

# BLUBBER CORTISOL IS HIGHLY ASSOCIATED WITH CIRCULATING CORTISOL IN MEDITERRANEAN STRANDED DOLPHINS

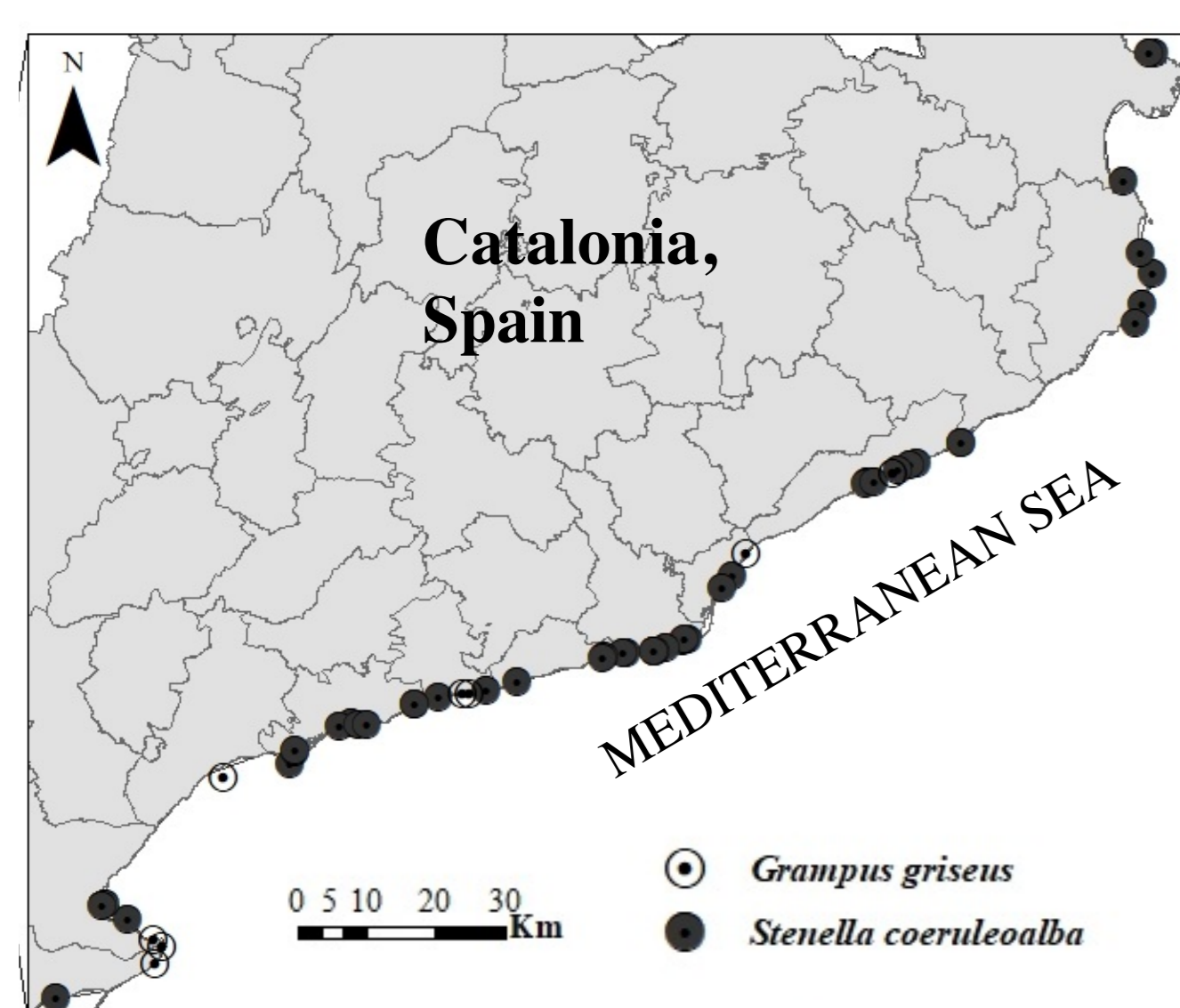
## COULD IT BE USED TO DETERMINE SUDDEN DEATH?

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### INTRODUCTION & OBJECTIVES

- Cetacean stress response is a newly and emerging topic of study in the attempt to address how emerging environmental changes are affecting populations. Cortisol is released after exposition to stressors and can be extracted from blood and blubber<sup>1</sup>.
- Strandings in the studied area are mostly the result of a natural death or a discarding after incidental capture in fishing nets, an emerging threat that is of global concern<sup>2</sup>. Disease is linked to chronic stress<sup>4</sup> and has been related to an increase in blubber cortisol<sup>3</sup>.
- **Objectives:** (1) Validate a protocol and an EIA test for blubber and serum cortisol detection in striped (*Stenella coeruleoalba*) and risso's dolphin (*Grampus griseus*); (2) study the relationship between cortisol levels and type of death; (3) Demonstrate the association between blubber and circulating cortisol levels in free-ranging cetaceans and provide references of glucocorticoid levels in different stress conditions; (4) Evaluate the utility of this tool to detect sudden death and assess bycatch.

### MATERIALS & METHODS

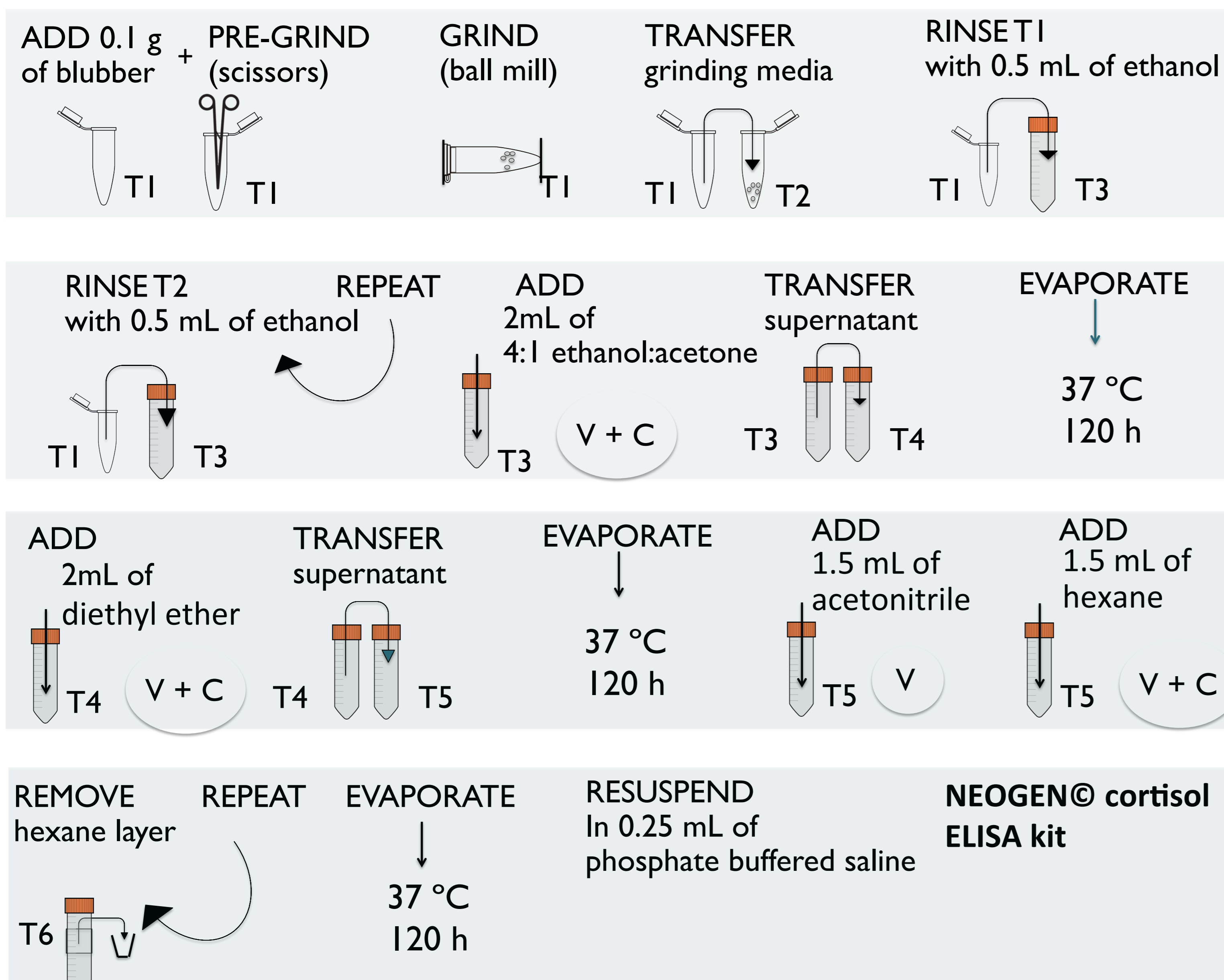


*Stenella coeruleoalba*  
N = 42 (20 F; 23 M)

*Grampus griseus*  
N = 7 (1 F; 6 M)

Map of sample collection sites; number of individuals and sex of stranded *S. coeruleoalba* (above) and *G. griseus* (below). F: female, M: male

- **Blubber hormone extraction** based on the methods of Kellar et al. (2015)



### Stranding causes



\***Presumably bycaught** (n=13)

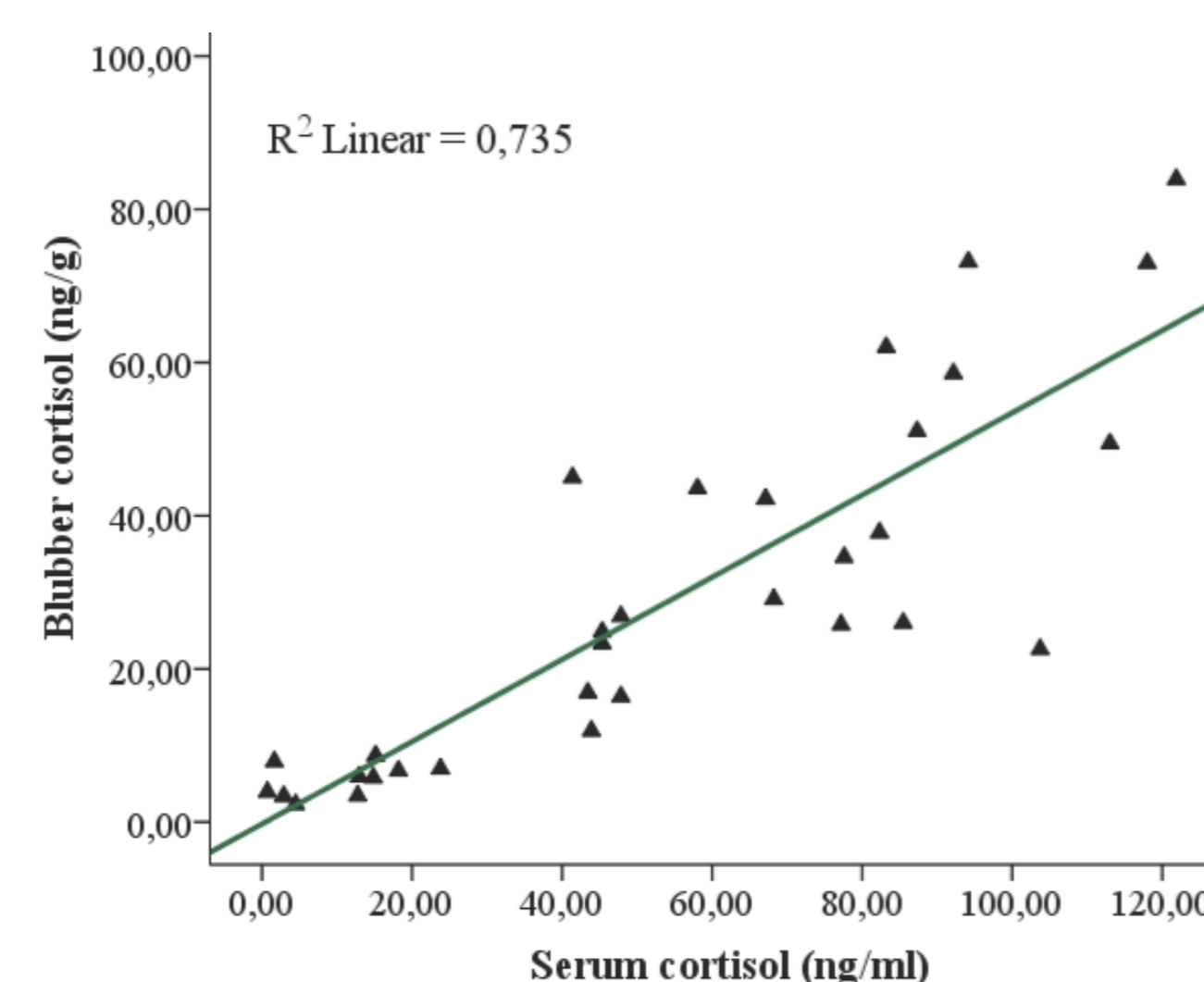
\***Stranded** (n=29): calves separated from the mother (n=6); dolphin morbillivirus (DMV) (n=6); *Brucella ceti* (n=5); bacterial septicaemia (n=3); parasitism (n=1); and unknown (n=8).



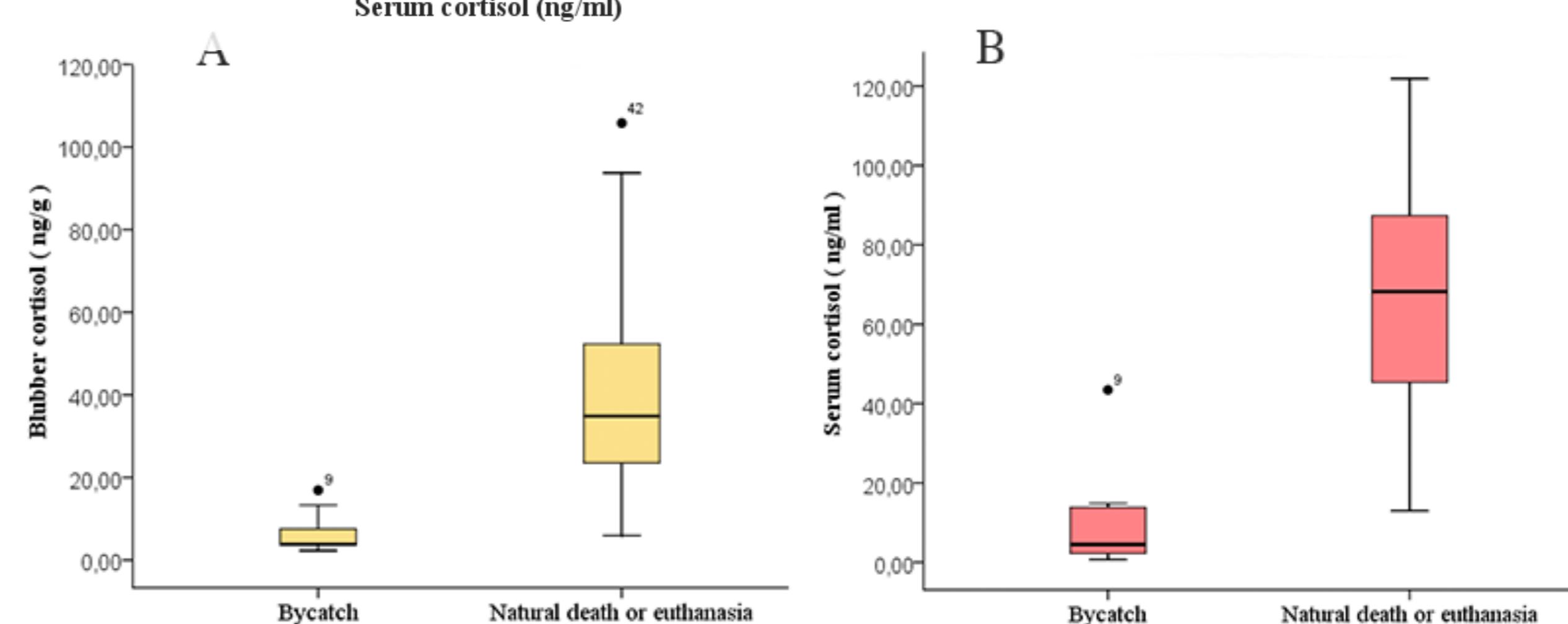
\***Stranded** (n=7): Parasitism (n=4); Sepsis and mother separation (n=2); and unknown (n=1)

### RESULTS

- ✓ Free cortisol was successfully detected from the two matrices evaluated from free-range dolphins: blubber and serum.
- ✓ Positive correlation between cortisol values of fresh and freeze-dried blubber samples ( $r = 0.94$ ,  $p = 0.01$ ).
- ✓ Blubber thickness was significantly lower in calves than in immature animals, mature males and mature females and did not vary between healthy and emaciated adults.
- ✓ Negative relationship between amount of lipid extracted and percentage of water.



✓ Blubber and serum cortisol were positive correlated ( $r = 0.86$ ,  $p < 0.01$ ).



- ✓ Blubber (A) and serum (B) cortisol concentrations from bycaught and stranded *Stenella coeruleoalba*. Stranded (mean  $\pm$  SD, blubber cortisol:  $35.3 \pm 23$  ng/g; serum cortisol  $66.3 \pm 32.2$  mg/ml) had on average 6 times more blubber and serum cortisol than bycaught (mean  $\pm$  SD, blubber cortisol:  $6.2 \pm 4.3$  ng/g; serum cortisol:  $11.5 \pm 15.1$  mg/ml).

### CONCLUSIONS

- ✓ Free cortisol can be successfully measured in blubber and serum of *S. coeruleoalba* and *G. griseus* through a commercial enzyme immunoassay (EIA) kit.
- ✓ Results validate the positive relationship between blubber and circulating cortisol concentrations in free-ranging dolphins.
- ✓ Cortisol concentrations were significantly higher in stranded dolphins.
- ✓ Low blubber cortisol values could be a new sign of incidental capture in stranded dolphins.

### References

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