

**NAMMCO Expert Group meeting 4 – 6 November, Copenhagen****Document 11****PROTOCOL for Statistical analyses of TTD in whaling operations**

**Which and how many killings should be recorded?**

- 1. The ideal is to record TTD for all animals killed.**
- 2. Nearly equally good is to record TTD for a random (in the statistical sense) sample of the killings (or boats or hunters).**
- 3. A non-random sample may provide valuable information, especially if explanatory variables are recorded, but a small random sample is better than a large non-random sample.**
- 4. If the sample has to be non-random, try to include all possible types of boats or hunters.**
- 5. If the sample has to be non-random, try to include the same boats or hunters (or similar boats and hunters) in the following years.**
- 6. Even a very small sample (less than 10) is better than no sample.**

**Advice on the organisation of the data matrix**

- a) Each whale should be represented by one line (row) in the matrix
- b) The first column should contain a whale identifier (e.g. a number)
- c) An early column should contain a binary value indicating instantaneous death  
(e.g. 1: instantaneous dead, 0: alive after the first hit)
- d) One column should contain time to event
- e) The next column should contain a variable indicating type of event (1: death, 2: censoring)
- f) The next columns should contain covariates which could be binary, categorical or scale,  
one column for each variable
- g) If a secondary weapon is used, the columns c), d), e) and f) should be repeated  
for the secondary weapon. If there are alternative secondary weapons,  
one column should indicate which secondary weapon is used.

## **All statistical packages have most of the necessary programs**

### **A) Instantaneous death**

- a) binomial  $p$  with confidence interval
- b) comparing two binomial  $p$ 's with chi-square ( $n-1$ ) or Fisher-Irwin test
- c) logistic regression with covariates

### **B) Time to death for whales that are not instantaneous dead**

- a) Kaplan-Meier plots
- b) Cox-regression with covariates
- c) survival analysis with censoring
- d) survival with use of secondary weapon