Analysis of a single dose-response curve
Count data

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Example 1

Data from a sublethal *Lemna minor* toxicity test where gradual reduction in
growth may be observed: numbers of fronds from *Lemna minor* were
counted for a range of concentrations, which were different dilutions of a
metal mining effluent:

```
library(drc)

library(devtools)
install_github("DoseResponse/drcData")
library(drcData)

head(lemna)
```

```
##   conc frond.num
## 1    0        70
## 2    0        66
## 3    0        61
## 4    0        65
## 5    0        65
## 6    0        61
```

Fitting the model

We will fit a Poisson dose-response model, specifically a three-parameter
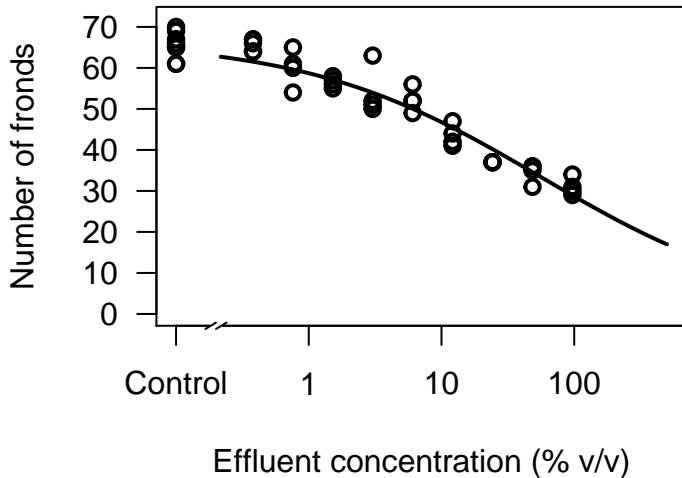log-logistic model:

```
lemna.minor.LL.3 <- drm(frond.num ~ conc,
                        data = lemna,
                        fct = LL.3(),
                        type = "Poisson")
```

Fitted dose-response curve (1)

The fitted curve together with the data may be obtained using the function plot():

```
plot(lemna.minor.LL.3, type = "all", broken = TRUE,
     xlab = "Effluent concentration (% v/v)",
     ylab = "Number of fronds",
     xlim = c(0, 500), ylim = c(0,72),
     conName = "Control", lwd = 2)
```

Fitted dose-response curve (2)

Summary of the model fit

Again, we can use the function summary() to show the estimates:

```
summary(lemna.minor.LL.3)
```

```
##
## Model fitted: Log-logistic (ED50 as parameter) with lower limit at 0 (3 parms)
##
## Parameter estimates:
##
##               Estimate Std. Error t-value   p-value
## b:(Intercept)  0.49207    0.07418  6.6335 3.278e-11 ***
## d:(Intercept) 66.79414    2.59857 25.7042 < 2.2e-16 ***
## e:(Intercept) 56.07520   14.27537  3.9281 8.562e-05 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Obtaining estimated EC values

The function ED() may be used for estimating any EC value of interest:

```
ED(lemna.minor.LL.3, c(10, 20, 50),
   interval = "delta")
```

```
##
## Estimated effective doses
##
##         Estimate Std. Error    Lower    Upper
## e:1:10   0.644967   0.467963 -0.272224  1.562158
## e:1:20   3.351589   1.677654  0.063448  6.639731
## e:1:50  56.075199  14.275369 28.095989 84.054408
```

The standard errors of the estimated EC10 and also EC20 to some extent
are quite large and the corresponding Wald-type 95% confidence interval
will have an unrealistic negative lower limit