

# A simple field method for age-class determination in the Harbour seal (*Phoca vitulina* L.)

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## Introduction

During the last decades the harbour seal population in the Dutch Wadden Sea has decreased greatly: from about 3000 in 1955, to 450 specimens in 1975 (for area location see Fig. 1). To determine the cause of this decrease a study was started of the population dynamics of this species. Establishment

of the age distribution was one of the problems the author met during this research. In comparable studies Bigg (1969), Boulva (1974) and Smith (1973) constructed life-tables for seals on the basis of random samples of seals there were shot. Because the number of seals in our area has dropped to such low numbers this method could not be used in the present study. Another more indirect method was

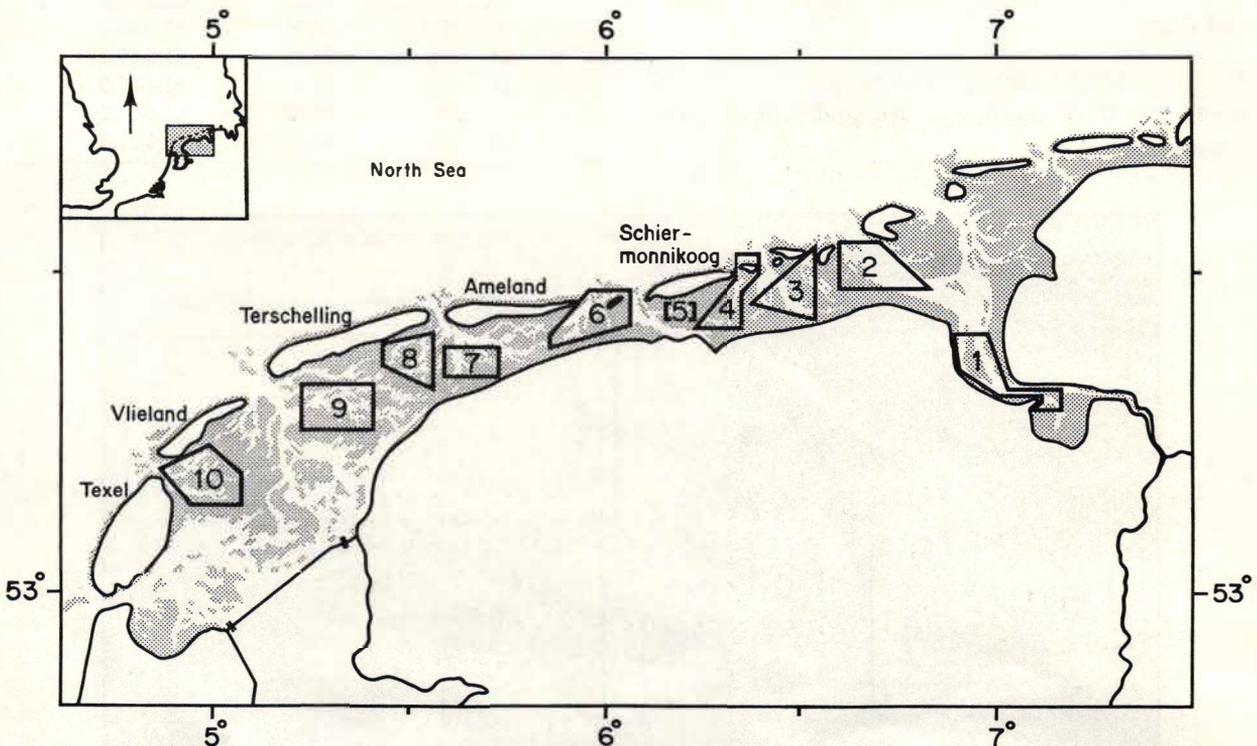


Fig. 1 — Study area — Dutch Waddensea with common seal localities

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developed instead. Van Haaften (1959) in his censuses used the tracks which remain on the sand banks when disturbed seals run from their resting places into the water. The seal uses its fore-flipper nails to crawl over the sand. (See photo). The width of the track may indicate the size of the seal and, according to a size-age relationship, also roughly the age when we distinguish only the age classes: juvenile, sub-adult and adult. The smallest distance between the marks of the left- and right fore-flipper is measured and is referred to as track width (Fig. 2).

Seals kept in captivity at the Texel Museum and the Artis Zoo, Amsterdam, provided basic data to determine a size-age relationship. With the help of this relationship it may be possible to estimate the age-class of seals in the field indirectly.

### Methods

The experiment was carried out in the middle of July. All animals (30 specimens) were collected in a bassin. Then one by one, they were released to a cage. Here girth behind the fore-flippers was measured, the seal was sexed and its known age was noted. Afterwards the animal was sent through a rather narrow lock with a moistured sandy bottom. The track each animal left behind was measured and compared with its age. Two mathematical models were tested to establish a regression model for the correlation between track width and age:

1)  $y = c(1 - e^{-bx})$  and 2)  $y = ax^3 + bx^2 + cx + d$   
 where  $y$  = track width,  $x$  = age, and  $a$ ,  $b$ ,  $c$ ,  $d$  are constants.

### Results and discussion

The trimonium gave a better fit than the exponential function to describe the samples. The model with the best fit is given by:

$$y = 0.038 x^3 - 1.144 x^2 + 11.245 x + 28.619$$

Confidence intervals of 95 % of the  $y$ -estimates were calculated (Fig. 3).

The three age classes have a clearly distinguishable range in track width: juveniles (0-1 year): 26.0-31.5 cm; subadults (1-2-3 year): 36.3-55.1 cm; adults ( $\geq 4$  year):  $\geq 55.8$  cm.

To make sure that the captive seals are representative for seals living in the Wadden Sea — i.e.

Table 1 | CALCULATION OF AGE DEPENDENT TRACK WIDTHS, USING THE EQUATION:  $Y = 0.038 X^3 - 1.144 X^2 + 11.245 X + 28.619$ , WHERE  $Y$  IS TRACK WIDTH AN  $X$  IS AGE. CONFIDENCE INTERVAL = 95 %; DATA IN BRACKETS ARE THE NUMBERS OF INDIVIDUALS EACH YEAR

age (years)	y-estimates (cm)	95 % conf. limm. y-estimates (cm)
0.01 (5)	28.73	26.0-31.5
1 (3)	38.76	36.3-41.3
3 (3)	46.84	44.6-49.1
3 (4)	53.08	51.0-55.1
4 (1)	57.71	55.8-59.6
5 (1)	60.97	59.4-62.6
6 (3)	63.07	61.2-65.0
7 (2)	64.25	62.3-66.2
9 (1)	64.72	62.3-67.1
10 (1)	64.47	61.8-67.1
11 (2)	64.21	62.4-66.0
13 (3)	64.52	61.8-67.2
15 (1)	67.48	63.6-71.3

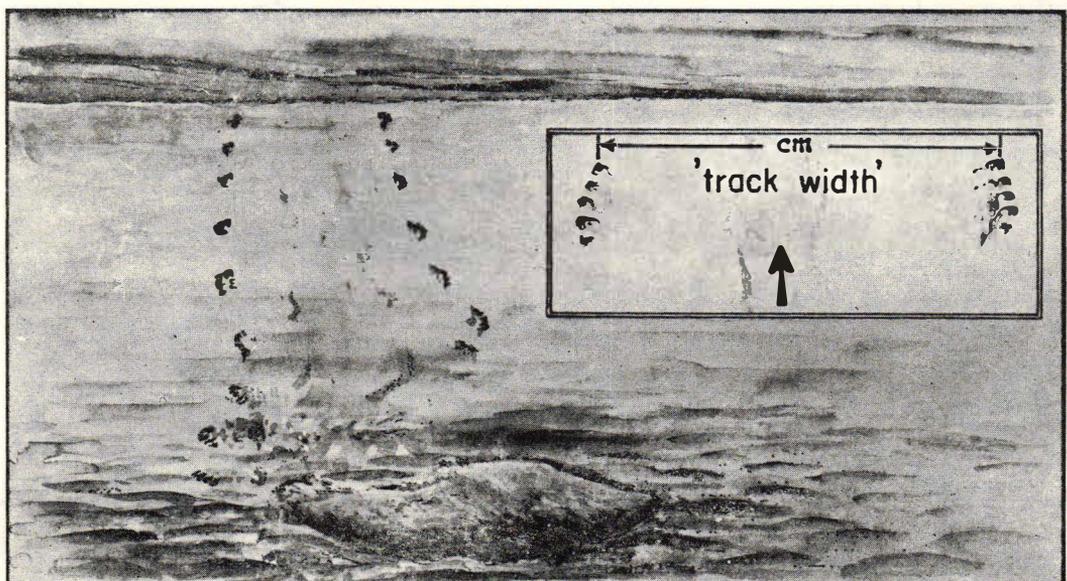
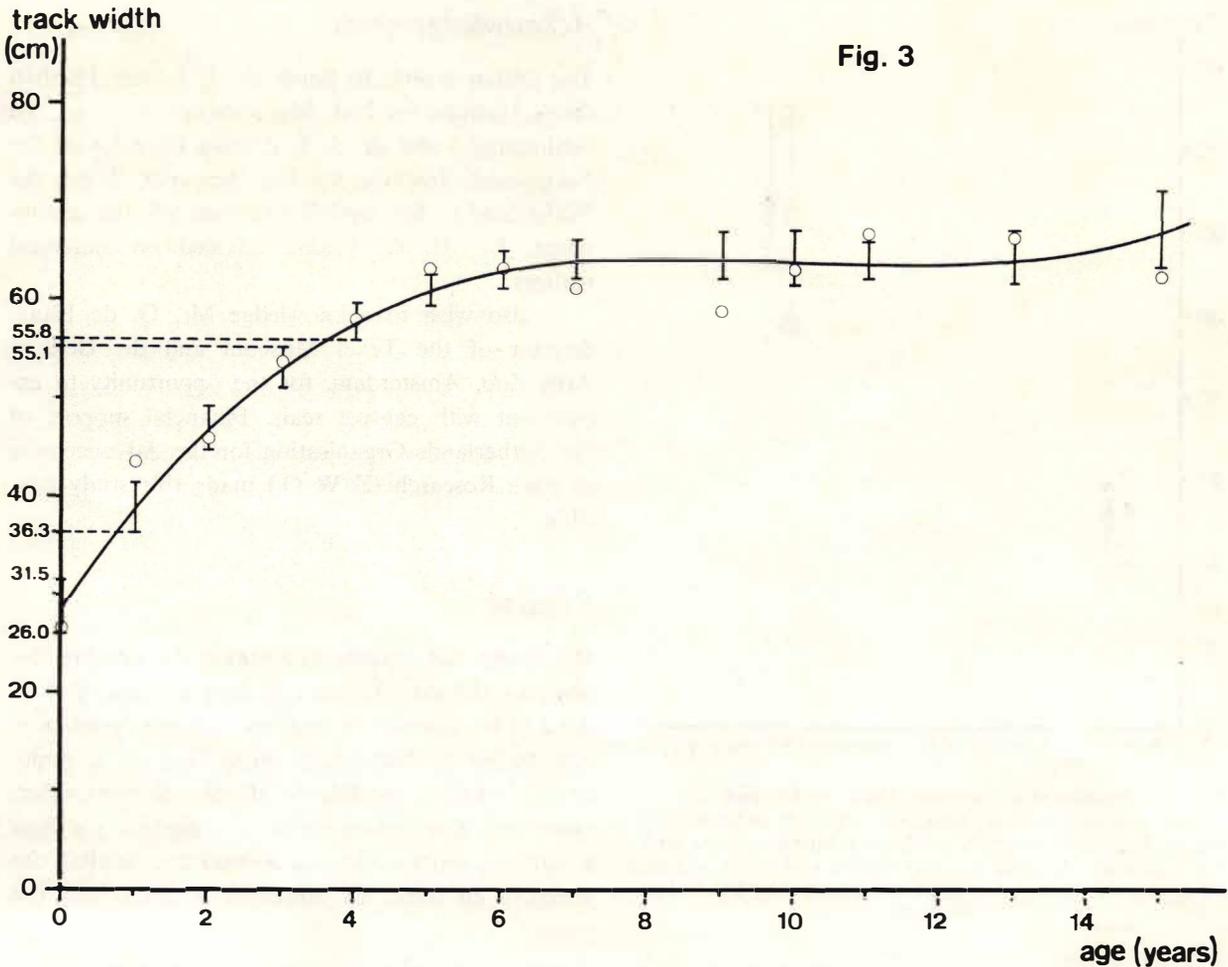


Fig. 2 — Resting place and seal track on sand bank



Relationship between track width and age of harbour seals:

- mean of samples, taken at whelping time
- ┆ interval of 95 % confidence

The distinguished age-classes are:

- 0 years - juveniles - > 26.0 cm < 31.5 cm
- 1, 2, 3 years - sub adults - > 36.3 cm < 55.1 cm
- ≥ 4 years - adults - ≥ 55.8 cm

have the same skeletal growth rate —, the model was applied to field observations during the same period in which the tracks of the captive seals were measured. Reliable information about the age class of a seal without killing the animal can only be obtained when a mother-young relationship, or a single pup (< 2 months old) is observed. When such a mother-young relationship or a pup was sighted, the corresponding track widths were measured. The results are given in Fig. 4.

For reasons discussed earlier, only information about juvenile ad mature females could be obtained. For juveniles:

- wild seals: mean track width: 26.3 cm; stand. dev. 2.987
- captive seals: mean track width: 26.4 cm; stand. dev. 2.408.

For matures:

- wild seals: mean track width: 61.7 cm; stand. dev. 4.948
- captive seals: mean track width: 63.3 cm; stand. dev. 4.670.

The mean value for mature captive seals is somewhat higher than for wild seals. This is partly due to the fact that with respect to the «captive group» the mature seals were mainly males (10 out of 15): fully grown male seals differ from females, the males being larger in length, about 3% (Wipper, 1974). On the other hand the «wild group» consisted purely of females so that the mean value should be regarded as being too low to represent both sexes.

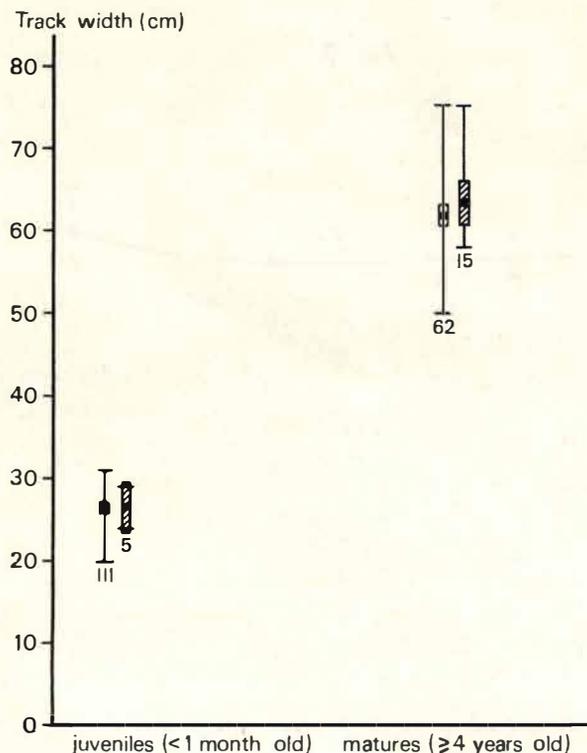


Fig. 4 — Relationship between track width and age of captive and wild harbour seals. Vertical lines indicate total ranges. Bars indicate 95 % confidence interval. Open bars for wild seals. Hatched bars for captive seals. Solid circles for means. Numbers of animals per group are given below the bars

Although the number of captive seals measured can only be small compared to numbers in field populations, the data from Fig. 4 suggest that the age classes in a harbour seal population.

We have also considered the possibility that the sexes vary in their contribution to the age class distribution model at certain ages. Bigg (1969), Bishop (1968) and Fisher (1952) stated that there is no significant difference in length and weight between sexes till the age of six years.

For seals in the Dutch Wadden Sea a linear regression model was established between girth and track width ( $r = 0.98$ ;  $p < 0.001$ ;  $n = 22$ ). Fisher (1952: 6-7) also reports data on girth being fore-flippers and age. He found no difference between sexes. Thus Fisher's data offer circumstantial evidence that the sexes do not differ in track width until the age of six years.

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### Résumé

Dû à une très grande diminution du nombre des phoques (*Phoca vitulina* L.), dans la Côte Hollandaise, il fut interdit de tuer ces animaux, pour pouvoir établir la distribution selon l'âge de la population. Ainsi, le modèle est développé pour déterminer une distribution de la classification par âges à «grosso modo» (jeunes, sub-adults, adults) des animaux en terre, en mesurant la dimension des traces.

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