

## Dispersal and By-Catch Mortality in Grey, *Halichoerus grypus*, and Harbour, *Phoca vitulina*, Seals Tagged at the Norwegian coast

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### PREFACE

*The results of the study presented here are submitted to a refereed journal for consideration. The review and printing process may not be completed at the time of the 2000 ICES Annual Science Conference and the subsequent release of the conference documents on CD-ROM. To avoid any formal incorrectness of double publishing the results during the period of the primary review and printing process, this paper provides a detailed outline of the content, but does not detail the specific results of the study. However, all results will be accounted for in the verbal presentation at the ICES Annual Science Conference.*

### Introduction

- Marine mammals are vulnerable to incidental mortality in gillnet fisheries worldwide. By-catches may exceed the level of sustainable removals, and therefore pose a threat to species and populations otherwise protected from intentional harvest. Focus has been on small cetaceans, where large numbers were reported taken annually in high seas purse seine and driftnet fisheries for tuna, and in various types of coastal gillnet fisheries. Due to public awareness, efforts have been launched to monitor this mortality, and mitigation measures are introduced in some areas.
- By-catch mortality in seals has received less emphasis, although mortality rates may be significant. Grey *Halichoerus grypus* and harbour *Phoca vitulina* seals are primarily fish feeders foraging in coastal waters. Their diets comprise a range of commercial fish species. In Norway, where fishing intensity in coastal waters is high, there is an enhanced potential for interactions between seals and fisheries.
- Tagging programmes on grey and harbour seals in Norway have been conducted since 1975 and 1978, respectively. The present review is based on accumulated recoveries from the initial tagging and up to 1998 inclusive. This paper is the first attempt to estimate by-catch mortality of grey and harbour seals in Norway based on mark-recapture experiments. The mortality is discussed in light of age, dispersal, latitude and habitat protection status.

## Methods

- Yellow plastic tags of the type “Dalton Jumbo Rototag” imprinted return address and serial number, were attached to the web of the hind flippers of pre-weaned harbour and grey seal pups. For both species, the taggings were predominantly conducted in three main areas: Central Norway; Nordland county and Finnmark county for grey seals; the Oslofjord, Central Norway and North Norway for harbour seals.
- To test for difference in recovery rates between the areas, we used the relationship between the numbers of tagged and recovered in the two areas showing the most different recovery rates using a Fisher's exact test. If the most different recovery rates were not significantly different, all areas were regarded not different.
- We compared the recovery rates and dispersal (distance between site of tagging and site of recovery) of grey and harbour seals using an independent-samples t-test after arc-sin transformation, and an independent-samples t-test, respectively.
- A Kruskal Wallis analysis of variance by ranks was used to compare the dispersal between main tagging areas. Within each area, a Mann-Whitney U-test was used to compare distances for those moving south along the coast and those moving north. All statistical tests were made in SPSS 9.0 for Windows (SPSS 1999) using a 5% significance level.

## Results and Discussion

- Between 1975 and 1998, totals of 3 571 grey and 630 harbour seal pups were tagged at the Norwegian coast, and 259 (7%) grey and 79 (13%) harbour seal tags were returned. Recoveries were exclusively made in coastal waters, and all returned tags were from dead seals.
- Most of the recovered tags in both species were returned during the first twelve months after tagging, and in particular shortly after weaning. Within species, we did not find any significant difference in recovery rates between the three main areas of tagging.
- Grey seals dispersed more widely than harbour seals. However, during the breeding season, adult grey seal were recovered in close proximity to their natal site. For both species, there was no significant difference in dispersal between those moving south and those moving north along the coast from their site of tagging.
- In both species, about 6% of all tags were returned from seals drowned in fishing gear. One particular type of fishing gear caused the majority of the reported casualties. No effort data were available to compare gear types with regard to “by-catch per unit effort”.
- No recovery was reported from 37 harbour seals tagged in a 724 km<sup>2</sup> nature reserve. For grey seals tagged within the same reserve, the incidental mortality was not significantly different from the mortality of grey seals tagged in other areas. The reserve sets strict regulations for human activities throughout the year, and prohibit human access to the breeding sites during the breeding seasons. The size of the nature reserve may be sufficiently large to influence the anthropogenic mortality in harbour seals, but not in the more widely dispersing grey seals.