# BCb Analysis- Early March

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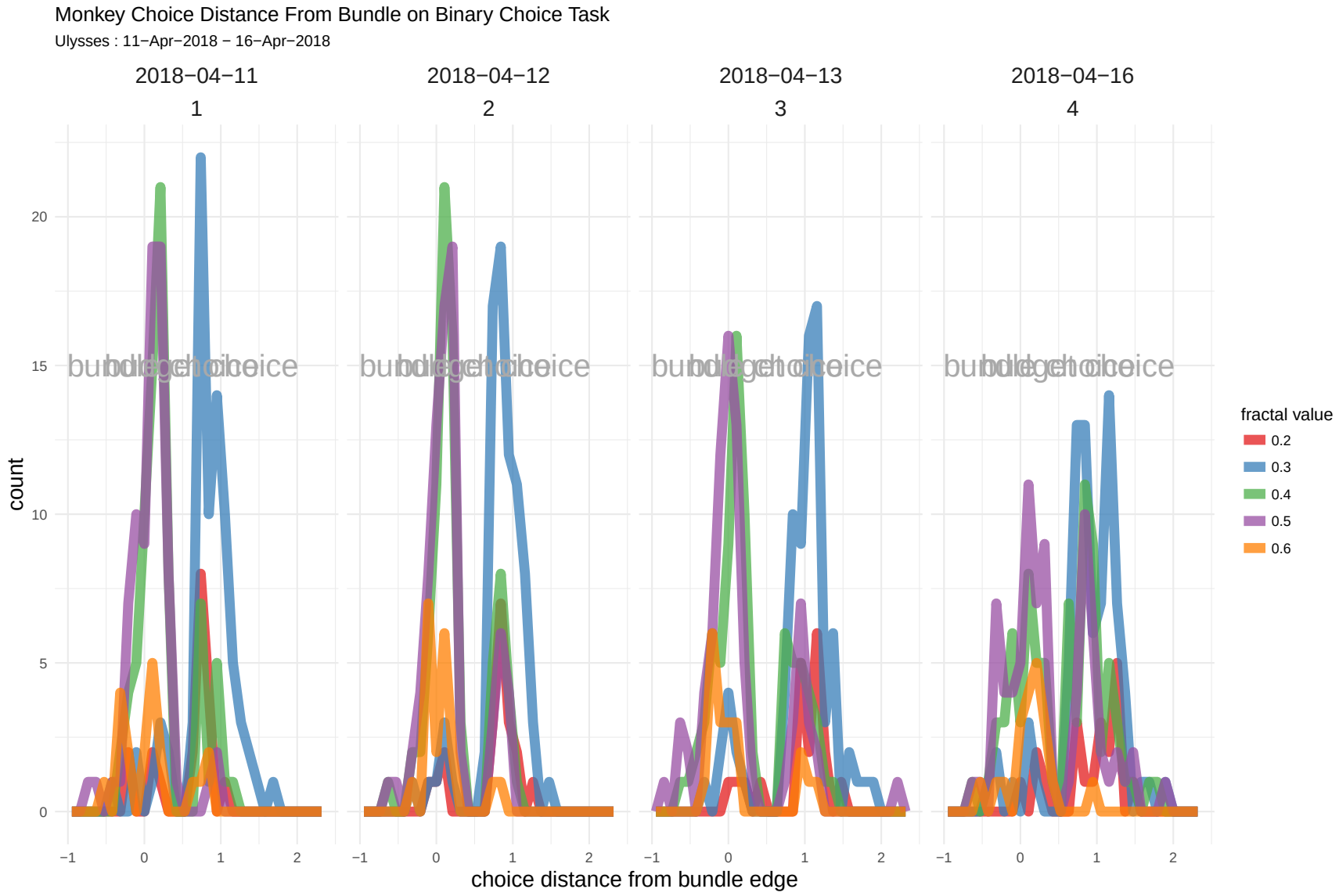
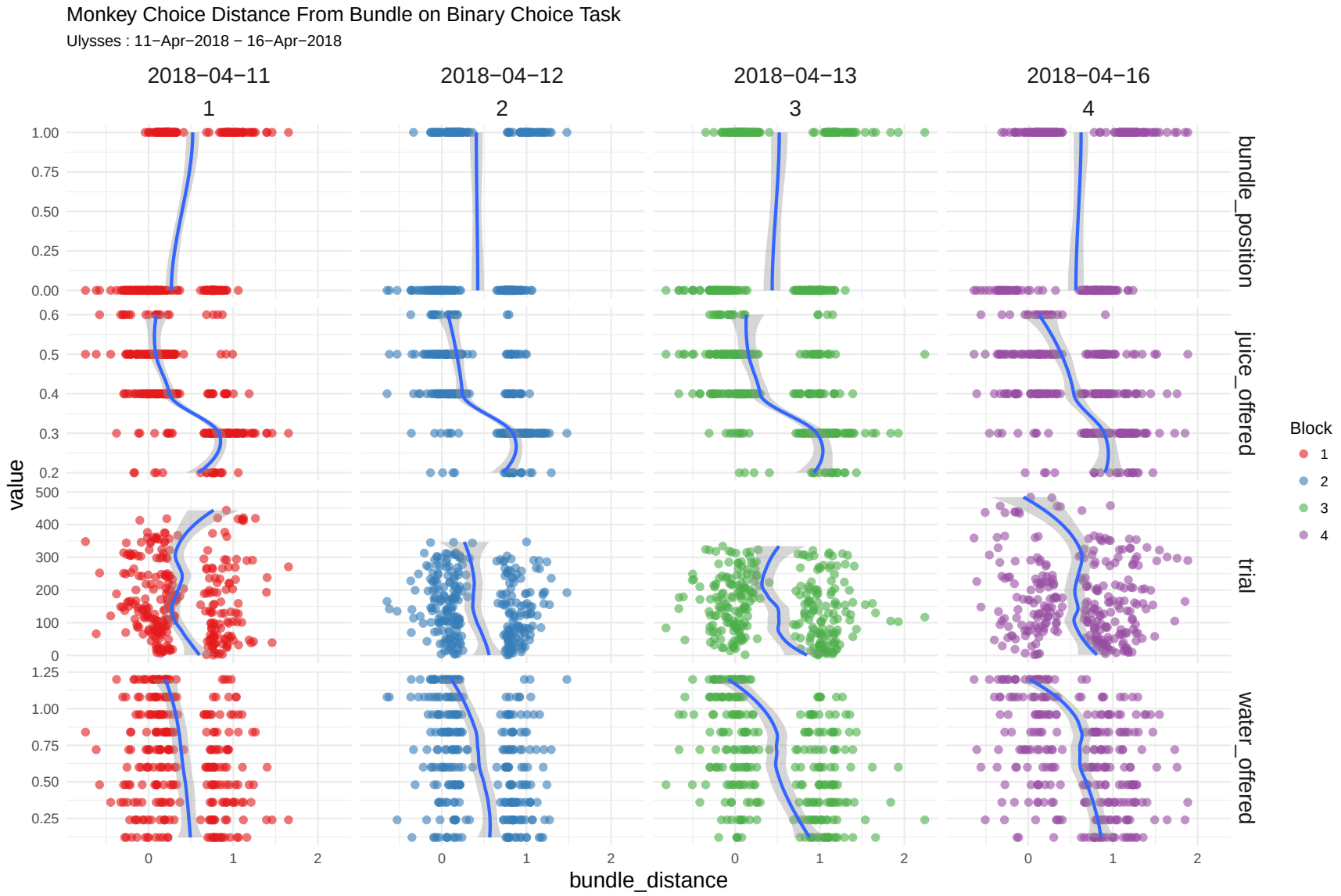
```
monkey <- "Ulysses"
today <- "16-Apr-2018"
look_back <- "11-Apr-2018"

start_trial <- 0
stop_trial <- "all"

merge_days <- TRUE
```

```
p1
```


Monkey Choice Distance From Bundle on Binary Choice Task
Ulysses : 11−Apr−2018 − 16−Apr−2018
2018−04−11
1
2018−04−12
2
2018−04−13
3
2018−04−16
4
count
choice distance from bundle edge
fractal value
0.2
0.3
0.4
0.5
0.6

```
p2
```


Monkey Choice Distance From Bundle on Binary Choice Task
Ulysses : 11−Apr−2018 − 16−Apr−2018
2018−04−11
1
2018−04−12
2
2018−04−13
3
2018−04−16
4
bundle_position
juice_offered
trial
water_offered
value
bundle_distance
Block
1
2
3
4

```r
#generate a model of likelihood to choice for the fractal dependent on it's position,
#value and associated water
model <- glm(data = task_data,
             fractal_choice ~ bundle_position + water_offered + juice_offered + trial + date,
             family = "binomial")

#summarise the parameters
summary(model)
```

```
##
## Call:
## glm(formula = fractal_choice ~ bundle_position + water_offered +
##     juice_offered + trial + date, family = "binomial", data = task_data)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -3.2160  -0.5544   0.1317   0.5661   2.5726
##
## Coefficients:
##                   Estimate Std. Error z value Pr(>|z|)
## (Intercept)      5.761e+03  8.469e+02   6.803 1.03e-11 ***
## bundle_position  1.197e+00  1.781e-01   6.722 1.80e-11 ***
## water_offered    3.715e+00  3.006e-01  12.357  < 2e-16 ***
## juice_offered    1.885e+01  1.190e+00  15.831  < 2e-16 ***
## trial            4.773e-03  8.340e-04   5.723 1.04e-08 ***
## date            -3.273e-01  4.804e-02  -6.814 9.48e-12 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 1548.27  on 1119  degrees of freedom
## Residual deviance:  853.03  on 1114  degrees of freedom
##   (489 observations deleted due to missingness)
## AIC: 865.03
##
## Number of Fisher Scoring iterations: 6
```

```r
#test for side bias with an exact binomial test
binom.test(c(nrow(task_data %>%
                    .[c(bundle_position != fractal_choice)]),
             nrow(task_data %>%
                    .[c(bundle_position == fractal_choice)])))
```

```
##
##  Exact binomial test
##
## data:  c(nrow(task_data %>% .[c(bundle_position != fractal_choice)]),     nrow(task_data %>% .[c(bundle_position == fractal_choice)]))
## number of successes = 462, number of trials = 1120, p-value =
## 5.183e-09
## alternative hypothesis: true probability of success is not equal to 0.5
## 95 percent confidence interval:
##  0.3834851 0.4419758
## sample estimates:
## probability of success
##                 0.4125
```

```r
#generate a model of likelihood to choice for the fractal dependent on it's position,
#value and associated water
model <- glm(data = dplyr::filter(task_data, block_no == max(block_no)),
             fractal_choice ~ bundle_position + water_offered + as.factor(juice_offered) + trial + date,
             family = "binomial")

#summarise the parameters
summary(model)
```

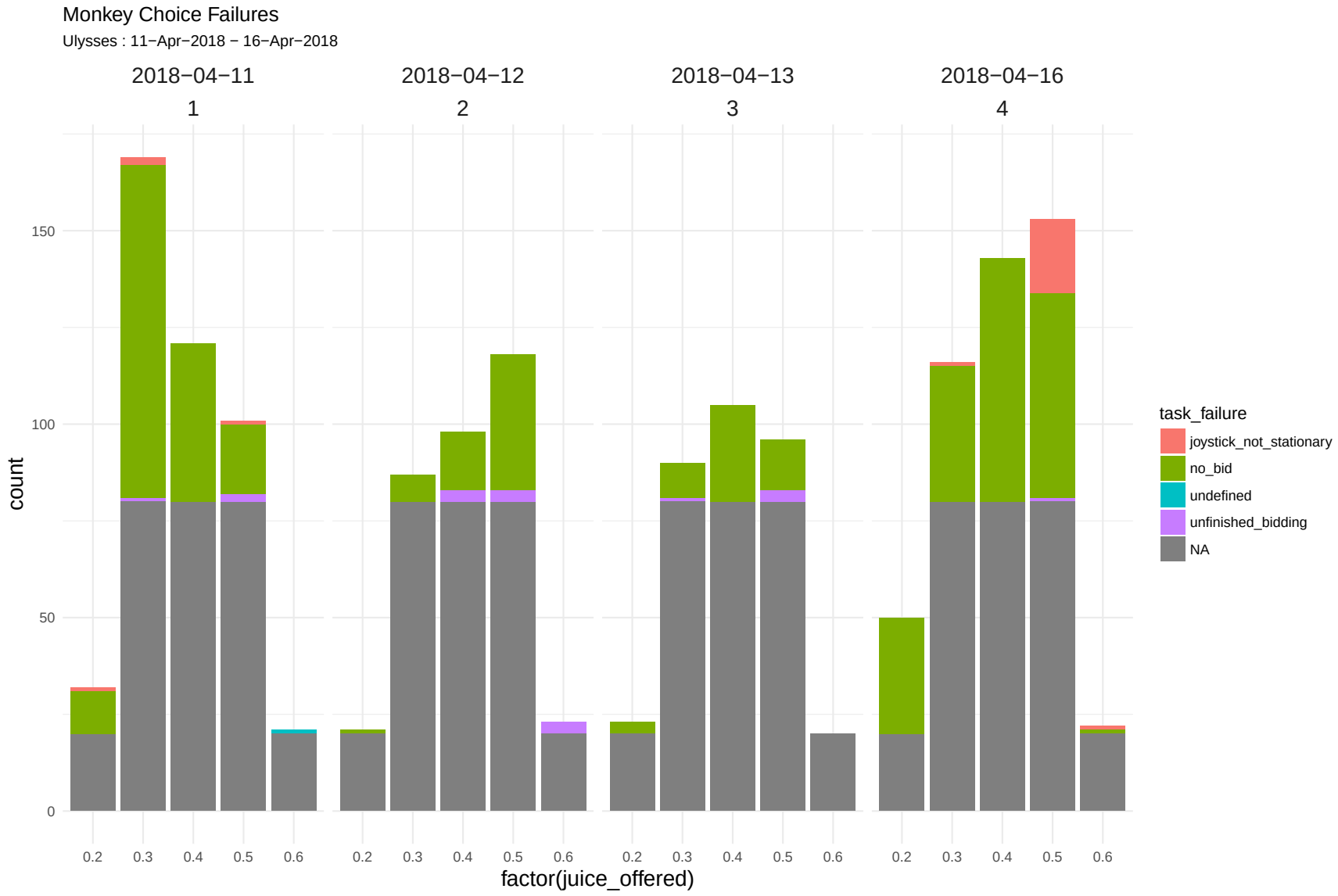
```
##
## Call:
## glm(formula = fractal_choice ~ bundle_position + water_offered +
##     as.factor(juice_offered) + trial + date, family = "binomial",
##     data = dplyr::filter(task_data, block_no == max(block_no)))
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -2.3353  -0.5157  -0.1044   0.4562   2.7843
##
## Coefficients: (1 not defined because of singularities)
##                               Estimate Std. Error z value Pr(>|z|)
## (Intercept)                  -7.555647   1.215838  -6.214 5.15e-10 ***
## bundle_position               2.083633   0.418795   4.975 6.51e-07 ***
## water_offered                 4.604260   0.695763   6.618 3.65e-11 ***
## as.factor(juice_offered)0.3 -0.724700   0.844998  -0.858  0.39109
## as.factor(juice_offered)0.4  2.326351   0.840349   2.768  0.00563 **
## as.factor(juice_offered)0.5  3.498982   0.876294   3.993 6.53e-05 ***
## as.factor(juice_offered)0.6  5.958145   1.375313   4.332 1.48e-05 ***
## trial                        0.004616   0.001548   2.983  0.00286 **
## date                               NA         NA      NA       NA
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 380.57  on 279  degrees of freedom
## Residual deviance: 194.45  on 272  degrees of freedom
##   (204 observations deleted due to missingness)
## AIC: 210.45
```

```
##
## Number of Fisher Scoring iterations: 6
```

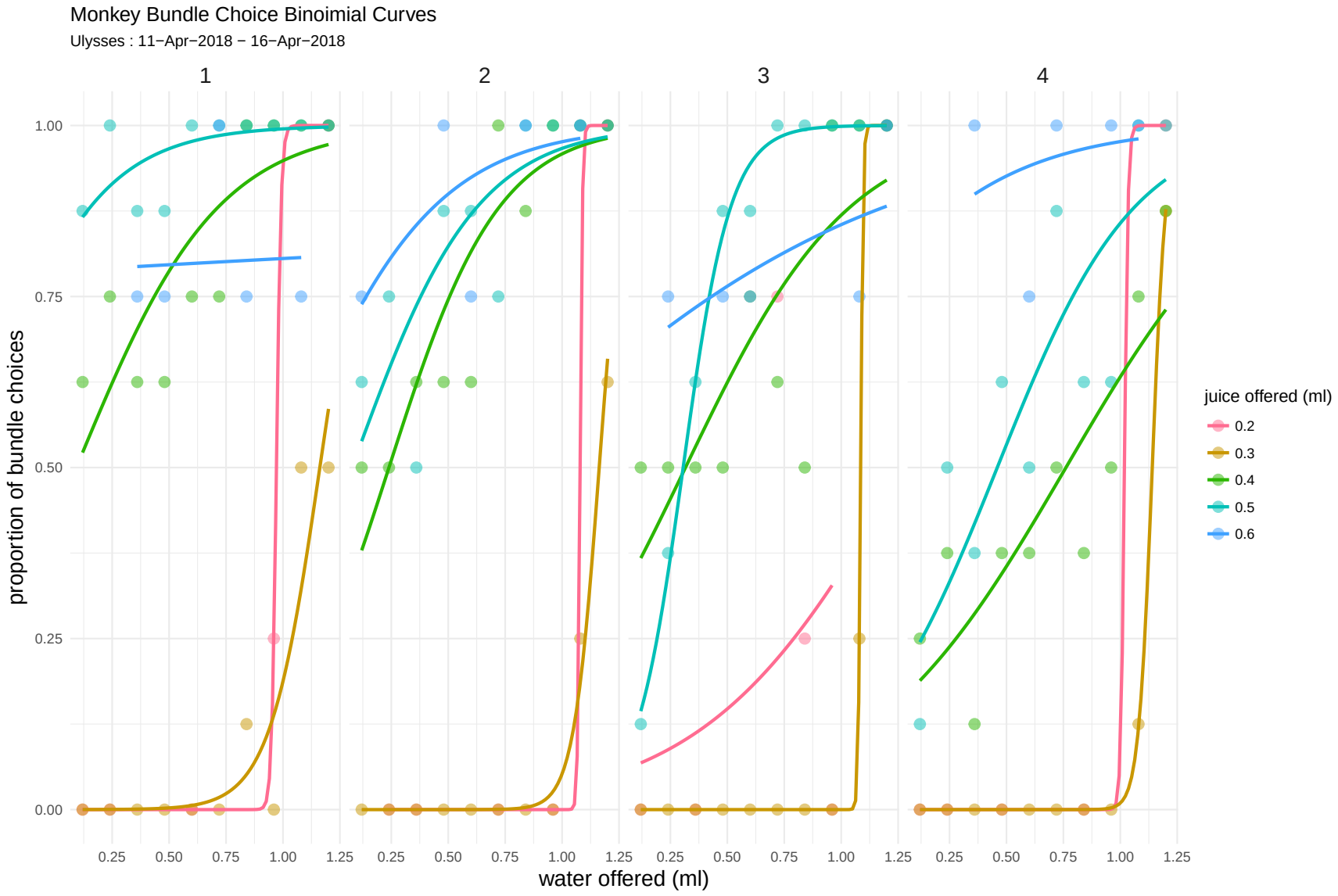
```
#test for side bias with an exact binomial test
binom.test(c(nrow(task_data %>%
                    .[c(bundle_position != fractal_choice & block_no == max(block_no))]),
             nrow(task_data %>%
                    .[c(bundle_position == fractal_choice & block_no == max(block_no))])))
```

```
##
##  Exact binomial test
##
## data:  c(nrow(task_data %>% .[c(bundle_position != fractal_choice &     block_no == max(block_no))]), nrow(task_data %>% .[c(bundle_pos
## number of successes = 99, number of trials = 280, p-value =
## 1.094e-06
## alternative hypothesis: true probability of success is not equal to 0.5
## 95 percent confidence interval:
##  0.2976043 0.4126752
## sample estimates:
## probability of success
##              0.3535714
```

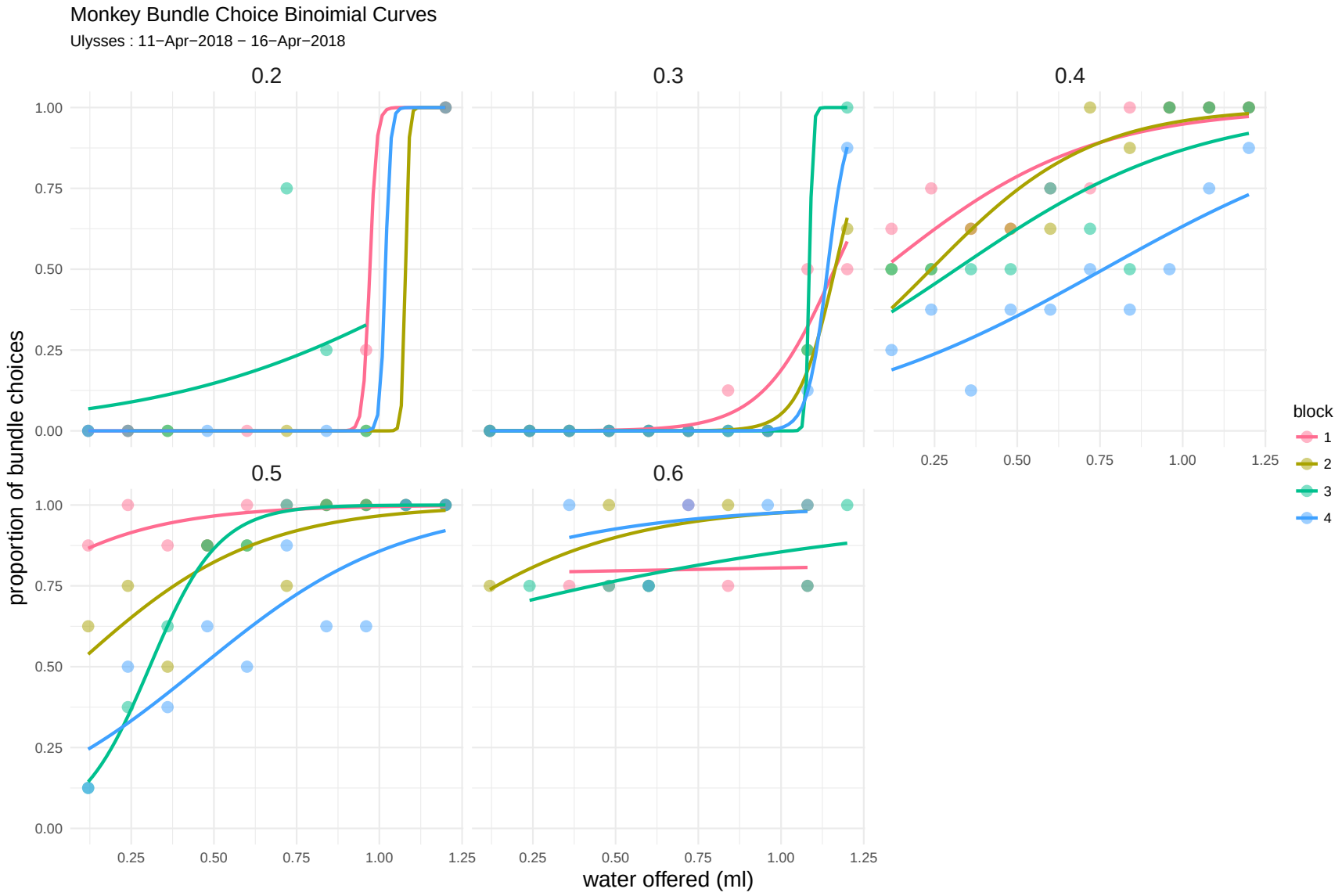
```
p3
```


Monkey Choice Failures
Ulysses : 11−Apr−2018 − 16−Apr−2018
2018−04−11
1
2018−04−12
2
2018−04−13
3
2018−04−16
4
count
150
100
50
0
0.2
0.3
0.4
0.5
0.6
factor(juice_offered)
task_failure
joystick_not_stationary
no_bid
undefined
unfinished_bidding
NA

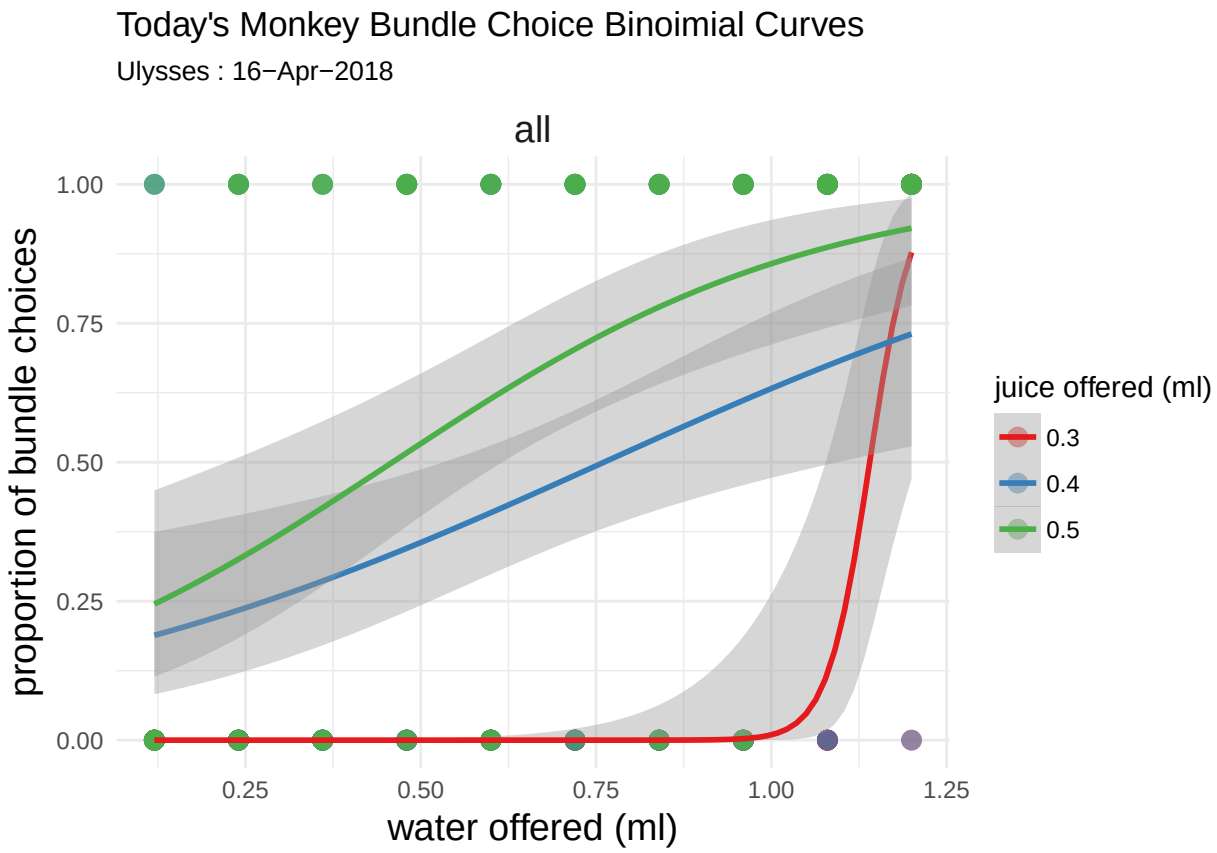
```
p4
```


Monkey Bundle Choice Binoimial Curves
Ulysses : 11−Apr−2018 − 16−Apr−2018
1
2
3
4
proportion of bundle choices
1.00
0.75
0.50
0.25
0.00
0.25
0.50
0.75
1.00
1.25
water offered (ml)
juice offered (ml)
0.2
0.3
0.4
0.5
0.6

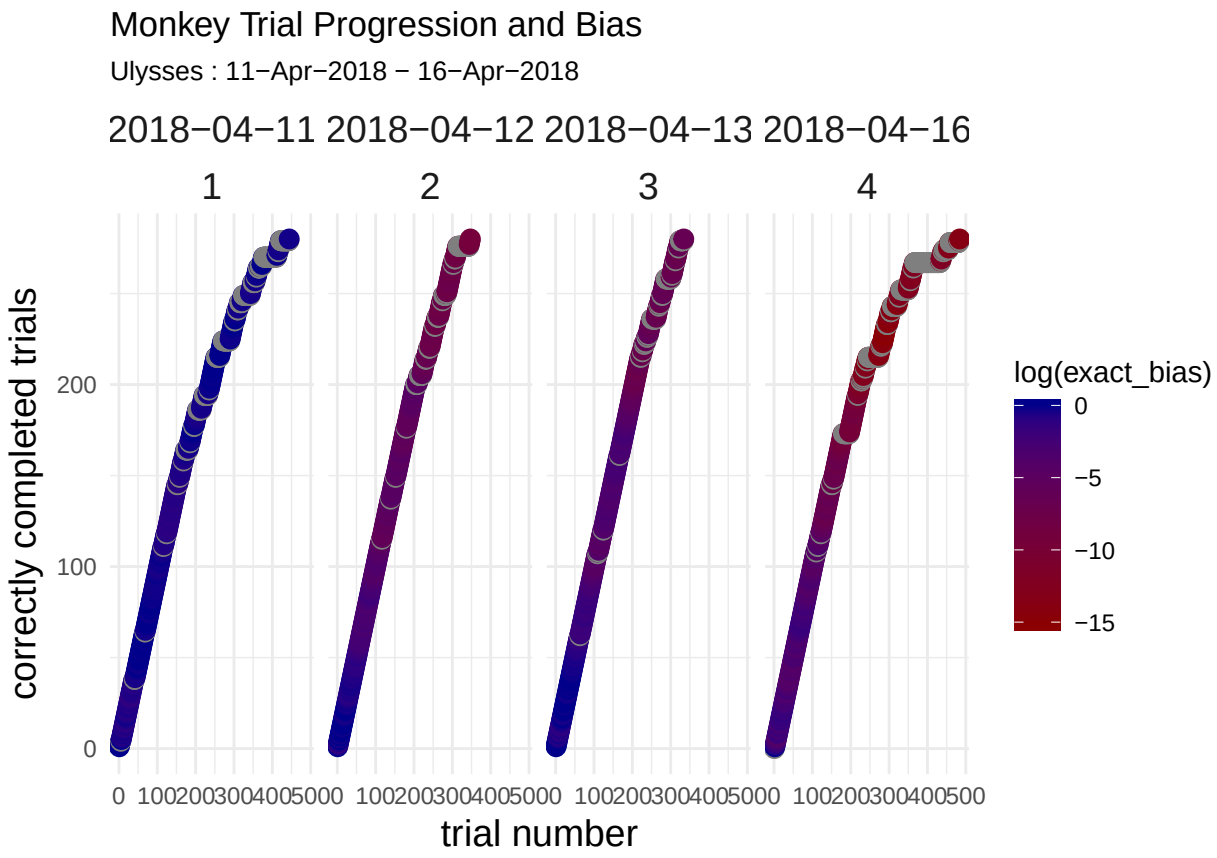
```
p5
```


Monkey Bundle Choice Binoimial Curves
Ulysses : 11−Apr−2018 − 16−Apr−2018
0.2
0.3
0.4
0.5
0.6
proportion of bundle choices
water offered (ml)
block
1
2
3
4

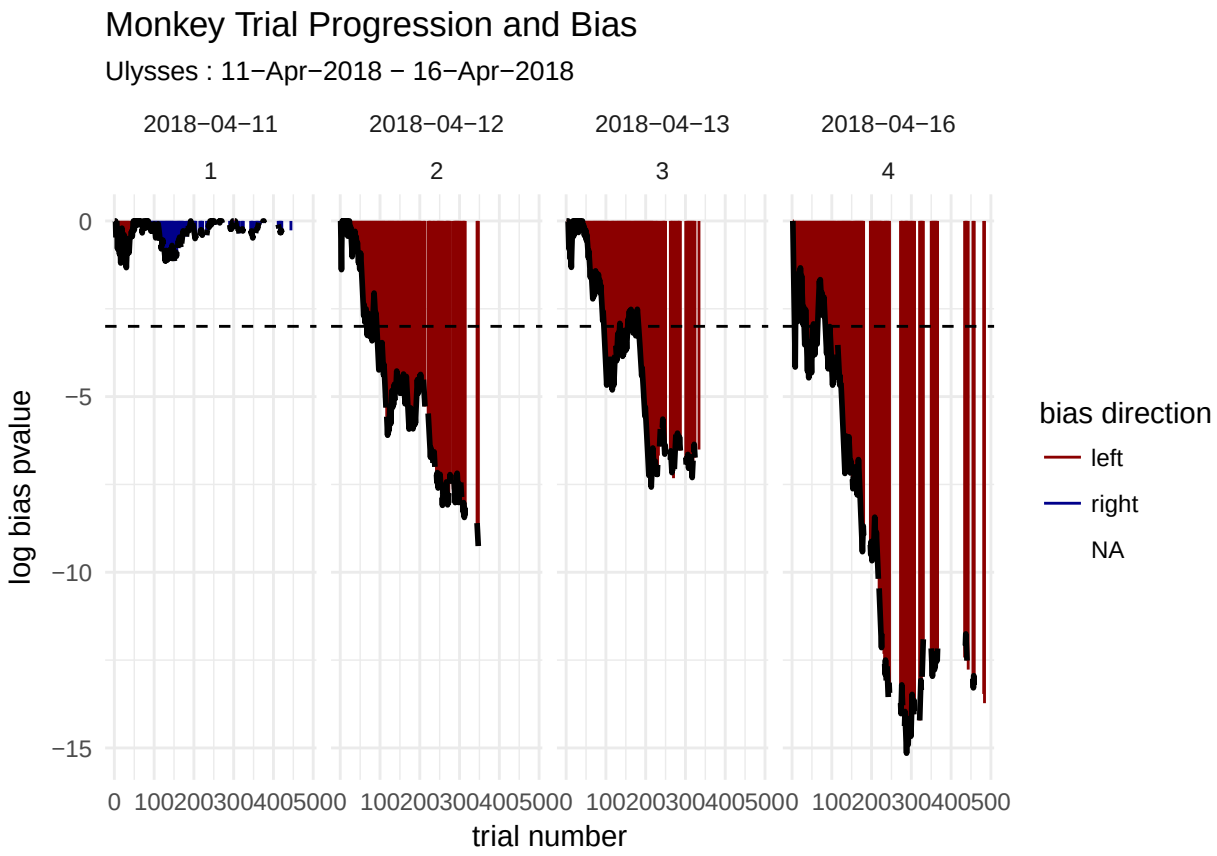
```
p6
```


Today's Monkey Bundle Choice Binoimial Curves
Ulysses : 16−Apr−2018
all
proportion of bundle choices
1.00
0.75
0.50
0.25
0.00
0.25
0.50
0.75
1.00
1.25
water offered (ml)
juice offered (ml)
0.3
0.4
0.5

```
p7
```


Monkey Trial Progression and Bias
Ulysses : 11−Apr−2018 − 16−Apr−2018
2018−04−11
2018−04−12
2018−04−13
2018−04−16
1
2
3
4
correctly completed trials
0
100
200
0 100200300400500
trial number
log(exact_bias)
0
−5
−10
−15

```
p8
```


Monkey Trial Progression and Bias
Ulysses : 11−Apr−2018 − 16−Apr−2018
2018−04−11
2018−04−12
2018−04−13
2018−04−16
1
2
3
4
0
−5
−10
−15
log bias pvalue
0 1002003004005000 1002003004005000 1002003004005000 100200300400500
trial number
bias direction
left
right
NA