

# Immobilization of southern elephant seal bulls (*Mirounga leonina*) in polar regions

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Fig. 1 Adult males moulting ashore

## Introduction

Tasks on free ranging pinnipeds such as blood and tissue sampling, or attachment of instruments often require remote immobilization. This is essential for elephant seal bulls, whose body mass mostly exceeds 1.5 tons. Basically, they are accessible when they stay ashore during breeding and moulting. Invasive studies, however, can be performed only during the moulting period as immobilization of breeding bulls impairs heavily the colonies' social structure. During moulting, they fast and hence undergo considerable metabolic changes. The individuals' constitutions are then highly variable, and the reaction to external stimuli is unpredictable. At this time, males aggregate tightly in large groups (Fig. 1), and estimation of body mass is difficult. Field conditions in polar regions additionally aggravate immobilization as remote injection devices are mainly designed for temperate areas. To enable our recent studies on wild elephant seal bulls, the method of distance immobilization was applied in due consideration of the species and the environment.

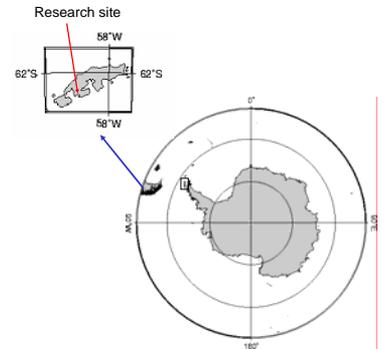


Fig. 2 Research area: King George Island, South Shetland Islands, Antarctica

## Material and Methods

Twenty-seven males were immobilized after their moulting period (March to May 2000, King George Island) for various tasks. The body mass and disposition was roughly assessed. Then the immobilization was performed by two steps. Firstly, a 10 ml self-evacuating dart syringe (Telinject<sup>®</sup>, Fig. 3) was filled with 0.25-0.8 ml Large Animal Immobilon<sup>®</sup> (2.4 mg etorphine/ 10 mg acepromazine/ ml LA Immobilon<sup>®</sup>, Fig. 4), and complemented by 9 ml of sterile NaCl solution (0.9%). Canules (2 x 80mm) were locked to the syringe by custom made aluminium safety connectors (Ludolph, Bremerhaven). The projectiles were darted using a CO<sub>2</sub>-powered rifle (G.U.T. 50, Telinject<sup>®</sup>) over a distance of ca. 5 to 20 m (2 to 4 bar) placed intramuscularly into the lateral hip area. Secondly, as touch of the animal was possible and breathing and reflexes appeared regularly, immobilization was maintained by manually injected subsequent doses of ketamine (100mg/ml) according to lid reflex, colour of mucosal tissues, breathing rate, and degree of muscle relaxation. The etorphine-antidote Large Animal Revivon<sup>®</sup> (3mg/ml diprenorphine HCl) was ready for i.v./i.m. injection in case of apnea and/or convulsions (Table 1). During narcosis, the body mass was recalculated using the regression equation for male elephant seals based on standard body length (Ling & Bryden 1981).

**Precautions:** For safety reasons on personnel, the antidote Narcan<sup>®</sup> (0.4mg/ml Naloxon) was ready during any handling of LA Immobilon<sup>®</sup>. Trained staff should be aboard.



Fig. 3 CO<sub>2</sub> powered rifle with dart syringes



Fig. 4 Drugs used: LA Immobilon<sup>®</sup> (etorphine HCl) and LA Revivon<sup>®</sup> (diprenorphine HCl)

## Results

The data of immobilization are displayed in table 1. The total dosages of ketamine required ( $x=1.7$  mg/kg) were negatively correlated ( $p<0.01$ , Fig. 5) with those of LA Immobilon<sup>®</sup> (0.0009 mg/kg etorphine). The dosages of LA Immobilon<sup>®</sup> were markedly lower than recommended for other large-sized mammal species (Born & Knutsen 1990, Griffith et al. 1993) and the therapeutic range was low. In 9 cases the application of the etorphine-antidote LA Revivon<sup>®</sup> ( $x=0.0052$  mg/kg diprenorphine) was required to antagonize apnea and/or convulsions.

Table 1 Data of immobilization

id	mass [kg]	etorphine [mg/kg]	acepromazine [mg/kg]	induction [min]	ketamine		duration [min]	diprenorphine [mg/kg]	remarks
					follow-up doses (n)	total dose [mg/kg]			
1	1168	0.00220	0.00276	5	5	6.8	55	0.0077*	convulsions
2	1148	0.00051	0.00214	5	5	3.2	75		
3	1245	0.00067	0.00281	8	2	2.9	185		
4	1365	0.00062	0.00257	11	2	2.9	185		
5	1380	0.00061	0.00254	17	3	3.3	75		disturbed diet
6	1440	0.00058	0.00242	10	3	2.7	155	0.0040**	no effect to sea
7	1220	0.00066	0.00260	14	1	1.6	170		low effect
8	1255	0.00066	0.00269	14	1	1.6	170		no effect to sea
9	1550	0.00062	0.00228	12	1	1.0	105		low effect
10	1380	0.00070	0.00290	30	3	2.4	105		low effect
11	1400	0.00069	0.00288						no effect to sea
12	1230	0.00076	0.00325	13	1	0.8	65		low effect
13	1900	0.00063	0.00263	11	4	1.9	90		low effect
14	1850	0.00064	0.00433	15	1	0.3	95		low effect
15	1990	0.00061	0.00421	7	2	0.6	65	0.0032	
16	2150	0.00066	0.00372	10	1	0.9	90		
17	1900	0.00076	0.00316	15	1	0.8	110	0.0066	
18	2025	0.00065	0.00395	7	1	0.6	55		
19	1675	0.00066	0.00358	10	3	1.3	50	0.0064	
20	1415	0.00062	0.00424	15	1	0.8	60	0.0065	
21	1845	0.00069	0.00372	16	2	0.6	50		
22	1565	0.00062	0.00384	25	1	1.0	50	0.0028*	
23	1845	0.00064	0.00434	28	1	0.8	40		
24	1965	0.00066	0.00407	15	2	0.9	90	0.0021*	
25	1675	0.00066	0.00350	15	4	2.6	90		low effect
26	1515	0.00065	0.00396	30	5	2.6	105		
27	1880	0.00062	0.00426	15	2	0.7	70	0.0036	
mean	1581.7	0.00067	0.00365	14.4	2.2	1.7	80.5	0.0052	
SD	288.2	0.00029	0.00121	7.3	1.3	1.4	37.7	0.0015	

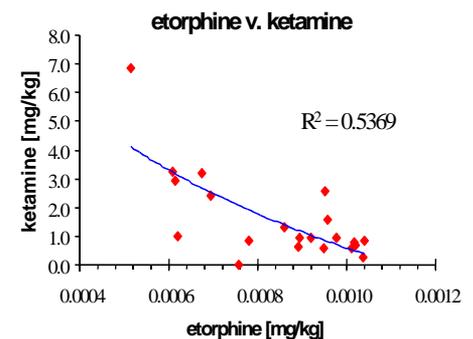


Fig. 5 Correlation (neg,  $p<0.01$ ) between dosages of etorphine given and ketamine required for suitable immobilization

## Discussion

LA Immobilon<sup>®</sup> appears to be useful as a short-term or first-step immobilization agent in elephant seal bulls by remote injection owing to its small volume required. Etorphine-immobilizations without subsequent use of other drugs (e.g. ketamine) may be sufficient for short-term handlings such as blood sampling. The combined effect of Immobilon<sup>®</sup> and ketamine appears suitable for long-term or invasive tasks such as tissue sampling or attachment of instruments (Fig. 6). We nevertheless suggest that LA Immobilon<sup>®</sup> should only be used as a kind of pre-medication, not used repeatedly in the same individual, and solely if the specific antidote (LA Revivon<sup>®</sup>) is ready. It has further to be realized that LA Immobilon<sup>®</sup> is potentially dangerous for personnel, especially when used in remote areas.



Fig. 6 Male with attached instrument