Extended `dfuncEstim` examples

Trent McDonald

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Following is a series of `dfuncEstim` calls that show the calling parameters for popular distance sampling options.

```
library(Rdistance)
```

```
## Rdistance (version 3.1.4)
```

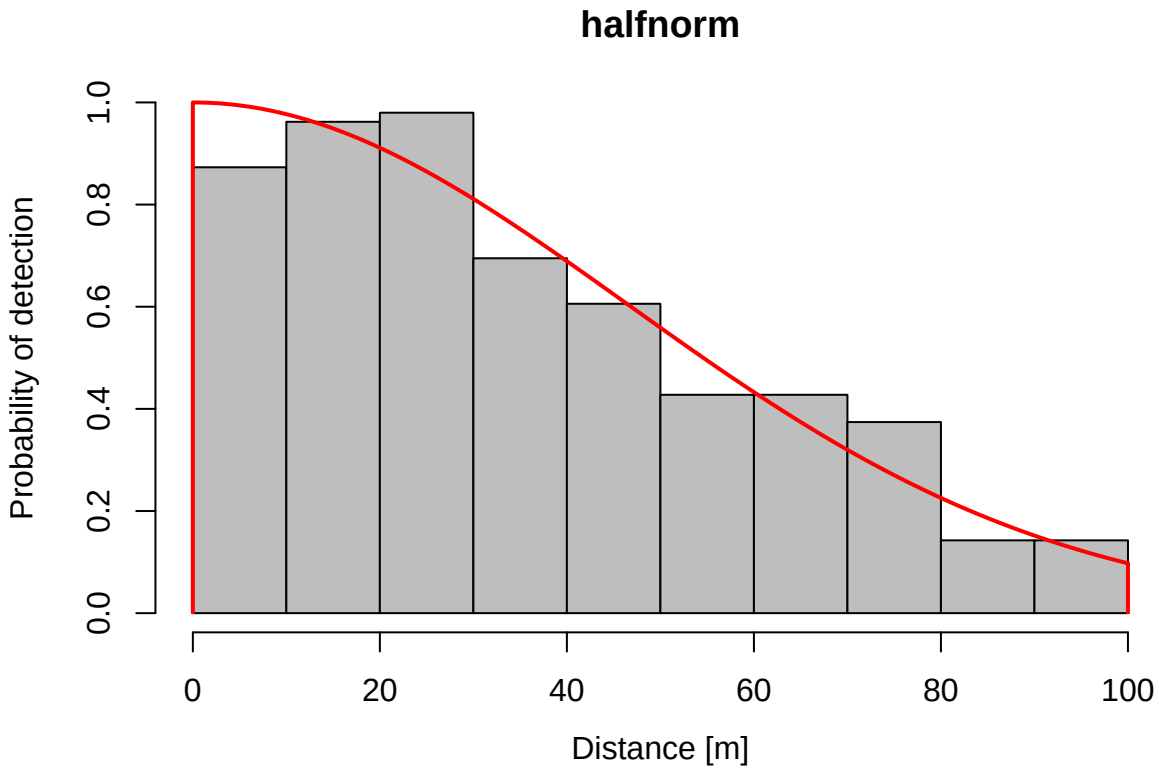
```
data("sparrowDetectionData")
data("sparrowSiteData")
```

Half-normal function with right truncation

```
dfunc <- dfuncEstim(formula = dist ~ 1
                  , detectionData = sparrowDetectionData
                  , w.hi = units::set_units(100, "m"))
dfunc
```

```
## Call: dfuncEstim(formula = dist ~ 1, detectionData =
##    sparrowDetectionData, w.hi = units::set_units(100, "m"))
## Coefficients:
##        Estimate  SE        z        p(>|z|)
## Sigma  46.3587   2.549913  18.1805  7.365789e-74
```

```
plot(dfunc, col="grey")
```

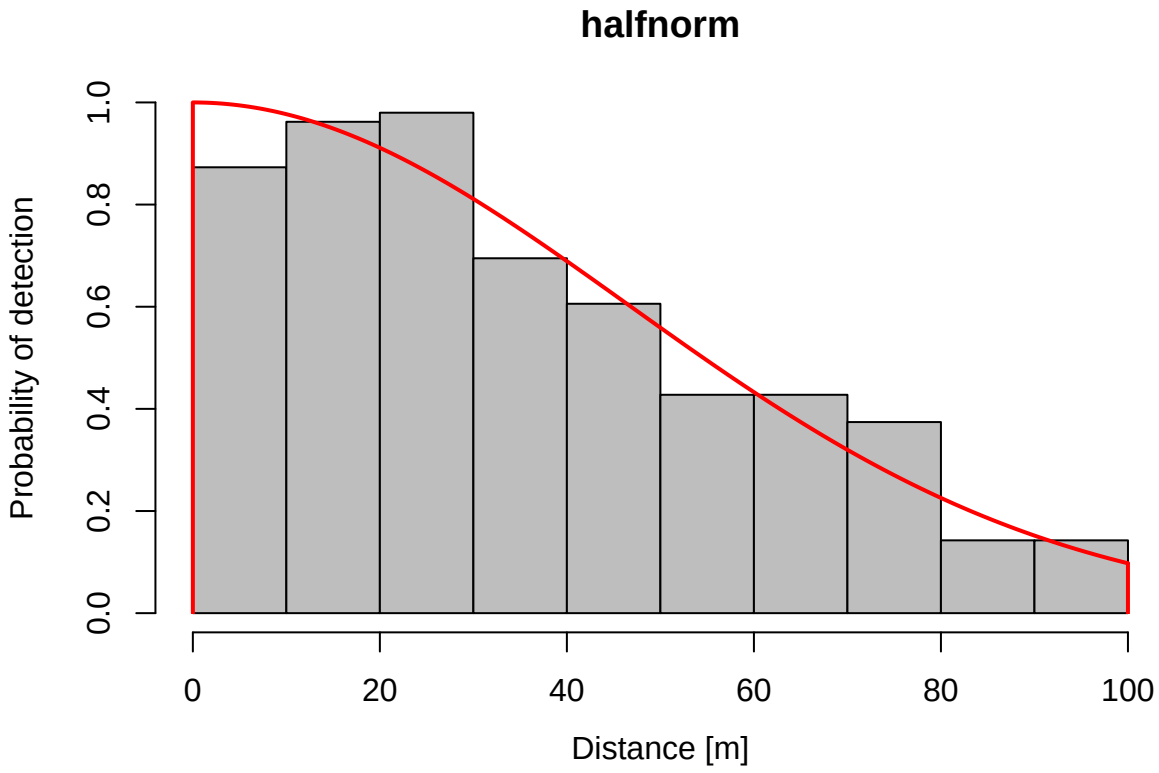


Half-normal function, truncation, group sizes

```
dfunc <- dfuncEstim(formula = dist ~ groupsize(groupsize)
                  , detectionData = sparrowDetectionData
                  , w.hi = units::set_units(100, "m"))
dfunc
```

```
## Call: dfuncEstim(formula = dist ~ groupsize(groupsize), detectionData =
##    sparrowDetectionData, w.hi = units::set_units(100, "m"))
## Coefficients:
##        Estimate  SE        z        p(>|z|)
## Sigma  46.3587   2.549913  18.1805  7.365789e-74
```

```
plot(dfunc, col="grey")
```



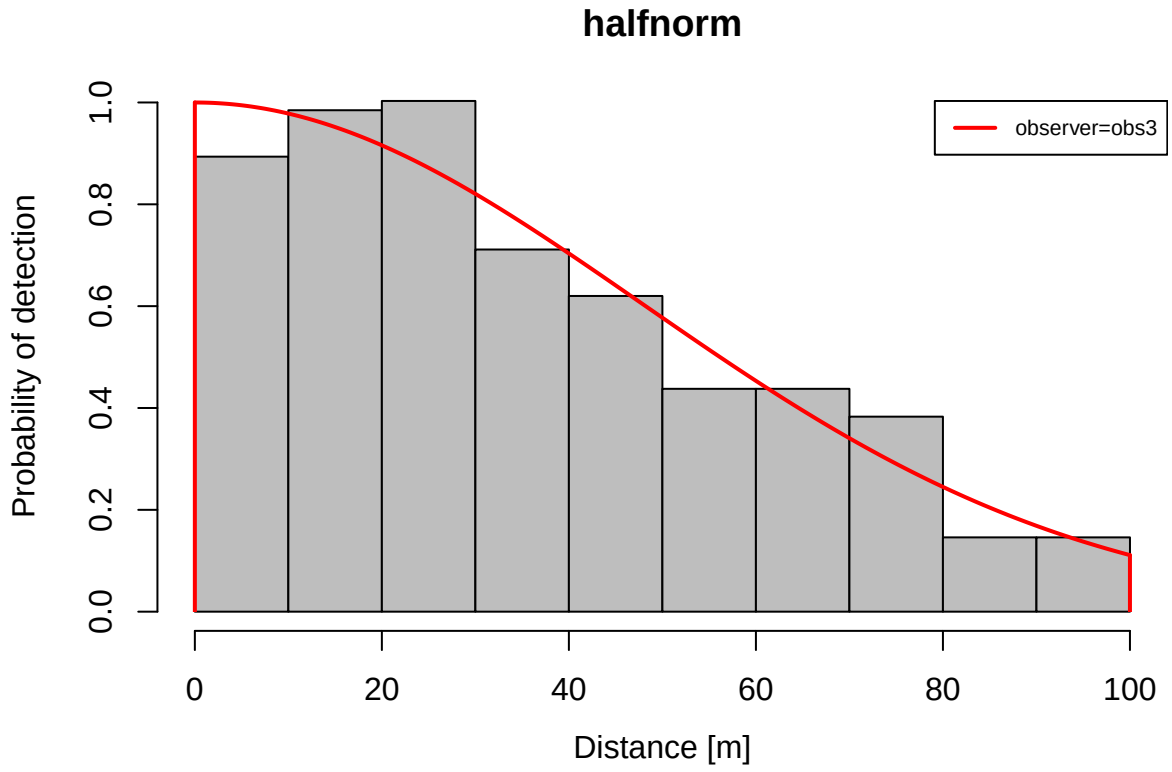
Half-normal function with factor covariate

Increase the maximum number of iterations if distance function convergence is an issue. The `observer` covariate is constant within transects and appears in the *site* data frame (`sparrowSiteData`), so the site data frame must be included in the call to `dfuncEstim`. Otherwise, the site data frame is not needed until abundance is estimated (in `abundEstim`).

```
dfuncObs <- dfuncEstim(formula = dist ~ observer
                     , detectionData = sparrowDetectionData
                     , siteData = sparrowSiteData
                     , w.hi = units::set_units(100, "m")
                     , control=RdistanceControls(maxIter=1000))
dfuncObs
```

```
## Call: dfuncEstim(formula = dist ~ observer, detectionData =
##     sparrowDetectionData, siteData = sparrowSiteData, w.hi =
##     units::set_units(100, "m"), control = RdistanceControls(maxIter =
##     1000))
## Coefficients:
##               Estimate    SE         z           p(>|z|)
## (Intercept)    3.9157276  0.1325055  29.5514293  6.295196e-192
## observerobs2   0.0368698  0.2121216   0.1738144   8.620113e-01
## observerobs3  -0.0508131  0.1747992  -0.2906941   7.712853e-01
## observerobs4  -0.2904761  0.1718375  -1.6904117   9.094922e-02
## observerobs5  -0.1025525  0.1758776  -0.5830903   5.598325e-01
```

```
plot(dfuncObs, col="grey")
```



Hazard-rate function with covariate, truncation, and variable group sizes

Group sizes do not influence the estimated distance function. Only distance to the group is used. But, group sizes are associated with individual detections and are used to estimate abundance in function `abundEstim`. If abundance will be estimate and group sizes vary, `Rdistance` requires specification of a group size variable in the call to `dfuncEstim`. Here, `groupsize` is a column in the *detection* data frame and group sizes are specified using `groupsize()` in the formula.

```
dfuncObs <- dfuncEstim(formula = dist ~ observer + groupsize(groupsize)
                     , likelihood = "hazrate"
                     , detectionData = sparrowDetectionData
                     , siteData = sparrowSiteData
                     , w.hi = units::set_units(100, "m"))
dfuncObs
```

```
## Call: dfuncEstim(formula = dist ~ observer + groupsize(groupsize),
##    detectionData = sparrowDetectionData, siteData = sparrowSiteData,
##    likelihood = "hazrate", w.hi = units::set_units(100, "m"))
## Coefficients:
##               Estimate     SE         z           p(>|z|)
## (Intercept)    3.86255655  0.1796040  21.5059619  1.369175e-102
## observerobs2   0.06544079  0.2884029   0.2269076   8.204956e-01
```

```
## observerobs3   0.05675879  0.2383286   0.2381535   8.117621e-01
## observerobs4  -0.39338344  0.2242432  -1.7542716   7.938398e-02
## observerobs5  -0.09897165  0.2135483  -0.4634626   6.430328e-01
## k              2.26440048  0.4846781   4.6719681   2.983273e-06
```

```
plot(dfuncObs, col="grey")
```

Hazard rate, covariate, group sizes, left and right truncation

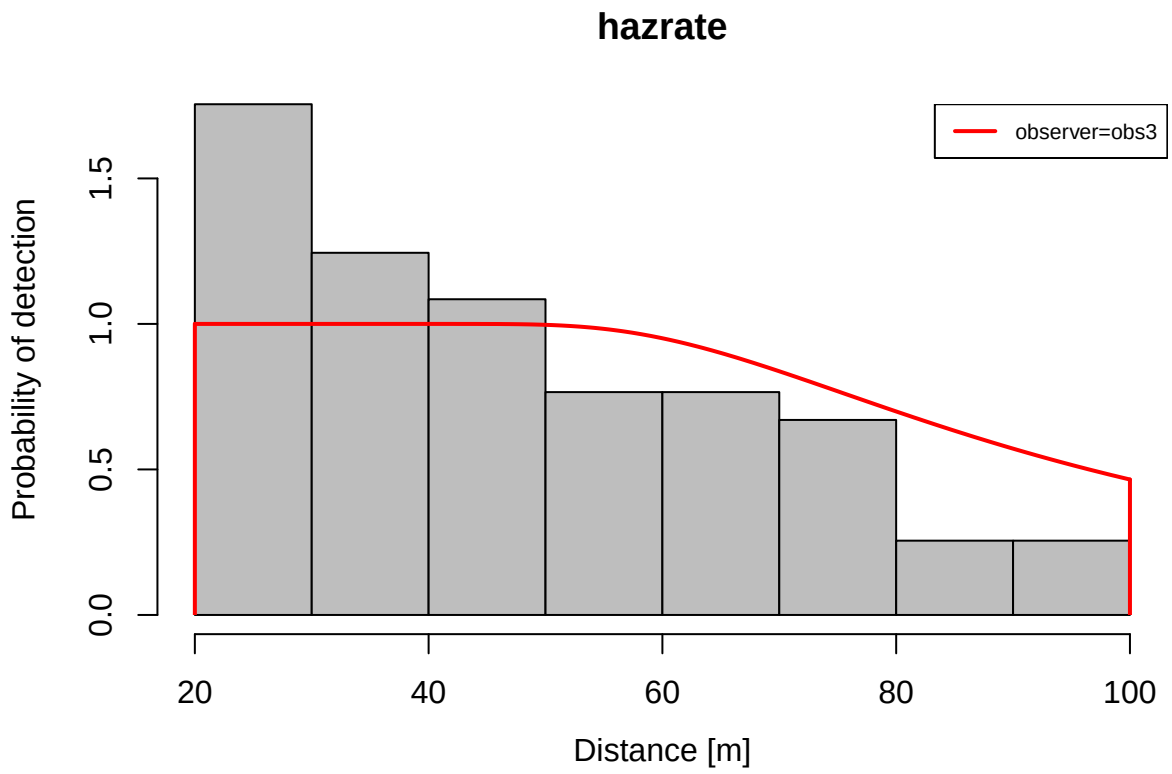
Right truncation at 100 meters, left truncation at 20 meters. If `x.scl` is not specified as greater than `w.lo`, a warning is issued.

```
dfunc <- dfuncEstim(formula = dist ~ observer + groupsize(groupsize)
                    , likelihood = "hazrate"
                    , detectionData = sparrowDetectionData
                    , siteData = sparrowSiteData
                    , w.lo = units::set_units(20, "m")
                    , x.scl = units::set_units(20, "m")
                    , w.hi = units::set_units(100, "m"))
dfunc
```

```
## Call: dfuncEstim(formula = dist ~ observer + groupsize(groupsize),
##    detectionData = sparrowDetectionData, siteData = sparrowSiteData,
##    likelihood = "hazrate", w.lo = units::set_units(20, "m"), w.hi =
##    units::set_units(100, "m"), x.scl = units::set_units(20, "m"))
## Coefficients:
##               Estimate    SE          z           p(>|z|)
```

```
## (Intercept)    3.8931772   0.2295966  16.95659907  1.720170e-64
## observerobs2   0.4785896   0.3884430   1.23207164  2.179223e-01
## observerobs3   0.2821896   0.2923237   0.96533256  3.343783e-01
## observerobs4  -3.1637038  47.3794687  -0.06677373  9.467618e-01
## observerobs5  -0.3483488   0.3284466  -1.06059507  2.888740e-01
## k              2.2649670   0.3463935   6.53871127  6.205119e-11
```

```
plot(dfunc, col="grey")
```



Hazard rate, covariate, group sizes, specify g(0)

Specify $g(0)$ at the intercept by setting `g.x.scl`. This scales the entire distance function. Here, probability of detection on the transect is known to be 0.8.

```
dfunc <- dfuncEstim(formula = dist ~ observer + groupsize(groupsize)
                    , likelihood = "hazrate"
                    , detectionData = sparrowDetectionData
                    , siteData = sparrowSiteData
                    , g.x.scl = 0.8)
dfunc
```

```
## Call: dfuncEstim(formula = dist ~ observer + groupsize(groupsize),
##    detectionData = sparrowDetectionData, siteData = sparrowSiteData,
##    likelihood = "hazrate", g.x.scl = 0.8)
## Coefficients:
##                Estimate      SE         z            p(>|z|)
## (Intercept)    3.999741285  0.1316419  30.38349752  9.075169e-203
```

```
## observerobs2   0.140084713  0.1737912   0.80605167   4.202131e-01
## observerobs3   0.004448866  0.1452428   0.03063055   9.755642e-01
## observerobs4  -0.423433581  0.1612353  -2.62618330   8.634830e-03
## observerobs5  -0.151863042  0.1508742  -1.00655437   3.141490e-01
## k              3.117839048  0.3313693   9.40895682   5.010852e-21
```

```
plot(dfunc, col="grey")
```