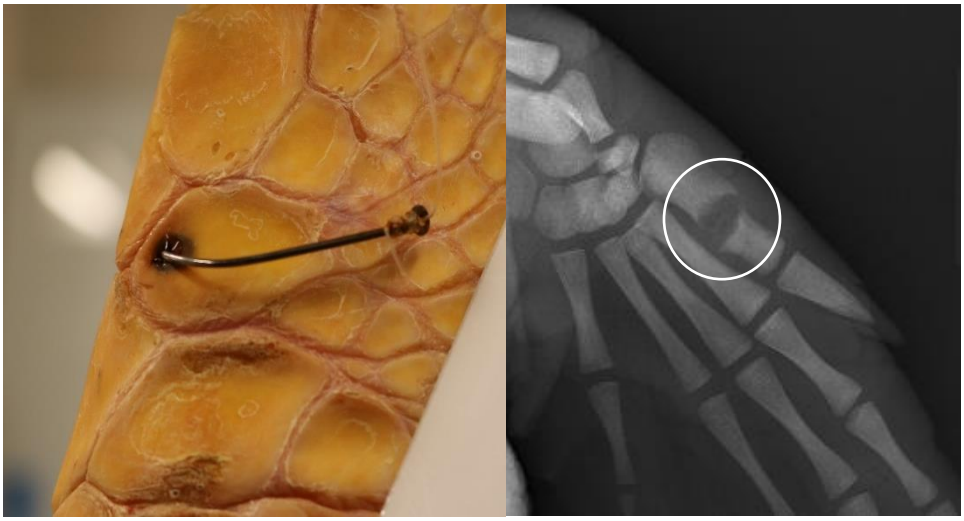
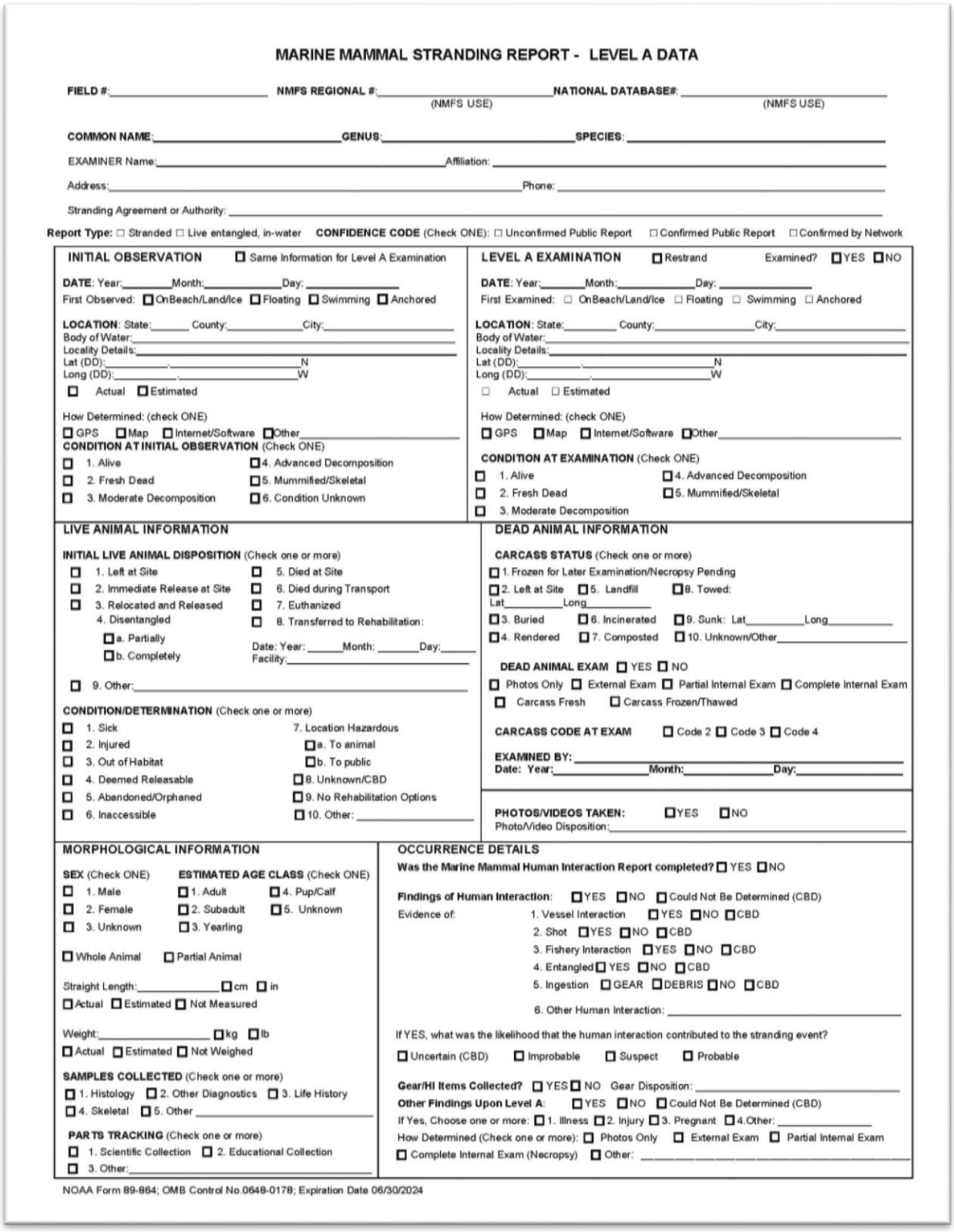


Figure 22: Left: Hook site at initial admit 7/27/21; Right: Osteomyelitis seen via radiographs 9/14/21

Appendix IV: Stranding Network Datasheets

A. Marine Mammal Level A data sheet



MARINE MAMMAL STRANDING REPORT - LEVEL A DATA

FIELD #:_____ NMFS REGIONAL #:_____ (NMFS USE) NATIONAL DATABASE#: _____ (NMFS USE)

COMMON NAME:_____ GENUS:_____ SPECIES: _____

EXAMINER Name:_____ Affiliation: _____

Address:_____ Phone: _____

Stranding Agreement or Authority: _____

Report Type: ☐ Stranded ☐ Live entangled, in-water CONFIDENCE CODE (Check ONE): ☐ Unconfirmed Public Report ☐ Confirmed Public Report ☐ Confirmed by Network

INITIAL OBSERVATION ☐ Same Information for Level A Examination

DATE: Year:_____Month:_____Day: _____

First Observed: ☐ OnBeach/Land/Ice ☐ Floating ☐ Swimming ☐ Anchored

LOCATION: State:_____ County:_____City:_____

Body of Water:_____

Locality Details:_____

Lat (DD):_____._____N

Long (DD):_____._____W

☐ Actual ☐ Estimated

How Determined: (check ONE)

☐ GPS ☐ Map ☐ Internet/Software ☐ Other_____

CONDITION AT INITIAL OBSERVATION (Check ONE)

☐ 1. Alive ☐ 4. Advanced Decomposition

☐ 2. Fresh Dead ☐ 5. Mummified/Skeletal

☐ 3. Moderate Decomposition ☐ 6. Condition Unknown

LEVEL A EXAMINATION ☐ Restrand Examined? ☐ YES ☐ NO

DATE: Year:_____Month:_____Day: _____

First Examined: ☐ OnBeach/Land/Ice ☐ Floating ☐ Swimming ☐ Anchored

LOCATION: State:_____ County:_____City:_____

Body of Water:_____

Locality Details:_____

Lat (DD):_____._____N

Long (DD):_____._____W

☐ Actual ☐ Estimated

How Determined: (check ONE)

☐ GPS ☐ Map ☐ Internet/Software ☐ Other_____

CONDITION AT EXAMINATION (Check ONE)

☐ 1. Alive ☐ 4. Advanced Decomposition

☐ 2. Fresh Dead ☐ 5. Mummified/Skeletal

☐ 3. Moderate Decomposition

LIVE ANIMAL INFORMATION

INITIAL LIVE ANIMAL DISPOSITION (Check one or more)

☐ 1. Left at Site ☐ 5. Died at Site

☐ 2. Immediate Release at Site ☐ 6. Died during Transport

☐ 3. Relocated and Released ☐ 7. Euthanized

4. Disentangled ☐ 8. Transferred to Rehabilitation:

☐ a. Partially Date: Year: _____Month: _____Day:_____

☐ b. Completely Facility:_____

☐ 9. Other:_____

CONDITION/DETERMINATION (Check one or more)

☐ 1. Sick 7. Location Hazardous

☐ 2. Injured ☐ a. To animal

☐ 3. Out of Habitat ☐ b. To public

☐ 4. Deemed Releasable ☐ 8. Unknown/CBD

☐ 5. Abandoned/Orphaned ☐ 9. No Rehabilitation Options

☐ 6. Inaccessible ☐ 10. Other: _____

DEAD ANIMAL INFORMATION

CARCASS STATUS (Check one or more)

☐ 1. Frozen for Later Examination/Necropsy Pending

☐ 2. Left at Site ☐ 5. Landfill ☐ 8. Towed:

Lat_____Long_____

☐ 3. Buried ☐ 6. Incinerated ☐ 9. Sunk: Lat_____Long_____

☐ 4. Rendered ☐ 7. Composted ☐ 10. Unknown/Other_____

DEAD ANIMAL EXAM ☐ YES ☐ NO

☐ Photos Only ☐ External Exam ☐ Partial Internal Exam ☐ Complete Internal Exam

☐ Carcass Fresh ☐ Carcass Frozen/Thawed

CARCASS CODE AT EXAM ☐ Code 2 ☐ Code 3 ☐ Code 4

EXAMINED BY: _____

Date: Year:_____Month:_____Day:_____

PHOTOS/VIDEOS TAKEN: ☐ YES ☐ NO

Photo/Video Disposition:_____

MORPHOLOGICAL INFORMATION

SEX (Check ONE) ESTIMATED AGE CLASS (Check ONE)

☐ 1. Male ☐ 1. Adult ☐ 4. Pup/Calf

☐ 2. Female ☐ 2. Subadult ☐ 5. Unknown

☐ 3. Unknown ☐ 3. Yearling

☐ Whole Animal ☐ Partial Animal

Straight Length:_____ ☐ cm ☐ in

☐ Actual ☐ Estimated ☐ Not Measured

Weight:_____ ☐ kg ☐ lb

☐ Actual ☐ Estimated ☐ Not Weighed

SAMPLES COLLECTED (Check one or more)

☐ 1. Histology ☐ 2. Other Diagnostics ☐ 3. Life History

☐ 4. Skeletal ☐ 5. Other _____

PARTS TRACKING (Check one or more)

☐ 1. Scientific Collection ☐ 2. Educational Collection

☐ 3. Other:_____

OCCURRENCE DETAILS

Was the Marine Mammal Human Interaction Report completed? ☐ YES ☐ NO

Findings of Human Interaction: ☐ YES ☐ NO ☐ Could Not Be Determined (CBD)

Evidence of:

1. Vessel Interaction ☐ YES ☐ NO ☐ CBD
2. Shot ☐ YES ☐ NO ☐ CBD
3. Fishery Interaction ☐ YES ☐ NO ☐ CBD
4. Entangled ☐ YES ☐ NO ☐ CBD
5. Ingestion ☐ GEAR ☐ DEBRIS ☐ NO ☐ CBD
6. Other Human Interaction: _____

If YES, what was the likelihood that the human interaction contributed to the stranding event?

☐ Uncertain (CBD) ☐ Improbable ☐ Suspect ☐ Probable

Gear/HI Items Collected? ☐ YES ☐ NO Gear Disposition: _____

Other Findings Upon Level A: ☐ YES ☐ NO ☐ Could Not Be Determined (CBD)

If Yes, Choose one or more: ☐ 1. Illness ☐ 2. Injury ☐ 3. Pregnant ☐ 4.Other: _____

How Determined (Check one or more): ☐ Photos Only ☐ External Exam ☐ Partial Internal Exam

☐ Complete Internal Exam (Necropsy) ☐ Other: _____

NOAA Form 89-864; OMB Control No.0648-0178; Expiration Date 06/30/2024

GE# _____ (NMFS Use)

Group Event: ☐ YES ☐ NO

If Yes, Type: ☐ Cow/Calf Pair ☐ Mass Stranding ☐ UME # Animals:_____☐ Actual ☐ Estimated

TAG DATA		ID#	Color	Type	Placement* (Circle ONE)	Applied	Present	Removed
Tags Were:								
Present at Time of Stranding (Pre-existing):	☐ YES ☐ NO				D DF L R LF LR RF RR V	☐	☐	☐
Applied during Stranding Response/Release:	☐ YES ☐ NO							
Applied during Rehabilitation/Release:	☐ YES ☐ NO				D DF L R LF LR RF RR V	☐	☐	☐
Absent but Suspect Prior Tag:	☐ YES ☐ NO							
					D DF L R LF LR RF RR V	☐	☐	☐
					D DF L R LF LR RF RR V	☐	☐	☐

* D= Dorsal; DF= Dorsal Fin; L= Left Lateral Body R= Right Lateral Body LF= Left Front; LR= Left Rear; RF= Right Front; RR= Right Rear; V= Ventrum

ADDITIONAL IDENTIFIER: _____ (If animal is restranded, please indicate any previous field numbers here)

ADDITIONAL REMARKS:

DISCLAIMER

THESE DATA SHOULD NOT BE USED OUT OF CONTEXT OR WITHOUT VERIFICATION. THIS SHOULD BE STRICTLY ENFORCED WHEN REPORTING SIGNS OF HUMAN INTERACTION DATA.

DATA ACCESS FOR LEVEL A DATA

UPON WRITTEN REQUEST, CERTAIN FIELDS OF THE LEVEL A DATA SHEET WILL BE RELEASED TO THE REQUESTOR PROVIDED THAT THE REQUESTOR CREDIT THE STRANDING NETWORK AND THE NATIONAL MARINE FISHERIES SERVICE. THE NATIONAL MARINE FISHERIES SERVICE WILL NOTIFY THE CONTRIBUTING STRANDING NETWORK MEMBERS THAT THESE DATA HAVE BEEN REQUESTED AND THE INTENT OF USE. ALL OTHER DATA WILL BE RELEASED TO THE REQUESTOR PROVIDED THAT THE REQUESTOR OBTAIN PERMISSION FROM THE CONTRIBUTING STRANDING NETWORK AND THE NATIONAL MARINE FISHERIES SERVICE.

PAPERWORK REDUCTION ACT INFORMATION

PUBLIC REPORTING BURDEN FOR THE COLLECTION OF INFORMATION IS ESTIMATED TO AVERAGE 30 MINUTES PER RESPONSE, INCLUDING THE TIME FOR REVIEWING INSTRUCTIONS, SEARCHING EXISTING DATA SOURCES, GATHERING AND MAINTAINING THE DATA NEEDED, AND COMPLETING AND REVIEWING THE COLLECTION OF INFORMATION. SEND COMMENTS REGARDING THIS BURDEN ESTIMATE OR ANY OTHER ASPECT OF THE COLLECTION INFORMATION, INCLUDING SUGGESTIONS FOR REDUCING THE BURDEN TO: CHIEF, MARINE MAMMAL AND SEA TURTLE CONSERVATION DIVISION, OFFICE OF PROTECTED RESOURCES, NOAA FISHERIES, 1315 EAST-WEST HIGHWAY, SILVER SPRING, MARYLAND 20910. NOT WITHSTANDING ANY OTHER PROVISION OF THE LAW, NO PERSON IS REQUIRED TO RESPOND, NOR SHALL ANY PERSON BE SUBJECTED TO A PENALTY FOR FAILURE TO COMPLY WITH, A COLLECTION OF INFORMATION SUBJECT TO THE REQUIREMENTS OF THE PAPERWORK REDUCTION ACT, UNLESS THE COLLECTION OF INFORMATION DISPLAYS A CURRENTLY VALID OFFICE OF MANAGEMENT AND BUDGET (OMB) CONTROL NUMBER.

NOAA Form 89-864; OMB Control Number 0648-0178; Expiration Date: 06/30/2024

B. Sea Turtle Stranding and Salvage Network (STSSN) data sheet (slightly modified for VAQS' specific use)

SEA TURTLE STRANDING AND SALVAGE NETWORK — STRANDING REPORT

OBSERVER'S NAME AND CONTACT INFORMATION:
First _____ M.I. _____ Last _____
Email _____
Affiliation _____
Phone number (____) _____

STRANDING DATE: *Use two digits for date fields.*
Year 20[__][__] Month[__][__] Day[__][__]
Turtle number by day[__][__][__] *Use three digits.*
VAQS Field Number: _____

STRANDING LOCATION:
State _____ County _____
Latitude _____ ☐ est Longitude _____ ☐ est
Location description _____

SPECIES: (check one, do not guess)
☐ Loggerhead (CC) ☐ Kemp's ridley (LK)
☐ Green turtle (CM) ☐ Olive ridley (LO)
☐ Leatherback (DC) ☐ Unidentified
☐ Hawksbill (EI)

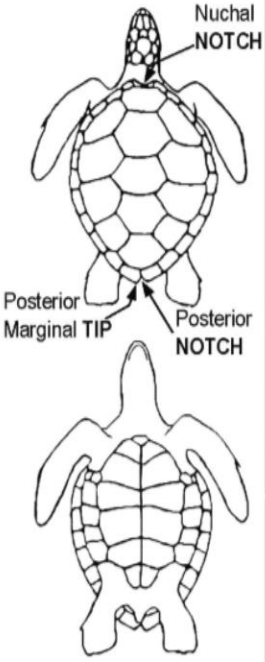
CIRCUMSTANCES OF ENCOUNTER: (check one)
Traditional Stranding
☐ Found washed ashore or washing ashore ☐ **Post-hatchling Washback**
☐ Found floating/struggling at water surface
☐ Found underwater ☐ **Cold-stunning**
Incidental Capture
☐ Caught by recreational fisherman
☐ Found in the intake canal of power plant
☐ Found in dredge equipment
☐ Entangled in line of pot/trap buoy
☐ Caught in commercial hook/line fishery
☐ Caught in commercial net fishery
☐ Captured during **relocation** efforts
☐ Captured during **research** efforts
☐ **Other** _____

NECROPSY:
Necropsied? ☐ Yes ☐ No ☐ Pending
Necropsy Date? _____
Necropsy Prosectors: _____
Necropsy type: ☐ Partial ☐ Complete

PHOTOS: (submit photos to state coordinator)
☐ YES (indicate below the completeness of photo series) ☐ NO
☐ Dorsal aspect visible ☐ Ventral aspect visible
A complete photo series includes photographs of the dorsal and ventral aspects of the turtle, and all injuries or anomalies.

CONDITION: (check one)
☐ Alive
☐ Mildly decomposed
☐ Moderately decomposed
☐ Severely decomposed
☐ Dried carcass
☐ Skeletal

SEX: (check one)
☐ Female
☐ Male
☐ Unknown
How Determined?
☐ Necropsy
☐ Tail Length



TAGS:
Contact state coordinator before disposing of a tagged turtle!
Flipper tags found? ☐ YES ☐ NO
Check all 4 flippers. If found, record tag number & location.
1. _____
2. _____
3. _____
PIT tag scan performed? ☐ YES ☐ NO
Check all 4 flippers. If found, record tag id & location.
1. _____
2. _____
Possible tag scars? ☐ YES ☐ NO
Check all locations of possible tag scars:
☐ Front left ☐ Front right ☐ Rear left ☐ Rear right
Living tag found? ☐ YES ☐ NO
If found, photograph & record scute number & side.
_____
Tracking gear found? ☐ YES ☐ NO If present, describe.
Do not dispose of turtle or remove gear; consult STSSN coordinator.
_____

EXAMINATION DETAILS:
Type of examination: (check one)
☐ In-person exam by STSSN participant
☐ Evaluated from photographs submitted by the public
Completeness of body: (check all that apply)
☐ Complete
☐ Missing head
☐ Missing one or more flippers (100%)
☐ Missing 50% or more of the shell (body)
☐ Not determined
Mouth checked? ☐ YES ☐ NO ☐ UNKNOWN

WEIGHT: (do not estimate weight)
Measured weight: _____ **kg**

TAIL MEASUREMENT:
Did the tail extend past the carapace?
At least 5cm/2in (LK or LO), 10cm/4in (CC, CM, EI), or 15cm/6in (DC)
☐ YES, directly measured: _____ **cm**
☐ NO ☐ NOT DETERMINED

CARAPACE MEASUREMENTS:
All measurements in cm, check box if estimated
Using calipers
Straight length (notch-tip) _____ ☐ est
Minimum length (notch-notch) _____ ☐ est
Straight width (widest point) _____ ☐ est
Using non-metal measuring tape
Curved length (notch-tip) _____ ☐ est
Minimum length (notch-notch) _____ ☐ est
Curved width (widest point) _____ ☐ est

FATE OR FINAL DISPOSITION:
If the stranded turtle was alive, choose one of the following:
☐ Alive, immediately released
☐ Alive, taken to rehabilitation facility; where?
_____
☐ Died before reaching rehabilitation facility
If the turtle was found dead or died, choose one of the following:
☐ Dead and left where found; marked? ☐ YES ☐ NO
If marked, describe: _____
☐ Dead; buried, rendered, or otherwise disposed of
☐ Dead and salvaged; location of salvaged remains?
_____
Salvaged for necropsy? ☐ YES ☐ NO

Revised: 19-Jan-21 **Clear Form**

ANTHROPOGENIC MATERIAL

Was there any man-made material found on the turtle (e.g., fishing gear, tar, or oil)? ☐YES ☐NO **If yes, were photos taken?** ☐YES ☐NO

If man-made material was present, please answer the following questions. (check all that apply)

Were any fishing hooks present on the turtle? ☐YES ☐NO
If yes, was the gear collected? ☐YES ☐NO
Where were the hooks located? ☐Mouth ☐Head ☐Neck ☐Carapace ☐Plastron ☐Front flipper ☐Rear flipper ☐Tail

Was line <0.5 cm dia. present on the turtle? ☐YES ☐NO
If yes, was the gear collected? ☐YES ☐NO
Where was the line located? ☐Mouth ☐Head ☐Neck ☐Carapace ☐Plastron ☐Front flipper ☐Rear flipper ☐Tail ☐Cloaca

Was the turtle entangled in line ≥0.5 cm dia.? ☐YES ☐NO
If yes, was the gear collected? ☐YES ☐NO
Where was the line located? ☐Head ☐Neck ☐Carapace ☐Plastron ☐Front flipper ☐Rear flipper ☐Tail

Was the turtle entangled in fishing net? ☐YES ☐NO
If yes, was the gear collected? ☐YES ☐NO
Where was the net located? ☐Head ☐Neck ☐Carapace ☐Plastron ☐Front flipper ☐Rear flipper ☐Tail

Was there any tar or oil present? ☐YES ☐NO
If yes, were any samples collected? ☐YES ☐NO
Where was the tar or oil located? ☐Mouth ☐Head ☐Neck ☐Carapace ☐Plastron ☐Front flipper ☐Rear flipper ☐Tail

Was there any other man-made material present? ☐YES ☐NO
Please describe the material: _____
Where was the material located? ☐Mouth ☐Head ☐Neck ☐Carapace ☐Plastron ☐Front flipper ☐Rear flipper ☐Tail

INJURIES

Were any injuries externally evident? ☐YES ☐NO **If yes, were photos taken?** ☐YES ☐NO

If injuries were evident, please answer the following questions. (check all that apply)

Were there any definitive vessel-strike injuries evident? ☐YES ☐NO
Where were these injuries located? ☐Head ☐Neck ☐Carapace ☐Plastron ☐Front flipper ☐Rear flipper ☐Tail

Were there any blunt force injuries evident? ☐YES ☐NO
Where were these injuries located? ☐Head ☐Carapace ☐Plastron

Were there any shark-bite injuries evident? ☐YES ☐NO
Where were these injuries located? ☐Head ☐Neck ☐Carapace ☐Plastron ☐Front flipper ☐Rear flipper ☐Tail

Were there any amputations of unknown cause evident? ☐YES ☐NO
How many amputations were present? _____
Where were these amputations located? ☐Front left flipper ☐Front right flipper ☐Rear left flipper ☐Rear right flipper

Was there an incised wound evident? ☐YES ☐NO
(e.g., clean cuts, as created by knife; typically longer than wide)
Where was the wound located? ☐Head ☐Neck ☐Carapace ☐Plastron ☐Front flipper ☐Rear flipper ☐Tail

Was there a perforating or penetrating wound evident? ☐YES ☐NO
(a wound that is typically deeper than wide)
Where was the wound located? ☐Head ☐Neck ☐Carapace ☐Plastron ☐Front flipper ☐Rear flipper ☐Tail

Was there a wound indicative of entanglement or ingestion of anthropogenic material without this material being present? ☐YES ☐NO
Where was the wounds located? ☐Head ☐Neck ☐Carapace ☐Plastron ☐Front flipper ☐Rear flipper ☐Tail

Was there a furrow on the edge of the beak? ☐YES ☐NO

Was there some other type of injury evident (not already described)? ☐YES ☐NO
Please describe: _____

DISEASES AND LEECHES

Were any diseases or leeches externally evident? ☐YES ☐NO **If yes, were photos taken?** ☐YES ☐NO

If diseases or leeches were evident, please answer the following questions. (check all that apply)

Were there any fibropapilloma-like tumors present? ☐YES ☐NO **If yes, were photos taken?** ☐YES ☐NO
Were eye tumors present? ☐YES ☐NO
Were mouth tumors present? ☐YES ☐NO
Did any of the tumors have a papillary texture? ☐YES ☐NO

Were there any non-fibropapilloma-like tumors present? ☐YES ☐NO **If yes, were photos taken?** ☐YES ☐NO
Please describe: _____

Were there any external skin lesions evident? ☐YES ☐NO **If yes, were photos taken?** ☐YES ☐NO
Which of the following best describes the lesions? ☐Superficial crusts on the skin surface ☐Deep lesions exposing underlying tissue ☐Both superficial crusts and deep lesions were present ☐Neither
Which best describes the extent of superficial crusts? ☐Found only in single area or in a few small, isolated areas ☐Found over large areas
Where were the superficial crusts found? ☐Head ☐Neck ☐Carapace ☐Plastron ☐Front flipper ☐Rear flipper ☐Tail
Which best describes the extent of the deep lesions exposing underlying tissues?
☐Found only in single area or in a few small, isolated areas ☐Found over large areas
Where were the deep lesions found? ☐Head ☐Neck ☐Carapace ☐Plastron ☐Front flipper ☐Rear flipper ☐Tail

Were there any leeches or leech eggs evident? ☐YES, small isolated egg patches or few adults ☐YES, large egg patches or many adults ☐NO **If yes, were photos taken?** ☐YES ☐NO

ADDITIONAL COMMENTS: _____

Appendix V: Virginia Species Lists

A. Marine mammal species in stranding records from Virginia, U.S.A. (Virginia Aquarium Marine Mammal Stranding Database, Potter 1991).

Common Name	Scientific Name	ESA Status
Order: Sirenia		
Family: Trichechidea		
West Indian manatee	*Trichechus manatus latirostris*	Threatened
Order: Cetacea		
Suborder: Mysticeti		
Family: Balaenidae		
North Atlantic Right whale	*Eubalaena glacialis*	Endangered
Family: Balaenopteridae		
Fin whale	*Balaenoptera physalus*	Endangered
Sei whale	*Balaenoptera borealis*	Endangered
Bryde's whale	*Balaenoptera brydei*	Endangered
Humpback whale	*Megaptera novaeangliae*	Not Listed
Minke whale	*Balaenoptera acutorostrata*	Not Listed
Suborder: Odontoceti		
Family: Physteridae		
Sperm whale	*Physeter macrocephalus*	Endangered
Pygmy sperm whale	*Kogia breviceps*	Uncertain
Dwarf sperm whale	*Kogia sima*	Uncertain
Family: Ziphiidae		
Cuvier's beaked whale	*Ziphius cavirostris*	Uncertain
Gervais' beaked whale	*Mesoplodon europaeus*	Uncertain
True's beaked whale	*Mesoplodon mirus*	Uncertain
Sowerby's beaked whale	*Mesoplodon bidens*	Uncertain
Blainville's beaked whale	*Mesoplodon densirostris*	Uncertain
Family: Delphinidae		
Long-finned pilot whale	*Globicephala melas*	Not Listed
Short-finned pilot whale	*Globicephala macrorynchus*	Not Listed
Risso's dolphin	*Grampus griseus*	Not Listed
Bottlenose dolphin	*Tursiops truncatus*	Not Listed
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	Not Listed
Pygmy killer whale	*Feresa attenuata*	Not Listed
Melon-headed whale	*Peponocephala electra*	Not Listed
Rough-toothed dolphin	*Steno bredanensis*	Uncertain
Common dolphin	*Delphinus delphis*	Not Listed
Striped dolphin	*Stenella coerubeoalba*	Not Listed
Pantropical spotted dolphin	*Stenella attenuata*	Not Listed
Atlantic spotted dolphin	*Stenella frontalis*	Not Listed

Common Name	Scientific Name	ESA Status
Family: Phocoenidae		
Harbor porpoise	*Phocoena phocoena*	Not Listed
Order: Carnivora		
Suborder: Pinnipedia		
Family: Phocidae		
Harbor seal	*Phoca vitulina*	Not Listed
Gray seal	*Halichoerus grypus*	Not Listed
Hooded seal	*Crystophora cristata*	Not Listed
Harp seal	*Pagophilus groenlandica*	Not Listed

B. Sea turtle species in stranding records from Virginia, U.S.A. (Virginia Aquarium Sea Turtle Stranding Database).

Common Name	Scientific Name	ESA Status
Class: Reptilia		
Order: Testudines		
Family: Dermochelyidea		
Leatherback sea turtle	*Dermochelys coriacea*	Endangered
Family: Cheloniidae		
Green sea turtle	*Chelonia mydas*	Threatened
Loggerhead sea turtle	*Caretta caretta*	Threatened
Hawksbill sea turtle	*Eretmochelys imbricata*	Endangered
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered