BCb Analysis- Early March

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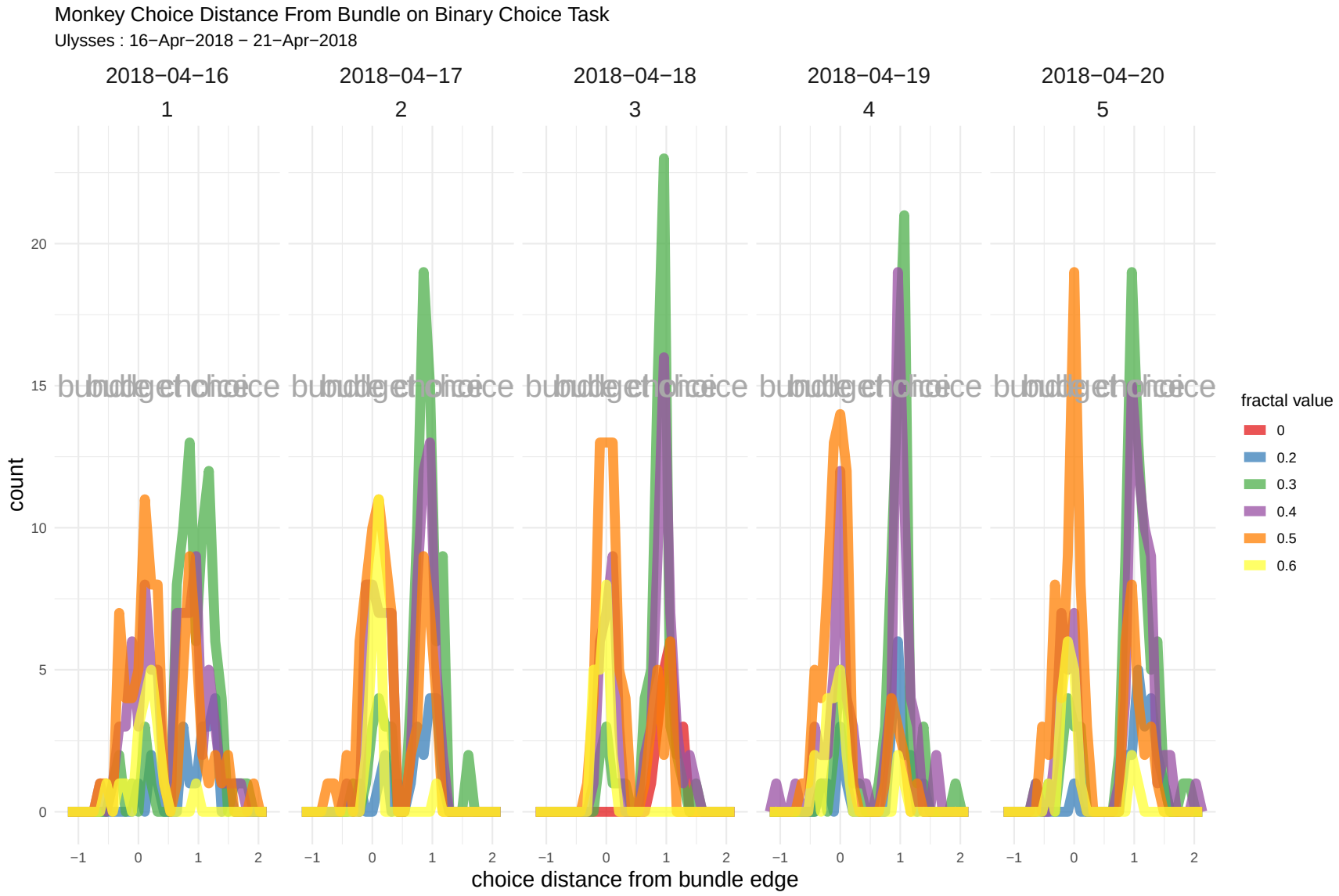
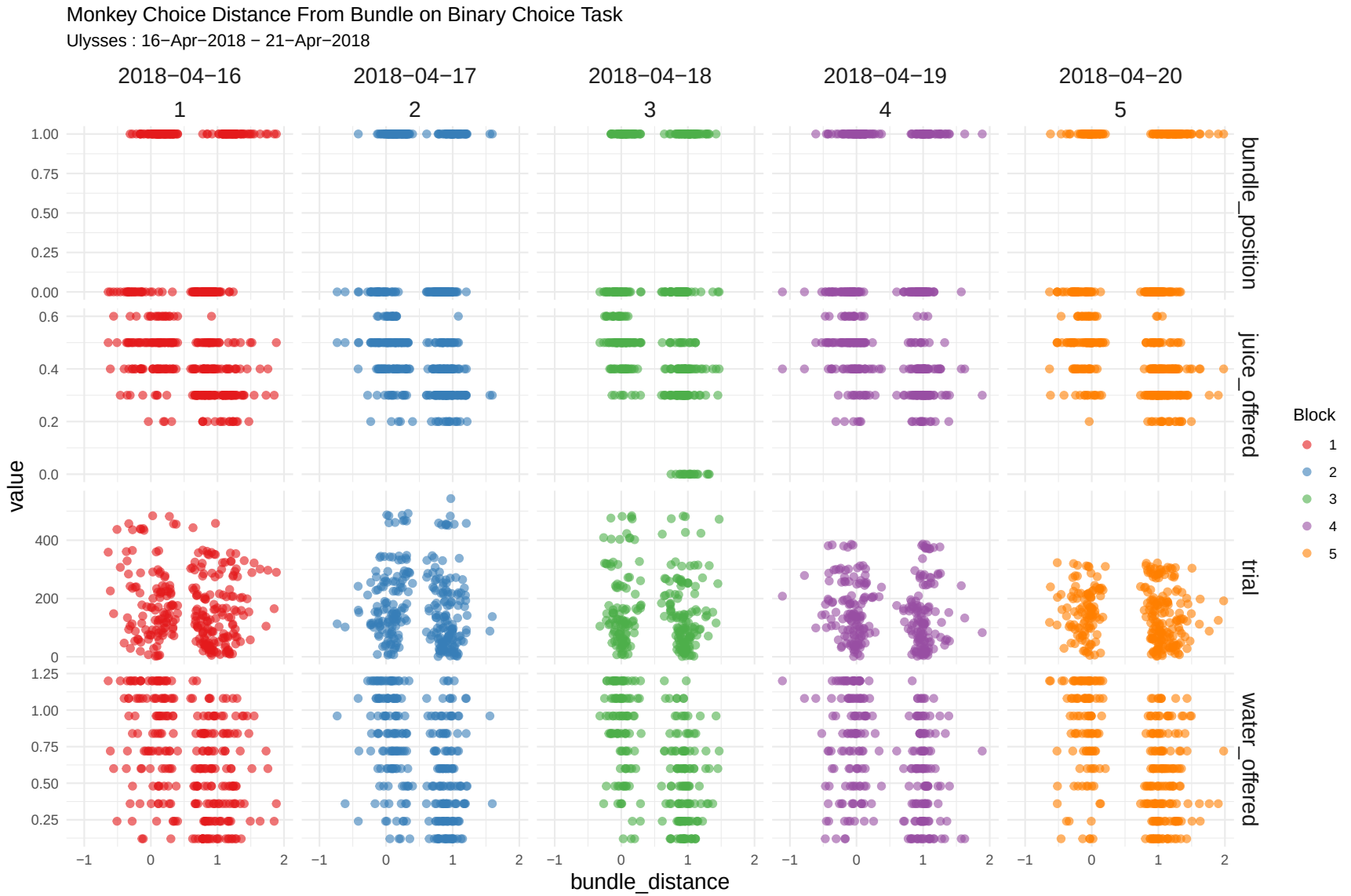
```
monkey <- "Ulysses"
today <- "21-Apr-2018"
look_back <- "16-Apr-2018"

start_trial <- 50
stop_trial <- 200

merge_days <- TRUE
```

```
#task_data %<>% .[is.na(task_failure), completed_trials := 1:.N, by = "block_no"] %>%
#  .[completed_trials < 181] %>%
#  .[completed_trials > 59]
```

```
p1
```


Monkey Choice Distance From Bundle on Binary Choice Task
Ulysses : 16−Apr−2018 − 21−Apr−2018
2018−04−16
1
2018−04−17
2
2018−04−18
3
2018−04−19
4
2018−04−20
5
count
choice distance from bundle edge
fractal value
0
0.2
0.3
0.4
0.5
0.6

```
p2
```


Monkey Choice Distance From Bundle on Binary Choice Task
Ulysses : 16−Apr−2018 − 21−Apr−2018
2018−04−16
2018−04−17
2018−04−18
2018−04−19
2018−04−20
1
2
3
4
5
bundle_position
juice_offered
trial
water_offered
value
bundle_distance
Block
1
2
3
4
5

```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
## -2.8283  -0.5272  -0.1078   0.5074   3.3636
##
## Coefficients:
##                   Estimate Std. Error z value Pr(>|z|)
## (Intercept)     -7.947e+02  9.866e+02  -0.805    0.421
## bundle_position  1.550e+00  1.716e-01   9.033  < 2e-16 ***
## water_offered    4.953e+00  3.130e-01  15.822  < 2e-16 ***
## juice_offered    1.812e+01  1.111e+00  16.318  < 2e-16 ***
## trial            4.280e-03  7.324e-04   5.843 5.13e-09 ***
## date             4.435e-02  5.593e-02   0.793    0.428
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 1844.49  on 1341  degrees of freedom
## Residual deviance:  971.16  on 1336  degrees of freedom
##   (936 observations deleted due to missingness)
## AIC: 983.16
##
## 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 = 538, number of trials = 1342, p-value =
## 3.951e-13
## alternative hypothesis: true probability of success is not equal to 0.5
## 95 percent confidence interval:
##  0.3745427 0.4276807
## sample estimates:
## probability of success
##              0.4008942
```

```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)
```

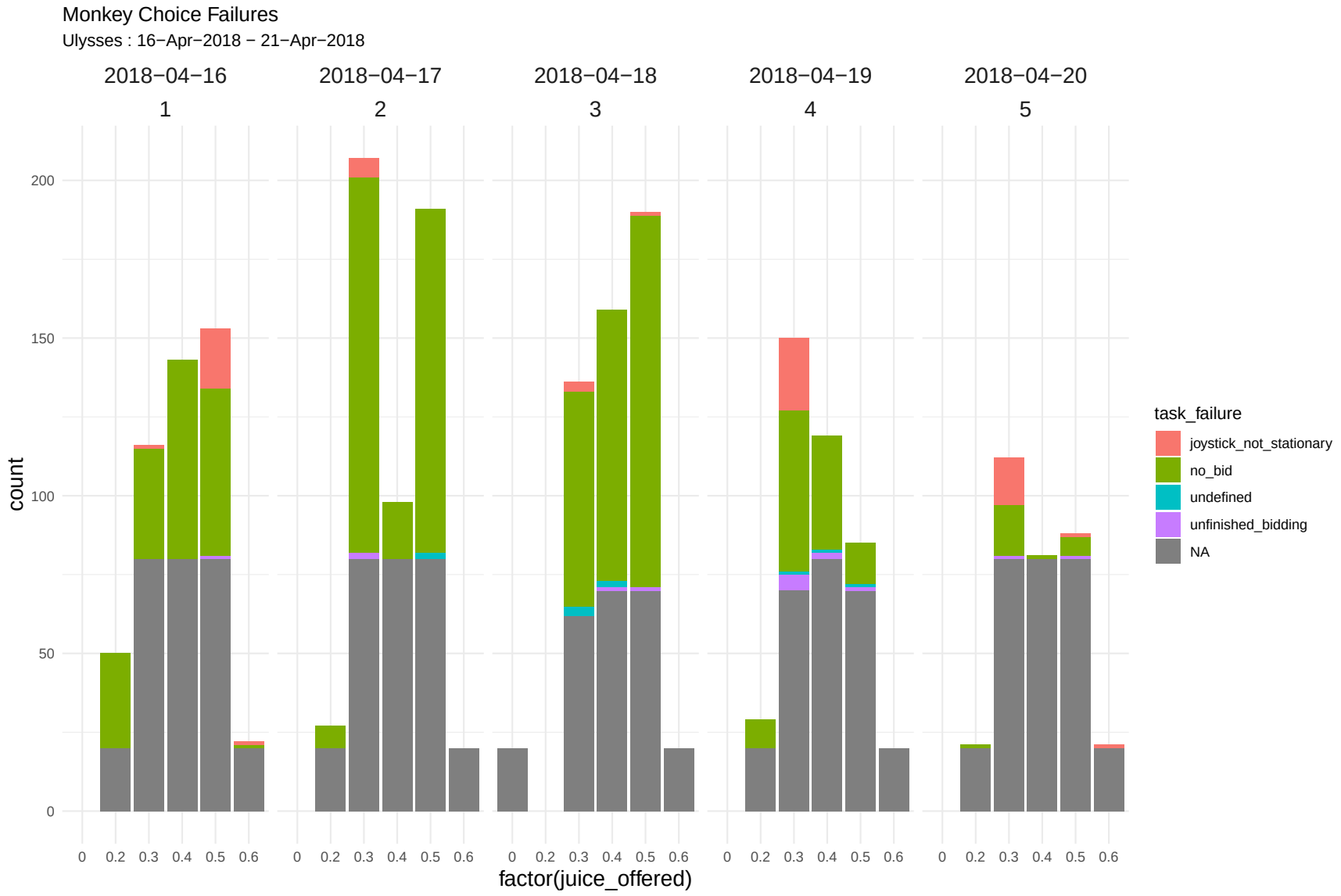
```
##
## Call:
## glm(formula = fractal_choice ~ bundle_position + water_offered +
##     as.factor(juice_offered) + trial + date, family = "binomial",
##     data = dplyr::filter(task_data, block_no == max(block_no)))
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -2.5624  -0.4286  -0.1099   0.3050   2.7162
##
## Coefficients: (1 not defined because of singularities)
##                              Estimate Std. Error z value Pr(>|z|)
## (Intercept)                 -9.706232   1.565947  -6.198 5.71e-10 ***
## bundle_position              1.401659   0.417420   3.358 0.000785 ***
## water_offered                6.358429   0.867770   7.327 2.35e-13 ***
## as.factor(juice_offered)0.3  1.007568   1.189428   0.847 0.396938
## as.factor(juice_offered)0.4  2.031525   1.178455   1.724 0.084728 .
## as.factor(juice_offered)0.5  5.516698   1.260932   4.375 1.21e-05 ***
## as.factor(juice_offered)0.6  6.582925   1.462312   4.502 6.74e-06 ***
## trial                        0.006687   0.002233   2.994 0.002749 **
## 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: 376.06  on 279  degrees of freedom
## Residual deviance: 174.67  on 272  degrees of freedom
##   (43 observations deleted due to missingness)
## AIC: 190.67
```

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

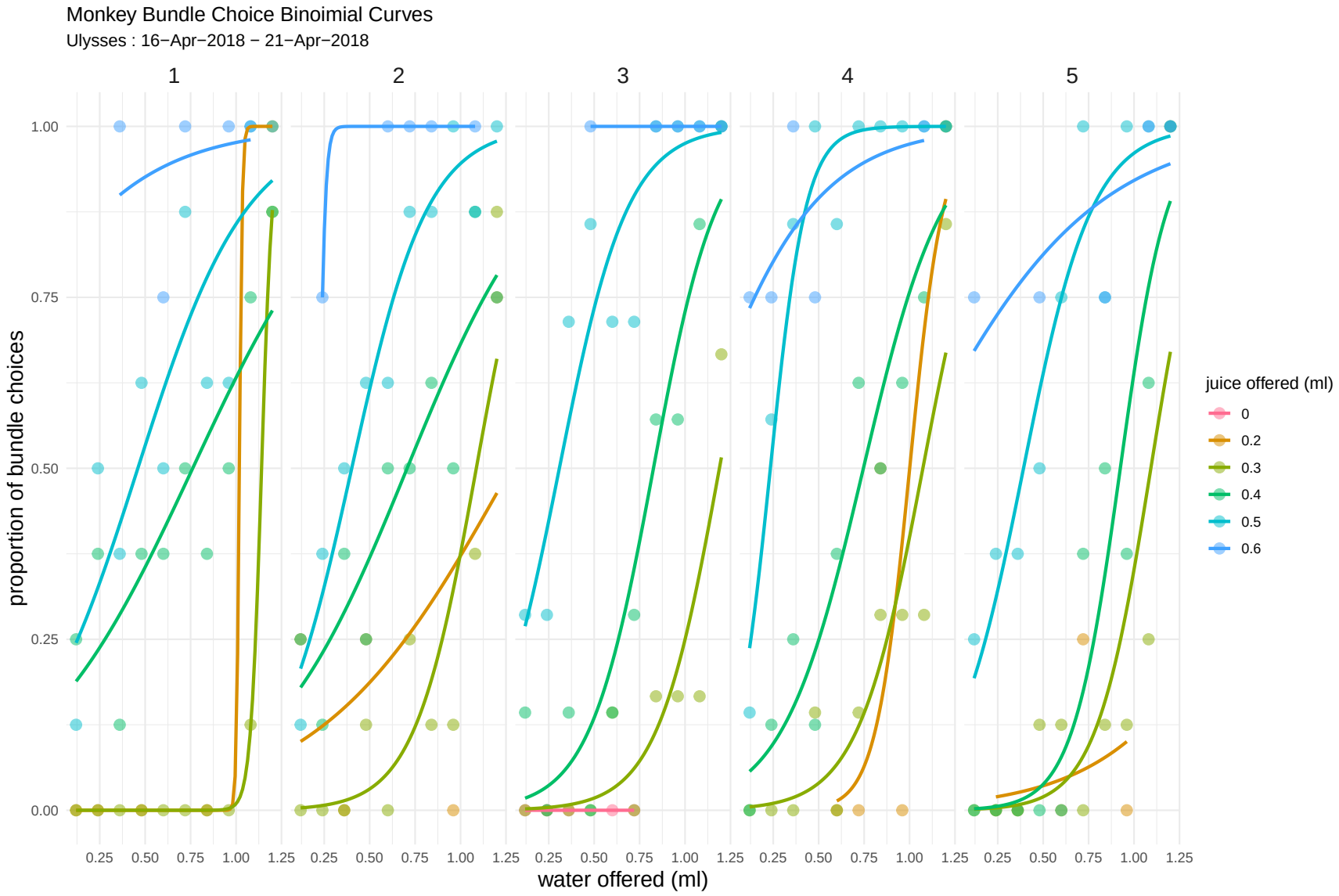
```
#test for side bias with an exact binomial test
binom.test(c(nrow(task_data %>%
                    .[c(bundle_position != fractal_choice & block_no == max(block_no))]),
             nrow(task_data %>%
                    .[c(bundle_position == fractal_choice & block_no == max(block_no))])))
```

```
##
##  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 = 121, number of trials = 280, p-value =
## 0.02685
## alternative hypothesis: true probability of success is not equal to 0.5
## 95 percent confidence interval:
##  0.3733256 0.4924117
## sample estimates:
## probability of success
##              0.4321429
```

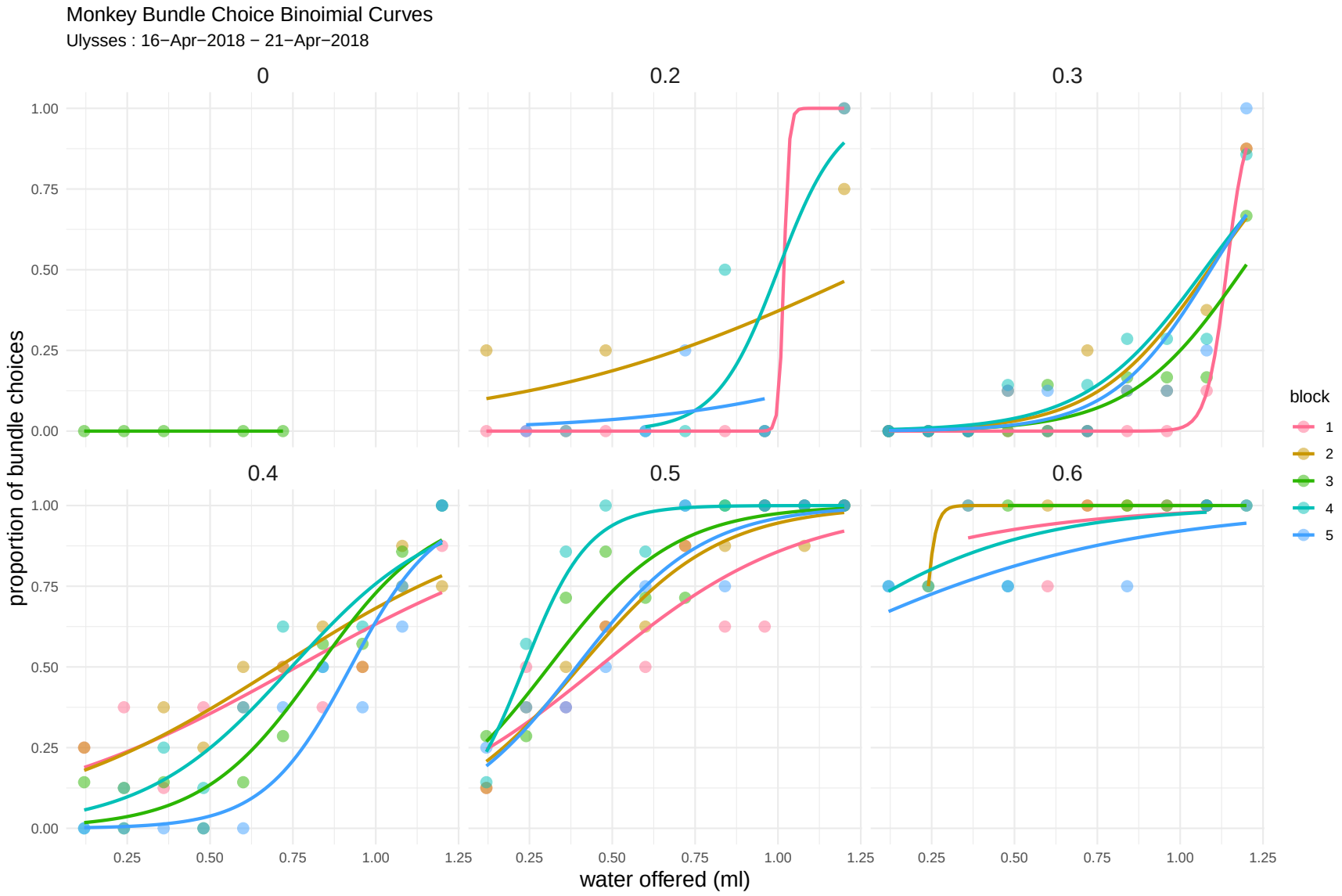
```
p3
```


Monkey Choice Failures
Ulysses : 16−Apr−2018 − 21−Apr−2018
2018−04−16
1
2018−04−17
2
2018−04−18
3
2018−04−19
4
2018−04−20
5
count
200
150
100
50
0
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

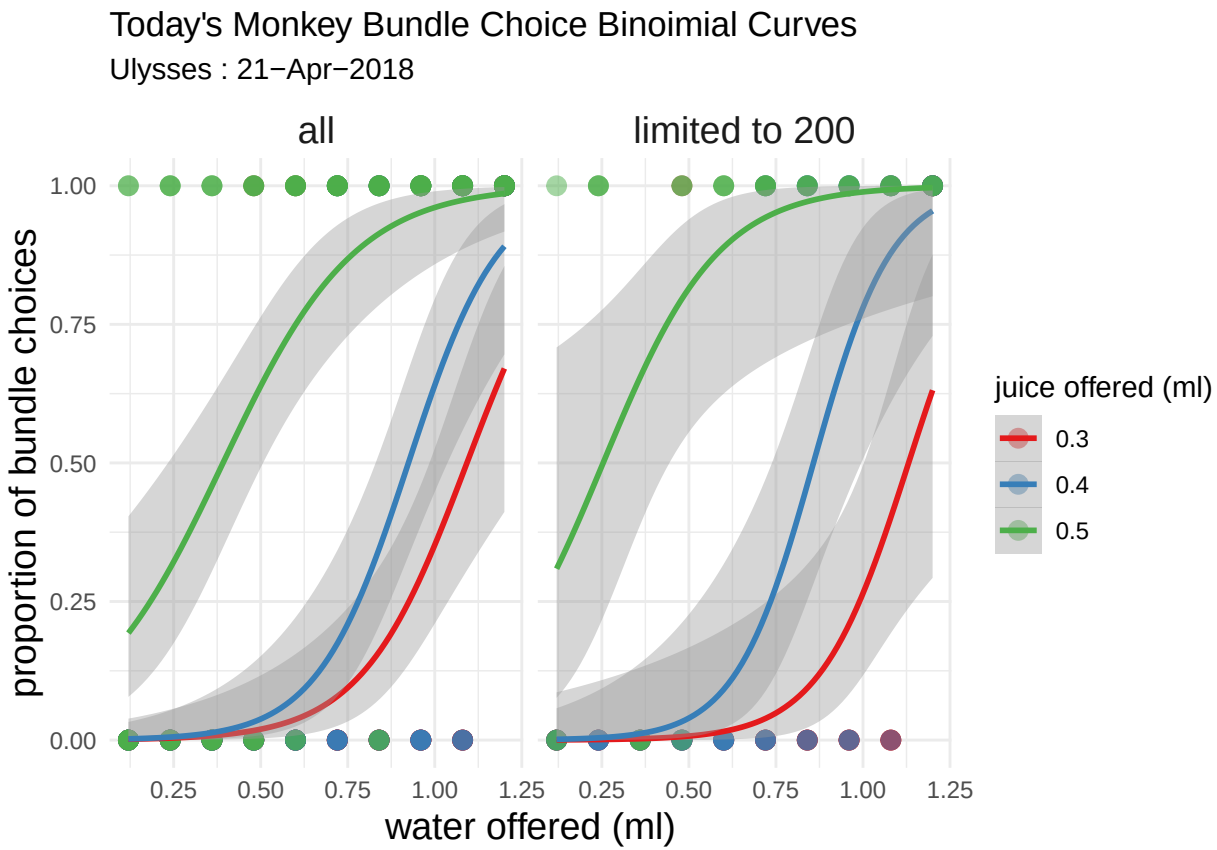
```
p4
```


Monkey Bundle Choice Binoimial Curves
Ulysses : 16−Apr−2018 − 21−Apr−2018
1
2
3
4
5
1.00
0.75
0.50
0.25
0.00
proportion of bundle choices
0.25 0.50 0.75 1.00 1.25
water offered (ml)
juice offered (ml)
0
0.2
0.3
0.4
0.5
0.6

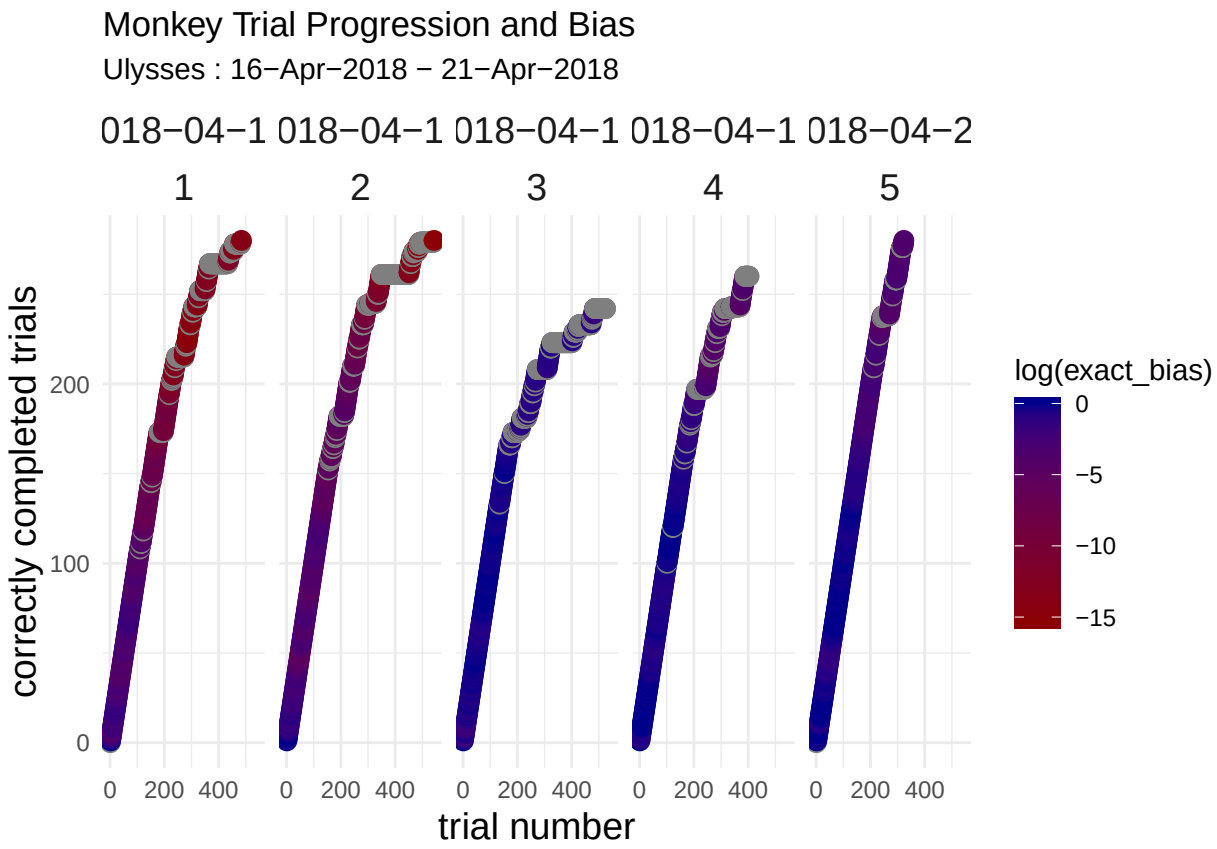
```
p5
```


Monkey Bundle Choice Binoimial Curves
Ulysses : 16−Apr−2018 − 21−Apr−2018
0
0.2
0.3
0.4
0.5
0.6
proportion of bundle choices
water offered (ml)
block
1
2
3
4
5

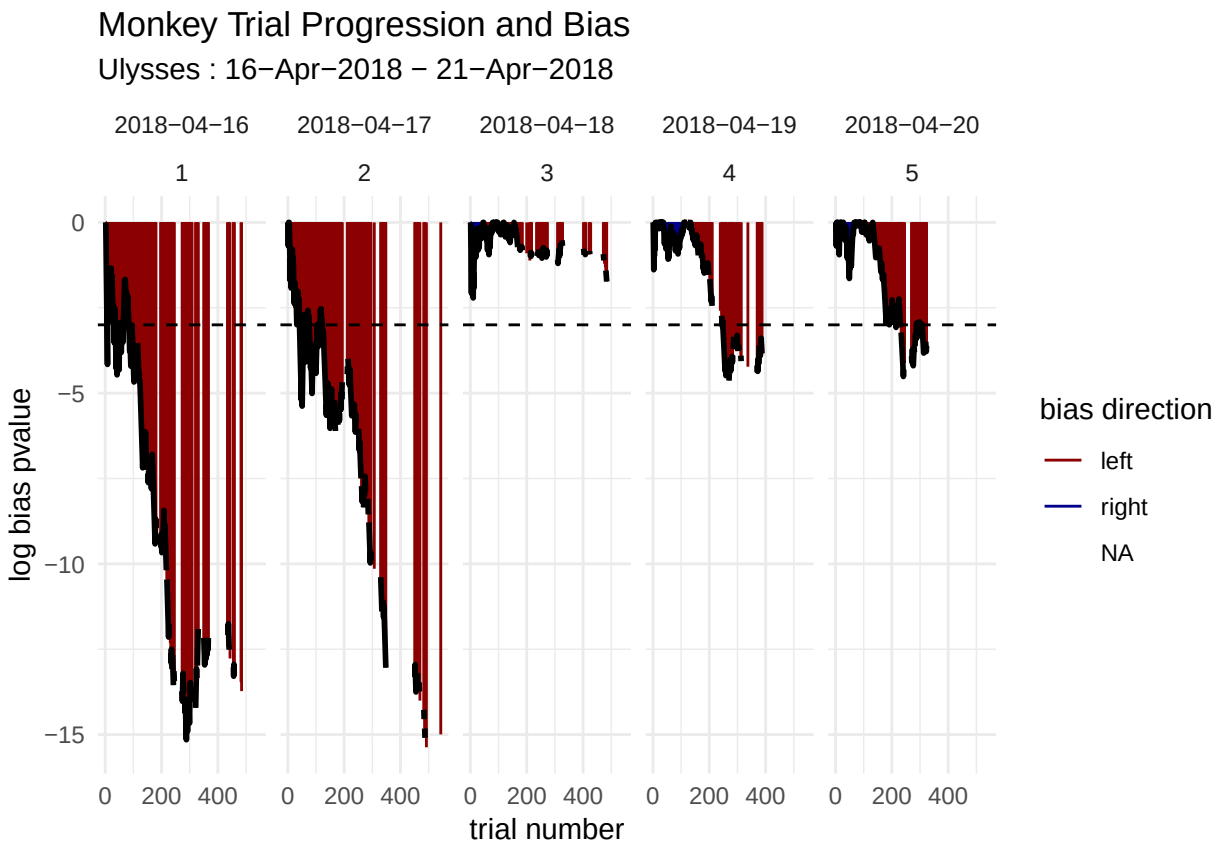
```
p6
```


Today's Monkey Bundle Choice Binoimial Curves
Ulysses : 21−Apr−2018
all
limited to 200
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

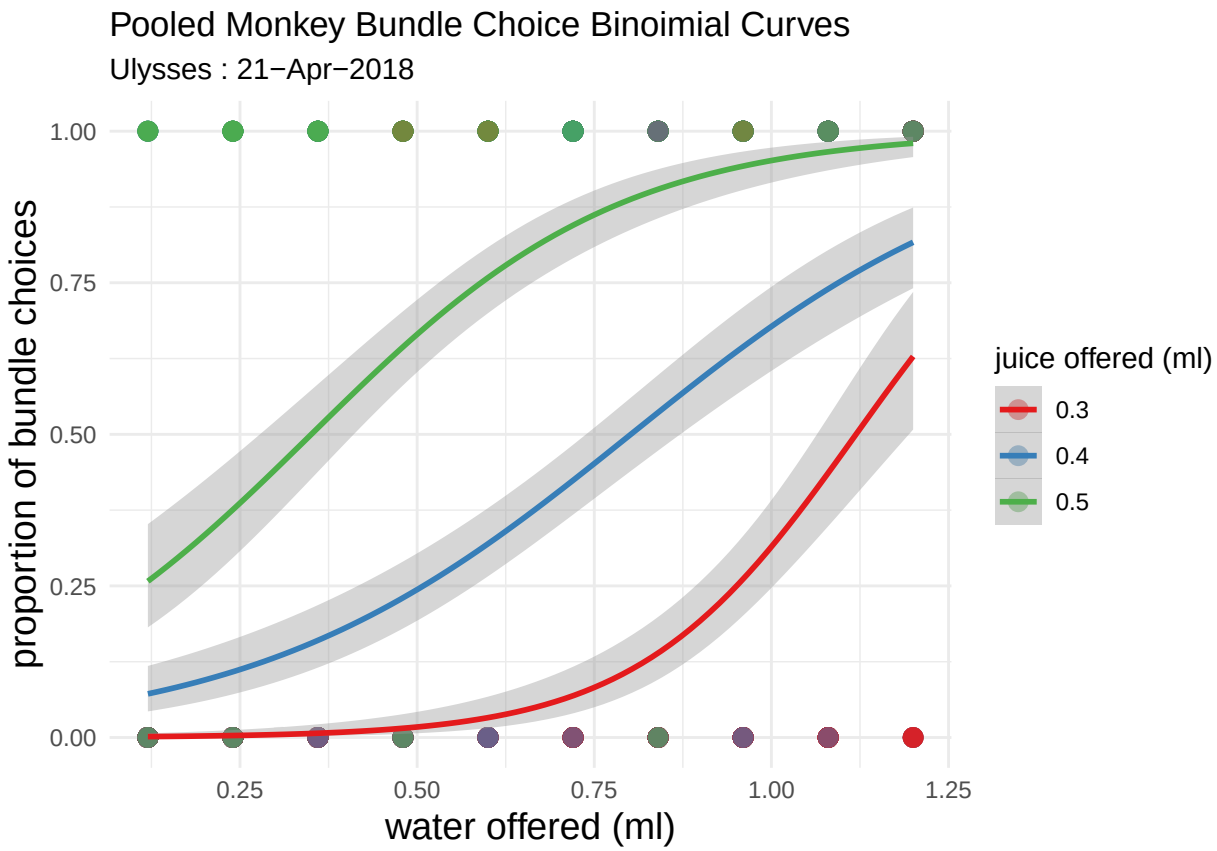
```
p7
```


Monkey Trial Progression and Bias
Ulysses : 16−Apr−2018 − 21−Apr−2018
018−04−1 018−04−1 018−04−1 018−04−1 018−04−2
1
2
3
4
5
correctly completed trials
0
100
200
0
200
400
trial number
log(exact_bias)
0
−5
−10
−15

```
p8
```


Monkey Trial Progression and Bias
Ulysses : 16−Apr−2018 − 21−Apr−2018
2018−04−16
2018−04−17
2018−04−18
2018−04−19
2018−04−20
1
2
3
4
5
0
−5
−10
−15
log bias pvalue
0
200
400
trial number
bias direction
left
right
NA

```
p9
```


Pooled Monkey Bundle Choice Binoimial Curves
Ulysses : 21−Apr−2018
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