Hayne Line Transect Estimator

The Hayne estimator was develop to estimate density of birds that flush as an observer comes within a certain radius. This method assumes that there is a fixed flushing distance *r* and all animals within *r* distance of the observer will flush.

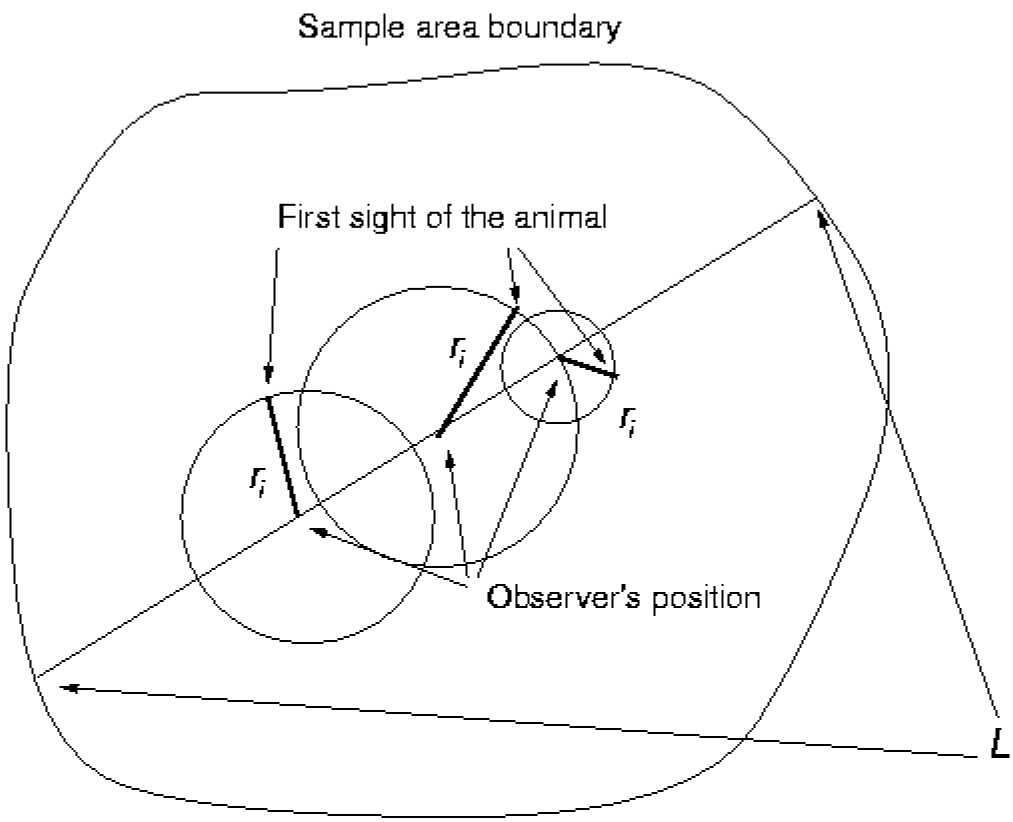

Figure 1. Illustrating the layout and important measures for the Hayne line transect estimator.

The density is estimated by :

$$\hat{D}_H = \frac{n}{2L}\left(\frac{1}{n}\sum_{i=1}^{n}\frac{1}{r_i}\right)$$

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where:

D_H is the Hayne density estimate

n is the number of animals

L is the length of the transect

r_i is the sighting distance to the i^{th} animal.

R is the mean of the reciprocal of the sighting distances and is calculated as:

$$R = \frac{1}{n}\sum_{i=1}^{n}\frac{1}{r_i}$$

The variance of the density estimate is calculated as :

$$Variance\left(\widehat{D}_H\right) = D_H^2\left[\frac{var(n)}{n^2} + \frac{\sum_{i=1}^{n}\left(\frac{1}{r_i} - R\right)^2}{R^2 n(n-1)}\right]$$

where:

D_H is the Hayne density estimate

n is the number of animals

var(n) is the variance of n approximately equal to n

r_i is the sighting distance to the i^{th} animal.

The standard error of the mean density is estimated by the square root of the variance.

Hayne method assumed that the mean sighing angle is 32.7°. This can be tested by:

$$Z = \frac{\sqrt{n}(\bar{\theta} - 32.7)}{21.56}$$

where:

Z is the standard normal deviate test value

n is the number of animals sighted

θ is the mean observed sighting angle (Figure 1).

The test would be if the Z value is greater than 1.96 or less than -1.96 the sighting angle is statistically different than 32.7° at the alpha = 0.05 level.

Also See:

Chapter 2 - Estimating Abundance: Line Transects pages 115-121 in:

Krebs, C. J. 1989. Ecological Methodology. Harper and Row, Publishers. New York. 654 pp.