## Appendix A

**List of common and scientific names cited**

<table>
<thead>
<tr>
<th>Common name</th>
<th>Scientific name</th>
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<tr>
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Appendix B
Notation and abbreviations, and their definitions

The following list is not exhaustive; notation is only included here if it is used through much of the text. Some of the notation listed below is occasionally used for another purpose; in such cases, the temporary definition is stated in the text. Standard mathematical and statistical symbols such as \(\infty\), \(\Sigma\) and \(\tau\) are not listed.

\(\rho\) effective strip width = \(1/f(0) = \int_0^w g(x) \, dx\); the half-width of the strip extending either side of a transect centreline such that as many objects are detected outside the strip as remain undetected within it

\(\nu\) effective area = \(2\pi/h(0) = 2\pi \int_0^w r g(r) \, dr\) (point transect sampling); the area such that as many objects are detected outside it as remain undetected inside it

\(\pi(s)\) probability distribution of cluster sizes in area \(A\)
\(\pi^*(s)\) probability distribution of sizes of detected clusters; this differs from \(\pi(s)\) when sampling of clusters is size-biased

\(\sigma\) effective radius = \(\sqrt{\nu/\pi}\); the radius of the circle around each point such that as many objects are detected beyond \(\sigma\) as remain undetected within \(\sigma\)

\(\theta\) a scale parameter, used primarily in the half-normal and hazard-rate detection functions

\(\alpha\) sighting angle (subscript \(i\), if present, denotes the \(i\)th detection)

\(a\) area within distance \(w\) of surveyed lines or points; the surveyed area

\(A\) size of study area, containing \(N\) objects; a sample of size \(a\) of this area is surveyed (subscript \(v\), if present, denotes the \(v\)th stratum)

\(\text{AIC}\) Akaike’s Information Criterion, used for model selection

\(b\) dispersion parameter, also called variance inflation factor

\(B\) number of bootstrap resamples
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c the sampling fraction, usually equal to one, but equal to 0.5 if just one side of the line is recorded (line transect sampling), or \( \phi/2\pi \) if just an arc of \( \phi \) radians is counted (point transect sampling and, especially, cue counting)
c_i cutpoint \( i \), separating interval \( i \) from interval \( i + 1 \), grouped distance data
cov sampling covariance
cv coefficient of variation = (standard error)/(estimate). When expressed numerically, usually converted to a percentage by multiplying by 100

\[ D \] density of objects in study area = \( N/A \) (subscript \( v \), if present, denotes the \( v \) th stratum)

\[ E(s) \] the mean size of the \( N_s \) clusters in the study area

\[ f(y) \] the probability density function of perpendicular distances (line transects) or detection distances (point transects)

\[ f(y, s) \] the joint probability density function of distances \( y \) and cluster sizes \( s \)

\[ f(y|s) \] the conditional probability density function of distances \( y \) given cluster size \( s \)

\[ f(0) \] the value of the probability density function of perpendicular distances, evaluated at zero distance (line transect sampling)

\[ g(y) \] the detection function; the probability that an object at distance \( y \) from the line or point is detected. If \( g_0 < 1 \), \( g(y) \) is the conditional probability, scaled such that \( g(0) = 1 \)

\[ g(y, s) \] the bivariate detection function; the probability that a cluster of size \( s \) and at distance \( y \) from the line or point is detected

\[ g(y|s) \] the conditional detection function; the probability that a cluster at distance \( y \) from the line or point is detected, given that it is of size \( s \); functional expression is equivalent to \( g(y, s) \)

\[ g_0 \] the probability that an object that is on the line or point \( (y = 0) \) is detected

\[ h(0) \] the slope of the probability density function of detection distances, evaluated at distance zero (point transect sampling) = \( f'(0) = 2\pi/v = 1/\int_0^w rg(r)dr \)

\[ k \] number of replicate lines or points (subscript \( v \), if present, denotes the \( v \) th stratum)

\[ l_i \] the length of line \( i \) in a line transect survey, \( i = 1, \ldots, k \)

\[ L \] the total line length in a line transect survey = \( \sum_{i=1}^k l_i \) (subscript \( v \), if present, denotes the \( v \) th stratum)

\[ L \] the likelihood function for data arising from distance sampling

\[ n \] sample size; number of objects detected (subscript \( v \), if present, denotes the \( v \) th stratum)

\[ N \] population size; total number of objects in the study area of size \( A \) (subscript \( v \), if present, denotes the \( v \) th stratum)

\[ N_z \] when objects occur in clusters, the total number of clusters in the study area

\[ P_a \] the probability that an object in the surveyed area \( a \) is detected

pdf probability density function, for example \( f(y) \)
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$r$ the detection or radial distance; the distance of an object from the observer at the time the object is detected (subscript $i$, if present, denotes the $i$th detection)

$r_{1/2}$ the distance from a point at which probability of detection is one half

$s$ the size of a cluster of objects (subscript $i$, if present, denotes the $i$th detection)

$sd$ standard deviation

$se$ standard error

$V$ number of strata

$var$ sampling variance

$w$ the truncation point; distances exceeding $w$ either are not recorded or are truncated before analysis

$x$ the perpendicular distance; the distance of a detected object from the transect centreline (subscript $i$, if present, denotes the $i$th detection)

$y$ the perpendicular distance $x$ of a detected object from the centreline (line transect sampling) or the detection distance $r$ of an object from the point (point transect sampling) (subscript $i$, if present, denotes the $i$th detection)

$z$ distance parallel to the centreline of an object from the observer at the moment of detection (subscript $i$, if present, denotes the $i$th detection)
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*Publications referenced in the text are indicated by an asterisk


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