Analyse pair approximation model

Contents

1 Model with local competition

1.1 Equation used

Compared to the initial model we used here, we expressed competition as only local.

1.1.1 Colonisation

1.1.1.1 Nurse species

$$w_{\{0,+_n\}} = \left(\delta_n \rho_{+_N} + (1-\delta_n)\, q_{+_n|0}\right)\left(b_n - c_n q_{+_n|+_n} - c_{pn} q_{+_p|0}\right) \tag{1}$$

1.1.1.2 Protégée species

$$w_{\{0,+_p\}} = \left(\delta_p \rho_{+_p} + (1-\delta_p)\, q_{+_p|0}\right)\left(b_p - c_p q_{+_p|0} - c_{np} q_{+_n|0} - g(1 - q_{+_n|0} n)\right) \tag{2}$$

1.2 Parameters used

Table 1: Listes des paramètres utilisées et de leur valeurs

	min	max
del	0.10	0.1
m	0.02	0.1
n	0.00	1.0
b	0.40	0.8
cn	0.20	0.2
cp	0.20	0.2
cnp	0.10	0.1
cpn	0.10	0.9
g	0.00	0.9

1.3 Coexistence

1.3.1 Effect of mortality

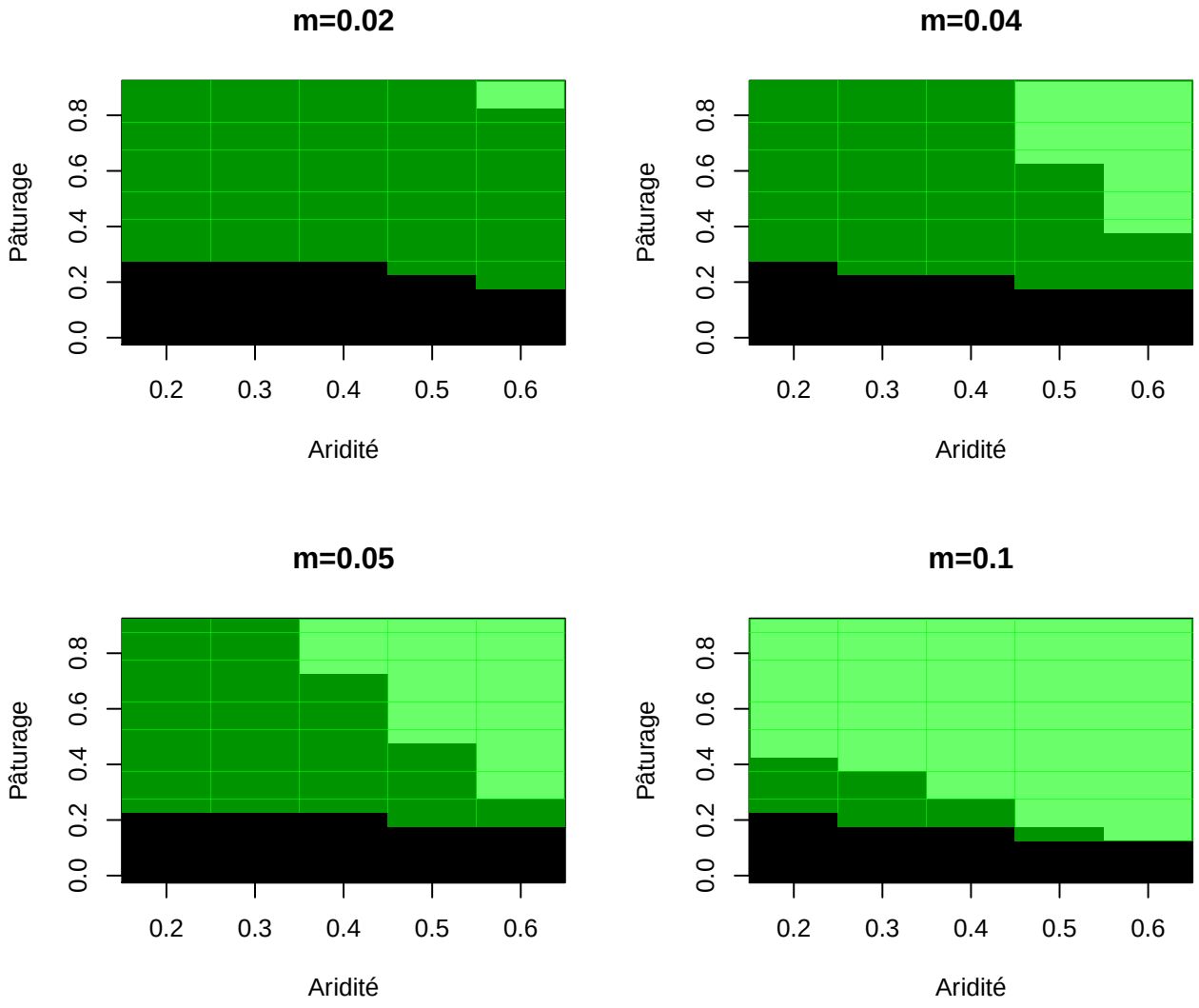
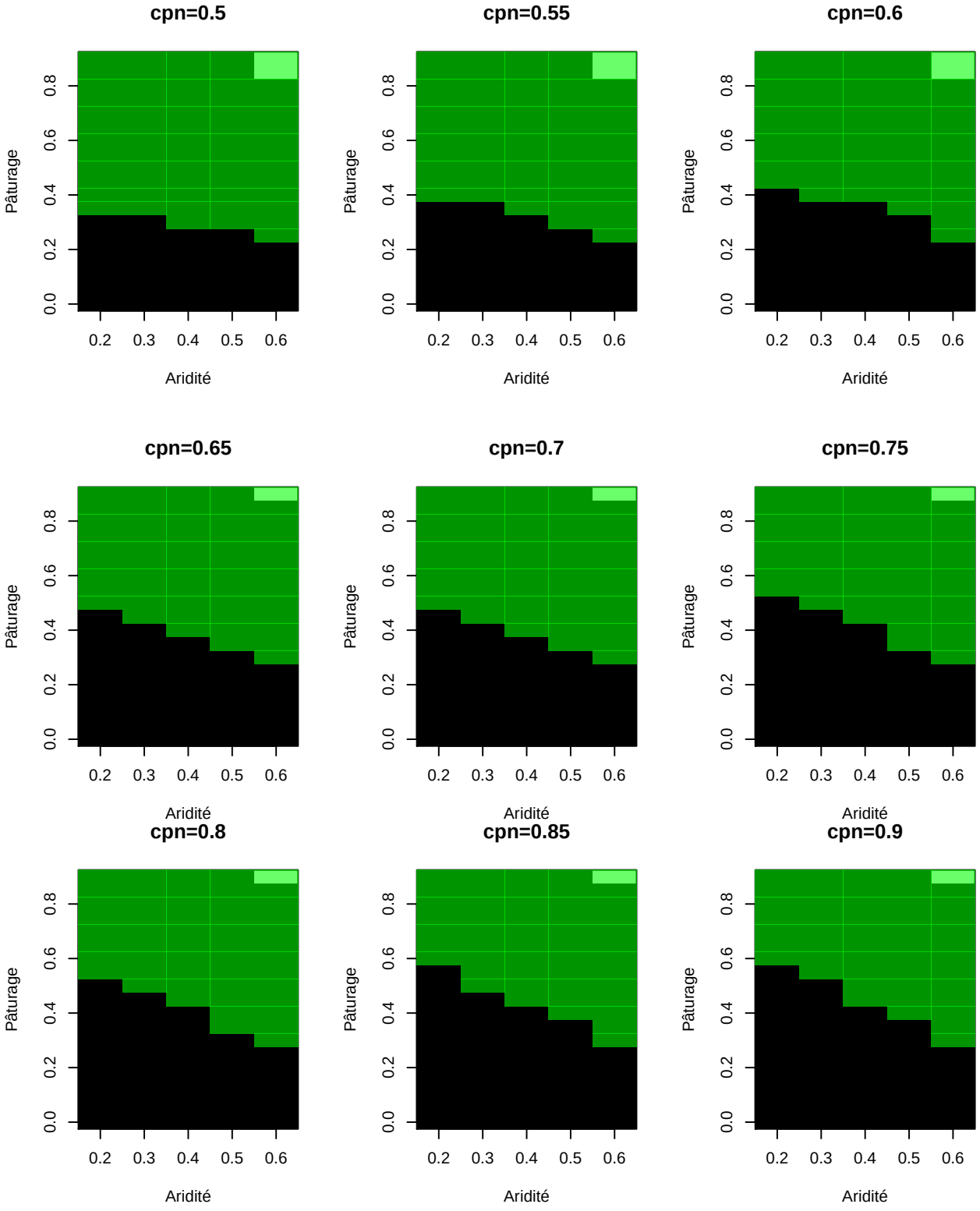


Figure 1: Green light: nurse alone, green dark: coexistence, black: protégée alone

1.3.2 Effect of competitive ability of the protégée



1.4 Co-occurences

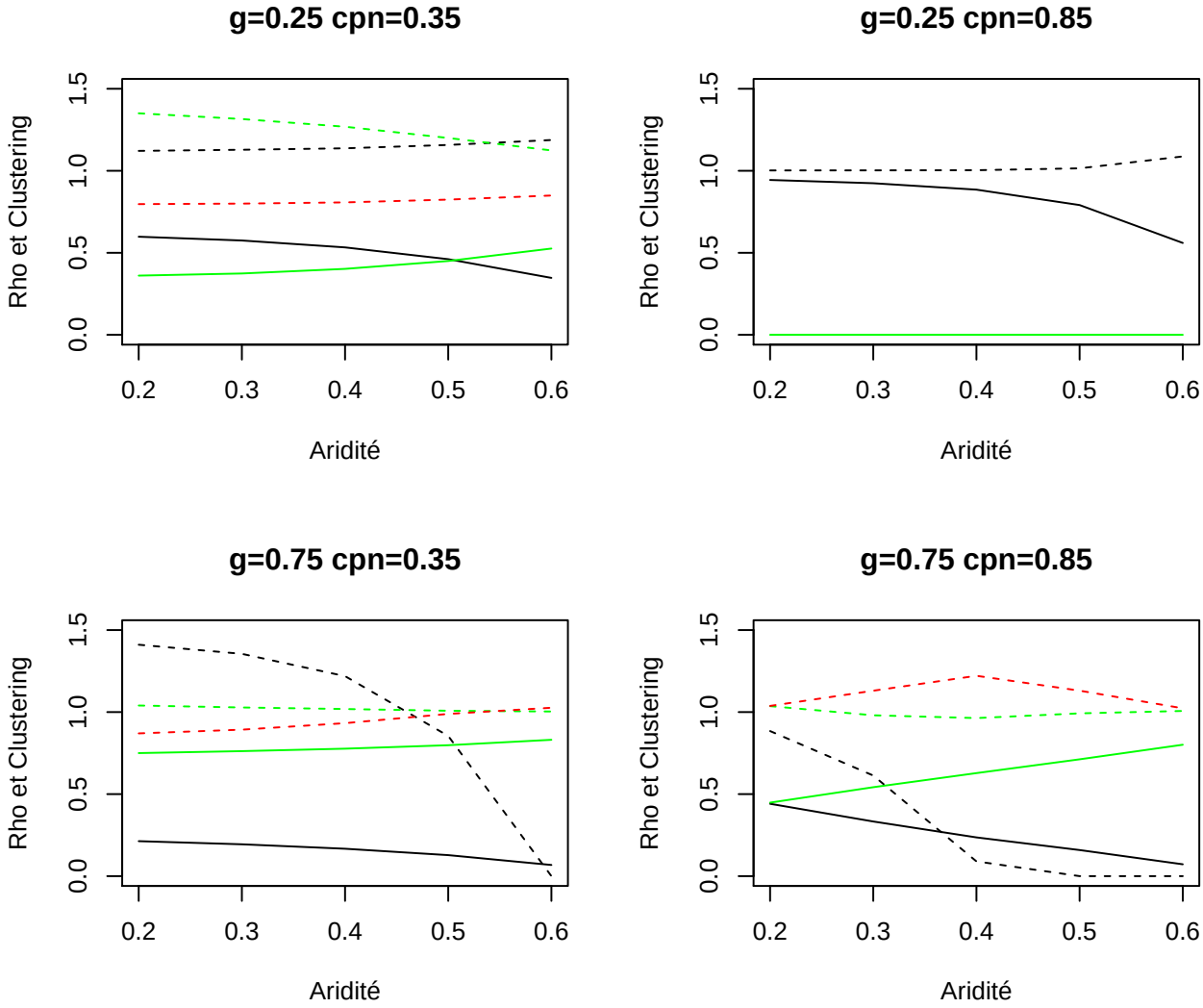
1.4.1 Statistics

Which parameter combination gives positive co-occurences between two species ?

```
##        m              n           b               cnp
##  Min.   :0.02   Min.   :1   Min.   :0.4000   Min.   :0.1
##  1st Qu.:0.02   1st Qu.:1   1st Qu.:0.5000   1st Qu.:0.1
##  Median :0.02   Median :1   Median :0.6000   Median :0.1
##  Mean   :0.02   Mean   :1   Mean   :0.5786   Mean   :0.1
##  3rd Qu.:0.02   3rd Qu.:1   3rd Qu.:0.6000   3rd Qu.:0.1
##  Max.   :0.02   Max.   :1   Max.   :0.8000   Max.   :0.1
##       cpn               g             Cnp
##  Min.   :0.6000   Min.   :0.500   Min.   :1.100
##  1st Qu.:0.7500   1st Qu.:0.700   1st Qu.:1.114
##  Median :0.8500   Median :0.750   Median :1.135
##  Mean   :0.8173   Mean   :0.753   Mean   :1.148
##  3rd Qu.:0.9000   3rd Qu.:0.850   3rd Qu.:1.176
##  Max.   :0.9000   Max.   :0.900   Max.   :1.263
```

The positive co-occurences arises when the grazing pressure and the competition of the nurse on the protégée is also high. A longer lifespan seems also promote coexistence.

1.4.2 The dynamic of co-occurences



Co-occurence diagram

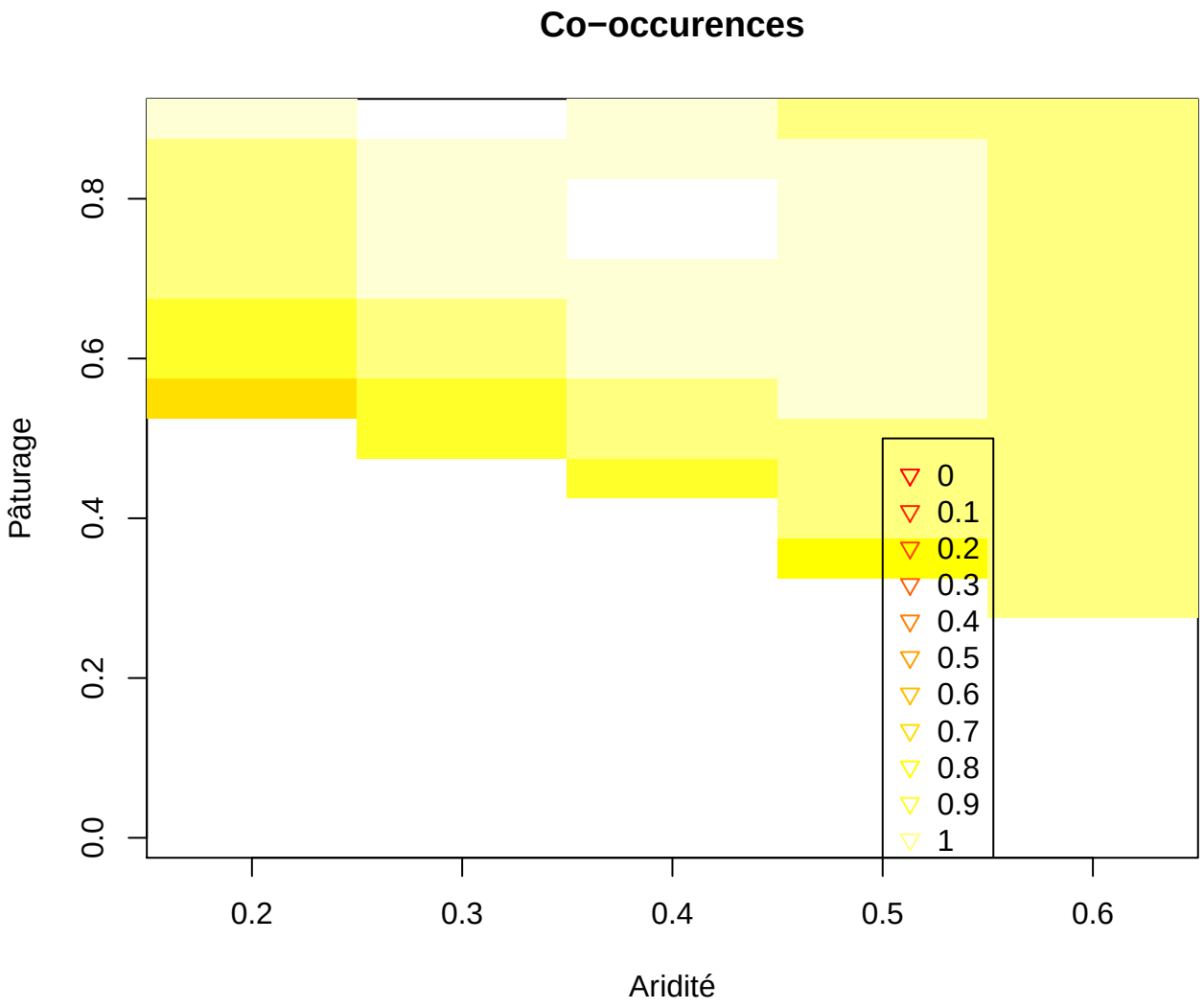

Co−occurences
Pâturage
0.0
0.2
0.4
0.6
0.8
0.2
0.3
0.4
0.5
0.6
Aridité
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1

Figure 2: