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ALASKA FISH AND WILDLIFE RESEARCH CENTER

Mammals Section
Walrus Project

Round Island Field Report
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I. Introduction

The understanding of the population dynamics of Pacific walruses is insufficient for the U.S. Fish and Wildlife Service to make the management decisions which will be necessary in the near future as conflicts among user groups become more prevalent and more international concern is voiced over the U. S. approach to management of the Pacific walrus population (Fay et al. 1985). The Pacific walrus population is thought to be declining, but there is not enough information on distributions on the different sex and age groups, haulout and movement patterns to allow unbiased interpretation of the existing composition, productivity and population data (Estes and Gilbert 1978).

The overall purpose of this project is to develop procedures to interpret existing data and gather new data to evaluate the population parameters of the Pacific walrus. Existing population estimators for the Pacific walrus are ad hoc and fail to account for composition, movement, distribution and behavioral patterns. The sampling effort, shared by the U.S. and U.S.S.R., lacks design and coordination. Accuracy and precision of the estimator lack credibility so the value of the results is limited (Estes and Gilbert 1978, Gilbert 1986). Many of the problems associated with the current estimator can best be addressed by determining the diving and movement patterns of individual walruses. By adapting existing satellite telemetry techniques for use on walruses, those data can be obtained. Under the current survey procedures, the majority of the animals seen during the US surveys are females and young on the ice, so movement and haulout data for that segment of the population at that time of year is needed. Although all the animals at Round Island are males, I wanted to test techniques on a terrestrial haulout first (females do not regularly haulout on land anywhere in Alaska), then try the refined techniques on females on pack ice in 1988. The purpose of the work on Round Island in June-August 1987 was to test many of the techniques needed to attach a satellite transmitter to a walrus.

III. Objectives

The specific objectives of the Round Island field season were:

1. Develop a functional satellite telemetry package including a salt water switch and pressure sensor

2. Develop a reliable attachment technique

3. Determine parameters which affect the function of a satellite telemetry package attached to a walrus.

IV. Methods

A. Objective 1 - Satellite package development. Three prototype satellite packages (PTT) incorporating a saltwater switch (SWS) and pressure sensor were ordered from Telonics, Inc. of Mesa, AZ for delivery in June 1987. Although the actual transmitter, SWS and pressure sensor had been used on other projects, the combination of sensors, bit assignments and sampling regime was new. Telonics performed standard tests in their lab before shipment and field testing in Alaska. Full field trials to test for leaks, accurate position fixes, adequate signal strength, and operation of the sensors were to be done by lowering the unit to known depths in salt water, monitoring the resulting transmissions on an uplink receiver and the local user terminal (LUT) in Fairbanks. Operation of the sensors was to be compared with data from a time depth recorder (TDR) made by Wildlife Computers, Inc., Woodinville, WA. Data to be recorded included time immersed in water, time removed, total time in water, predicted time of satellite overpass, true location, depth to which lowered, time at that depth category, maximum depth for that trial, and data readout on the uplink receiver and TDR.

B. Objective 2 - Attachment technique.

1. Drug delivery. Three methods of drug delivery, a crossbow (to shoot Cap-chur darts), a Cap-chur gun, and a Stirling-Sjare jabstick, were investigated, although only the jabstick, was used to actually deliver immobilizing drugs. The jabstick is a long, sectioned, pole with a needle and tubing on one end. The tubing leads back to a syringe; both the syringe and the tubing are filled with drug. Walruses resting on the beaches of Round Island were quietly approached and the needle was inserted into muscles in the hip area. The researcher remained motionless after inserting the needle; if the animal settled back down, the calculated dose of immobilizing drug was then pushed out of the syringe held by the researcher, through the tubing and in to the animal. If the animal was disturbed and headed for the water, the needle was pulled out and no drug was given. For testing both the Whamo Powermaster crossbow and the Palmer Cap-chur gun, Cap-chur darts filled with water were shot into the muscles of the hip area of resting walruses. The method, the distance from which the dart was shot, and the animal's reaction were recorded.

2. Drug choice. Ketamine and sernalyn had been tried on Pacific walruses before (DeMaster et al. 1981) and Telezol (a 1:1 mixture of tiletamine hydrochloride and zolazepam hydrochloride) was used by Canadian researchers on Atlantic walruses in April-May 1987 (Stirling pers. comm.). After review of the literature and many discussions with veterinarians and other walrus researchers, Telezol and carfentenil were chosen as the first two drugs to test to find a safe, efficient, immobilizing drug for Pacific walruses with a short induction time and a long enough down time to allow attachment of radios. Although the reported induction time of Telezol was longer than that of carfentenil (Taylor pers. comm.), the facts that Telezol is far less dangerous to humans than carfentenil and that Stirling and Sjare (pers. comm.) reported good results with Telezol for Atlantic walruses lead me to test Telezol first. Data recorded included: time of injection, induction time, respiration, heart rate, temperature, estimated weight, estimated age, amount of drug injected, supplemental doses (if any), weather and tide conditions, skin color, responses of the animal to the needle and to the injection, time to first head lift, and time to coordinated movement. Carfentenil was to be tested if Telezol proved unsatisfactory and the results compared.

3. Attachment. VHF radios in the same housing used for the satellite transmitter were attached to the walrus' tusks with 0.75 inch-wide, 316 stainless steel Band-it bands to test attachment technique before the PTT was deployed. A groove was rasped into the tusk to prevent the band from sliding down and colorless Devcon MVP-11 or Two-Ton epoxy was used under the band. Devcon Flexane urethane was applied to the housing to act as an additional glue and as a gasket between the housing and the tusk. The position of the antenna, pointing up toward the animal's face or down toward the distal end of the tusk, was also to be tested. Project personnel or Round Island Sanctuary staff and Togiak National Wildlife Refuge volunteers at Cape Peirce listened for transmitters daily after deployment and scanned hauled out walruses for transmittered and marked animals.

4. Marking. To facilitate visual relocations of transmittered animals, each was marked with Nyanzol dye (black), gentian violet (purple) and traffic line paint (white). Marks were placed on the dorsal surface of

the animal.

C. Objective 3 - PTT function on a walrus. The PTT was to be attached to the tusk of a carcass to test the effects of the proximity of the large body mass on signal strength (VSWR effects). Three PTTs were to be attached to Pacific walruses and the resulting transmissions monitored and analyzed. A conventional VHF radio with a three year battery life was attached to the other tusk as a backup beacon to allow relocation of the animal should the PTT fail.

V. Results and Discussion

A. Objective 1 - Satellite package development. Although three units were ordered for June, only one PTT was delivered in August, without the pressure sensor and with a different data collection program than was originally requested. Telonics performed standard tests before shipment, but because of the lateness of the delivery time in the field season and the lack of a pressure sensor, it was not possible to completely field test the unit. The PTT was immersed in salt water at known locations and the location, time in and out of water, predicted satellite pass time and data readout on the uplink receiver were recorded. Location and signal strength were adequate but the SWS did not function although the unit worked when a 100-ohm resistor was used to close the switch rather than salt water. The SWS not only operates as a sensor for haulout times, but also to keep the unit from transmitting when it is submerged. The decision was made to deploy the unit with a non-functioning SWS, although the expected battery life would be reduced considerably with continuous transmission, and data on haulout bout length would be lost. Shortly after deployment of the unit on a walrus, Telonics staff reported duplicating the problem with silicone grease on the switch and the dive counter data transmitted from the deployed unit indicated that the SWS on the unit was functioning.

B. Objective 2 - Attachment techniques.

1. Drug delivery. Despite quite noisy delivery and hard impact, in 9 of 10 and 10 of 10 trials of the crossbow and the dart gun, respectively, the target animal remained on the beach and did not head for the water. The jabstick gave the most control over administration of the immobilizing drug, however. With

the jabstick, the most disruptive action, insertion of the needle, was not immediately followed by injection of the drug and supplemental doses of drug could be given if needed without further disruption. For these reasons, the jabstick was the only method used to deliver drug on Round Island. Use of the jabstick required close approach (within 4-5 m); the other methods allowed drug administration from 15-40 m and may be more practical for use with animals on the ice. The arrangement of tubing and syringe allows administration of larger amounts of drug than could conveniently be given in a dart, but may be inefficient and inaccurate for delivery of small doses of other drugs such as carfentenil. About 10 cc of drug is needed to fill the tubing and cannot be injected. Telezol is relatively inexpensive but waste of more expensive and dangerous drugs may make the jabstick impractical.

2. Drug Choice. Seven animals were injected with Telezol via jabstick in dosages bracketing 2.0-2.5 mg/kg, the "ideal" dose recommended by Stirling and Sjare (pers. comm. and in prep) on Round Island in June-August 1987 (Table 1). Of the seven, one was killed when several other animals ran over it as they were leaving the beach, two others stopped breathing and died after injection, and one was not immobilized sufficiently to allow attachment of a radio although its respiration rate was depressed so that no more drug was given. Marine Mammal Permit number PRT-690715, under which this research was conducted, required review of procedures after two mortalities so activities were suspended 6 July-13 August for review and revision of procedures. Possible contributing factors identified for the first mortalities were 1) trampling by other animals, 2) drug from a different manufacturer, 3) heat stress, 4) misjudgment of weight and resulting overdose of drug, 5) unobservable abnormality or pathology of that particular animal. The immobilization which resulted in the third mortality was conducted in accordance with the revised protocol; the animal was not trampled, drug from the French manufacturer was used (Zoletil, the drug used for the first two successful immobilizations), the animal's internal temperature was within the normal range, the target dose was low, and a gross necropsy did not reveal any physical abnormalities.

Table 1. Responses of male Pacific walruses to Telezol.

	Walrus Number						
	87-1	87-2	87-3	87-4	87-5	87-6	87-7
Date (1987)	6/21	6/24	7/2	7/5	8/14	8/15	8/17
Est. wt.(kg)	1000	1300	1100	1100	1000	900	900
Telezol (mg)	2900	2600	2640	2750	2000	1750	1125
mg/kg	2.9	2.0	2.4	2.5	2.0	1.9	1.25
Time to immobility (min.)	12	21	23	23	35	14	17
Supplemental dose (mg)	--	625	--	--	375	--	--
Est. age (yrs)	15	25	30	15-20	16-18	12-15	20
Status	ok	ok	died	died	ok	died	ok
Radio	VHF	VHF	--	--	PTT + VHF	--	--

3. Attachment. Two VHF radios and one satellite radio with a VHF back up were attached on 21 June, 24 June and 14 August 1987, respectively. The first animal was seen and the signal heard from several different beaches on Round Island from banding through 6 July. Subsequent relocations on Round Island were on 13 July, 20 July, 21 July, 28 July 29 July, 4 August, 7-9 August and the transmitter was found on a beach at Round Island 19 August. The animal was never heard or seen at Cape Peirce. The tusk had not been rasped to prevent the bands from slipping and the band buckles ahd not been attached properly, but the transmitter remained attached for at least six weeks.

The antenna of the transmitter on the second animal was pointed toward the distal end of the tusk (as opposed to toward the animal's face as for the first animal).

It was seen and heard in the vicinity of the beach on which it was banded for three days after attachment, but was never again heard on Round Island. It was seen and heard at Cape Peirce on 9 July, 10 July, 21 July, 25 August, 26 August, 6 September, and 23 September. On the last occasion, it was not transmitting; the lower half of the housing was smashed and the antenna was gone. The housing had not moved up or down on the tusk.

The third animal was not ever seen or heard on Round Island or Cape Peirce, although transmissions from the PTT indicated that it was on the beaches there (Map 1). Transmissions from different locations and with changing sensor data continued through 28 December, indicating that the package was attached through at least that time. The antennae of both transmitters were directed toward the animal's face.

Although the attachment technique is somewhat slow and can be very difficult if the animal's head is moving, the evidence from the four radios indicated that it adequate. The current bracket design causes the transmitter to be too far from the tusk and Flexane is messy and did not perform well either as a glue or a gasket. The antenna comes out of the cannister on the bracket side, causing it to press into the muzzle of the animal when the antenna is positioned up, the best position for receiving signals when the animal is at sea. The bracket will be redesigned and the antenna moved to the other side of the cannister.

4. Marking. Recovery from Telezol takes several hours so all marking materials were dry before the animal went in the water. Both of the first two animals were seen within a few days of marking. Gentian violet and traffic line paint completely disappeared within 24 hrs. Nyanzol dye marks could be distinguised up to three days after marking, but were not distinctive enough to help find the animal on the beach. The animals were usually heard first, then seen, then the status of the mark determined. The Nyanzol dye was quite old, may not have been mixed properly, and should be tried again.

C. Objective 3 - PTT function. No walrus carcasses were available when the PTT arrived so testing for VSWR effects was not done. The unit functioned from the day it was attached, 14 August, through 28 December 1987 Table 2 is a summary of the transmissions; data are not

yet completely analyzed.

Table 2. Transmissions from prototype PTT on Pacific walrus.

Month	Days with Transmissions	Locations	Passes with Data	1-hit Passes
Aug 87	15	14	65	33
Sep 87	30	8	100	69
Oct 87	28	11	96	57
Nov 87	15	1	28	20
Dec 87	7	0	26	11
Totals	95	34	312	190

VI. Future Work

A. Satellite package development. The other two units originally ordered from Telonics with the pressure sensor and the originally requested sampling design, were delivered after the work on Round Island ended and will be field tested before being deployed in 1988. One will be put on a male at Cape Seniavin on the Alaska Peninsula in April or May 1988 and the other, along with four others, will be attached to females on the ice near Wainwright, Alaska.

B. Attachment techniques.

1. Delivery method. Although the jabstick gives the most control over administration of immobilizing drugs, conditions on the ice may require alternate methods of delivery. Other systems, such as CO2 guns and the Telinject system will be investigated at Cape Seniavin.

2. Drug choice. At Cape Seniavin in April-May 1988, further drug testing will be conducted under the supervision of a veterinarian. Dr. Lanny Cornell of Seaworld, San Diego, and Dr. Sam Rigeway of Naval Ocean Systems Center, San Diego, will be consulted on immobilization drugs for Pacific walruses, other possible causes of mortality of the Round Island animals and ways to change the protocol to avoid future mortalities. If, after further testing, Telezol does not prove to be satisfactory, carfentenil will be

tested as well as other drugs recommended by Cornell or Rigeway.

3. Attachment. The bracket will be redesigned to eliminate the need for Flexane. Another kind of epoxy that can be colored will be sought, as will a quicker method of banding.

4. Marking. Nyanzol dye will be tried again, and other potential marking paints will be researched and tested. Other forms of marking will be tried such as Allflex cattle ear tags on the flippers, and, if the permit can be modified to include it, hot branding for a permanent mark on the animal should the transmitters fall off.

C. PTT function. Data from the PTT will be further analyzed for indications of the cause of failure and future PTTs modified to extend the life of the unit. Personnel at Round Island and Cape Peirce will watch and listen for the VHF unit (which should still be functional) during summer 1988, to see if the PTT is still intact.

VII. Literature Cited

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