FIELD INHALATION ANESTHESIA IN FREE-RANGING JUVENILE STELLER SEA LIONS (*Eumetopias jubatus*)

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Abstract

The Alaska Department of Fish and Game has caught and anesthetized 511 free-ranging Steller sea lions (*Eumetopias jubatus*) over a 10-yr period (1993-2003). Captures occurred at different haulouts and rookeries throughout Alaska as part of scientific investigations into the Steller sea lion decline. Animals were captured using one of three methods: chemical darting (n = 48), beach netting (n = 60), or underwater noose (n = 403), in order to perform physiologic, morphometric, and biologic sampling. Since 1998, all captures were achieved using either the underwater or beach capture method due to the difficulties and high risks associated with dart capture as previously described by Heath, et al.[1] Beach captures have the drawbacks of emptying the entire haulout with each capture thereby limiting the pool of sea lion candidates for that day and sometimes longer. Working on slick rock surfaces during beach captures can also be hazardous for the capturer as well as the sea lions.

In order to successfully capture juvenile Steller sea lions from the same site over a short span of time with minimal disturbance, a technique was developed using underwater divers to safely place a noose with attached floating buoy around a sea lion thus allowing a capture team to load the animal into a capture box with a small skiff.[2] Animals are then loaded onto a research vessel for inhalation isoflurane anesthesia and processing. This method of capture and anesthesia has been very successful and safe for the animals. No mortalities have occurred during the underwater captures, but potential risks to the animals include loss of the animal with noose around neck, asphyxiation from overly tight noose, and boat strike while chasing after the floating buoy. To counter these risks, the noose is equipped with a corroding pin that will release the noose over time, the capture team in the skiff is skilled in boat handling and trained to recognize and alleviate possible asphyxiation caused by noose. Emergency drugs are also carried on the skiff, accompanied by a veterinarian or technician. The underwater diver method has greatly enhanced the number of juvenile sea lions that can be captured from a single site causing minimal disturbance to the haulouts and rookeries.

A total of 403 juvenile Steller sea lions (2-41 mo of age) with a mean mass of 92.8 ± 33.5 kg (mean ± SD, range 32-230 kg) were anesthetized after capture by the underwater noose method. Following capture and rest, anesthesia was administered using a portable field anesthesia machine (Seven Seven Anesthesia, Fort Collins, CO, USA) delivering isoflurane via mask for

short procedures or for induction for intubation for longer procedures. A comparison of sevoflurane to isoflurane in Steller sea lions was performed in 17 of the underwater captured animals.[3] In animals anesthetized using sevoflurane, there was a significant improvement (decrease) in the time from anesthesia off to extubation and from the time of extubation to safely swimming. Sevoflurane recoveries were subjectively characterized by the authors as producing a more alert and stronger animal at extubation. Even though the time benefit was significant with sevoflurane, it was outweighed by the greater cost of the newer anesthetic. The anesthesia parameters reported in this study include only animals anesthetized with isoflurane.

Post-capture rest was found to be important to allow the animals to stabilize from their capture. In those animals taken directly from capture to anesthesia, body temperature dropped precipitously to 32.9 ± 0.89°C (n = 9), and vigorous temperature correction with artificial heat sources was necessary. Most animals allowed 45-60 min of rest before anesthesia maintained body temperature throughout subsequent anesthesia with no external heat measures necessary. Sea lions were restrained in the capture box to allow masking with isoflurane at 4-5% vaporizer setting with 5-10 L/min oxygen. During maintenance of anesthesia, isoflurane concentrations were reduced to 1-2% with 2-3 L oxygen flow. Induction time from mask application to intubation was 14 ± 6 min (range 4-45, n = 154). The induction time data does not accurately estimate the time needed before intubation could be performed because some animals were intentionally kept on the mask in order to complete a procedure (i.e., blood draw) before intubation was attempted. Time of anesthesia was 52 ± 17 min (range 14-139, n = 234) and time from anesthesia vaporizer off to extubation was 4 ± 3 min (range 0-16, n = 236). For procedures that did not require extended periods of time or for animals that could not be intubated, anesthesia was maintained by mask for 22 ± 10 min (range 9-83, n = 252). Physiologic parameters monitored throughout the anesthetic procedure included temperature, respiration and heart rate, mucous membrane color and refill, oxygen saturations, and some end-tidal CO_2 measurements. The anesthetic procedure was very safe; resulting in one mortality from a total of 463 animals anesthetized using the capture box/mask induction method. Apnea occasionally occurred at the time of intubation or at the finish of the procedure after turning off the vaporizer but before extubation. During this time, some animals needed mechanical assistance with respirations. Additionally, doxapram was used to stimulate respirations in 18 animals (i.m. or sublingual) during these times. Diazepam was given to seven animals that were extremely aggressive in order to sedate them in the capture box prior to masking. Other emergency drugs administered included atropine (i.m.) to one animal and epinephrine to another that went into respiratory arrest following extubation. This animal was revived after being reintubated, oxygenated mechanically, and administered emergency medications. The one mortality occurred in a 7-mo-old female during the recovery period following a short isoflurane mask-only procedure. The animal was found dead in the box with its head twisted and nose pressed into a corner. Necropsy revealed no abnormalities except asphyxiation.

The combination of the underwater noose capture technique, capture box restraint, and inhalation isoflurane anesthesia has proven to be a safe and effective method for capturing and sampling large numbers of juvenile Steller sea lions.

LITERATURE CITED

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