**Supplementary Material**

**Modelling determinants of extinction across two Mesozoic hyperthermal events**

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**Supplementary methods**

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| --- |
| Table S1: List of variables in each GLM. “no env” refers to models run without depositional environmental setting data which is only present for around 50% of the data set. Therefore, the removal of the depositional environmental setting doubles the sample size. |
| Model | Determinants |
| all | motility; tiering; feeding; calcification; latitude; palaeoocean basin; depositional setting |
| all no env | motility; tiering; feeding; calcification; latitude; palaeoocean basin |
| extrinsic | latitude; palaeoocean basin; depositional setting |
| extrinsic no env | latitude; palaeoocean basin |
| intrinsic | motility; tiering; feeding; calcification |
| intrinsic no env | motility; tiering; feeding; calcification |

**Supplementary results**

**GLM outputs**

**LTE**

**Model = all**

> GLM\_LTE\_A1ii <- glm(extinction ~ fMOTILITY + fTIERING + fFEEDING +

+ fLATITUDE + fBASIN + fENVIRONMENT +

+ fCALCIFICATION,

+ family = quasibinomial, data = LTE)

> summary(GLM\_LTE\_A1ii)

Call:

glm(formula = extinction ~ fMOTILITY + fTIERING + fFEEDING +

 fLATITUDE + fBASIN + fENVIRONMENT + fCALCIFICATION, family = quasibinomial,

 data = LTE)

Deviance Residuals:

 Min 1Q Median 3Q Max

-0.52039 -0.07450 0.00003 0.15316 0.55019

Coefficients: (1 not defined because of singularities)

 Estimate Std. Error t value Pr(>|t|)

(Intercept) 2.6340 1.5901 1.656 0.1320

fMOTILITYnonmotile -0.6121 0.7194 -0.851 0.4170

fTIERINGinfaunal -1.0261 0.6461 -1.588 0.1468

fTIERINGpelagic -2.2947 1.8030 -1.273 0.2350

fFEEDINGphotosymbiotic 1.6102 2.0644 0.780 0.4554

fFEEDINGpredatory NA NA NA NA

fFEEDINGsuspension 0.7476 0.8971 0.833 0.4262

fLATITUDET 2.9924 1.1182 2.676 0.0254 \*

fBASINTethys -0.9580 0.9703 -0.987 0.3493

fENVIRONMENTOffshore 1.1036 0.7170 1.539 0.1581

fENVIRONMENTReef 16.1132 3723.9890 0.004 0.9966

fCALCIFICATIONmoderate -1.7223 1.0296 -1.673 0.1287

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasibinomial family taken to be 0.1443989)

 Null deviance: 6.1229 on 19 degrees of freedom

Residual deviance: 1.3575 on 9 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 19

> # find best model

>

> drop1(GLM\_LTE\_A1ii, test = "F")

Single term deletions

Model:

extinction ~ fMOTILITY + fTIERING + fFEEDING + fLATITUDE + fBASIN +

 fENVIRONMENT + fCALCIFICATION

 Df Deviance F value Pr(>F)

<none> 1.3576

fMOTILITY 1 1.4633 0.7010 0.424115

fTIERING 1 1.7343 2.4975 0.148485

fFEEDING 2 1.4873 0.4300 0.663196

fLATITUDE 1 3.1510 11.8898 0.007296 \*\*

fBASIN 1 1.5097 1.0090 0.341381

fENVIRONMENT 2 1.7986 1.4619 0.281992

fCALCIFICATION 1 1.8601 3.3320 0.101236

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

>

> # best model

>

> GLM\_LTE\_A1iii <- glm(extinction ~ fLATITUDE,

+ family = quasibinomial, data = LTE)

>

> summary(GLM\_LTE\_A1iii)

Call:

glm(formula = extinction ~ fLATITUDE, family = quasibinomial,

 data = LTE)

Deviance Residuals:

 Min 1Q Median 3Q Max

-0.79806 -0.18099 0.08947 0.30075 0.81341

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) 0.9362 0.2806 3.336 0.00367 \*\*

fLATITUDET 2.1372 0.8825 2.422 0.02623 \*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasibinomial family taken to be 0.207126)

 Null deviance: 6.1229 on 19 degrees of freedom

Residual deviance: 4.1803 on 18 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 6

**Model = all no env**

> GLM\_LTE\_B1ii <- glm(extinction ~ fMOTILITY + fTIERING + fFEEDING +

+ fLATITUDE + fBASIN + fCALCIFICATION,

+ family = quasibinomial, data = LTE)

> summary(GLM\_LTE\_B1ii)

Call:

glm(formula = extinction ~ fMOTILITY + fTIERING + fFEEDING +

 fLATITUDE + fBASIN + fCALCIFICATION, family = quasibinomial,

 data = LTE)

Deviance Residuals:

 Min 1Q Median 3Q Max

-0.9482 -0.1619 0.1085 0.2678 0.7364

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) 3.30683 1.90023 1.740 0.0965 .

fMOTILITYnonmotile -0.16350 0.48100 -0.340 0.7373

fTIERINGinfaunal 0.04299 0.51878 0.083 0.9347

fTIERINGpelagic -0.97680 1.26559 -0.772 0.4488

fFEEDINGgrazing -1.00009 1.39971 -0.715 0.4828

fFEEDINGphotosymbiotic 2.28581 1.50753 1.516 0.1444

fFEEDINGpredatory 3.24156 1.46390 2.214 0.0380 \*

fFEEDINGsuspension 0.80595 0.79223 1.017 0.3206

fLATITUDEP -1.15779 1.14155 -1.014 0.3220

fLATITUDET 0.77683 0.48202 1.612 0.1220

fBASINPanthalassa -2.38603 1.34792 -1.770 0.0912 .

fBASINTethys -2.87926 1.46745 -1.962 0.0631 .

fCALCIFICATIONlight -1.79362 1.26434 -1.419 0.1707

fCALCIFICATIONmoderate -1.03692 0.65945 -1.572 0.1308

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasibinomial family taken to be 0.2016485)

 Null deviance: 11.300 on 34 degrees of freedom

Residual deviance: 4.467 on 21 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 6

>

> # find best model

>

> drop1(GLM\_LTE\_B1ii, test = "F")

Single term deletions

Model:

extinction ~ fMOTILITY + fTIERING + fFEEDING + fLATITUDE + fBASIN +

 fCALCIFICATION

 Df Deviance F value Pr(>F)

<none> 4.4670

fMOTILITY 1 4.4904 0.1099 0.74358

fTIERING 2 4.6018 0.3168 0.73189

fFEEDING 4 6.8103 2.7541 0.05507 .

fLATITUDE 2 5.2620 1.8687 0.17909

fBASIN 2 5.2717 1.8916 0.17566

fCALCIFICATION 2 5.1245 1.5455 0.23650

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

>

> # best model

> GLM\_LTE\_B1iii <- glm(extinction ~ fFEEDING,

+ family = quasibinomial, data = LTE)

>

> summary(GLM\_LTE\_B1iii)

Call:

glm(formula = extinction ~ fFEEDING, family = quasibinomial,

 data = LTE)

Deviance Residuals:

 Min 1Q Median 3Q Max

-0.94003 -0.24861 0.07654 0.30255 0.81753

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) -0.5878 0.6253 -0.940 0.35471

fFEEDINGgrazing -1.0217 1.2975 -0.787 0.43724

fFEEDINGphotosymbiotic 3.6779 1.2119 3.035 0.00494 \*\*

fFEEDINGpredatory 2.5197 0.7893 3.192 0.00330 \*\*

fFEEDINGsuspension 1.5121 0.6580 2.298 0.02871 \*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasibinomial family taken to be 0.1795301)

 Null deviance: 11.2997 on 34 degrees of freedom

Residual deviance: 6.4135 on 30 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 5

**Model = extrinsic**

> GLM\_LTE\_A3ii <- glm(extinction ~ fLATITUDE + fBASIN + fENVIRONMENT,

+ family = quasibinomial, data = LTE)

> summary(GLM\_LTE\_A3ii)

Call:

glm(formula = extinction ~ fLATITUDE + fBASIN + fENVIRONMENT,

 family = quasibinomial, data = LTE)

Deviance Residuals:

 Min 1Q Median 3Q Max

-0.7523 -0.1184 0.0339 0.3520 0.8552

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) 7.396e-01 8.197e-01 0.902 0.381

fLATITUDET 1.933e+00 9.244e-01 2.090 0.054 .

fBASINTethys 7.801e-02 8.717e-01 0.089 0.930

fENVIRONMENTOffshore 2.407e-02 5.685e-01 0.042 0.967

fENVIRONMENTReef 1.884e+01 4.216e+03 0.004 0.996

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasibinomial family taken to be 0.1914137)

 Null deviance: 6.1229 on 19 degrees of freedom

Residual deviance: 3.2701 on 15 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 19

> # find best model

>

> drop1(GLM\_LTE\_A3ii, test = "F")

Single term deletions

Model:

extinction ~ fLATITUDE + fBASIN + fENVIRONMENT

 Df Deviance F value Pr(>F)

<none> 3.2701

fLATITUDE 1 4.3804 5.0929 0.03937 \*

fBASIN 1 3.2716 0.0070 0.93446

fENVIRONMENT 2 4.0752 1.8465 0.19191

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

>

> # best model

>

> GLM\_LTE\_A3iii <- glm(extinction ~ fLATITUDE,

+ family = quasibinomial, data = LTE)

>

> summary(GLM\_LTE\_A3iii)

Call:

glm(formula = extinction ~ fLATITUDE, family = quasibinomial,

 data = LTE)

Deviance Residuals:

 Min 1Q Median 3Q Max

-0.79806 -0.18099 0.08947 0.30075 0.81341

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) 0.9362 0.2806 3.336 0.00367 \*\*

fLATITUDET 2.1372 0.8825 2.422 0.02623 \*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasibinomial family taken to be 0.207126)

 Null deviance: 6.1229 on 19 degrees of freedom

Residual deviance: 4.1803 on 18 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 6

**Model = extrinsic no env**

> GLM\_LTE\_B3ii <- glm(extinction ~ fLATITUDE + fBASIN,

+ family = quasibinomial, data = LTE)

> summary(GLM\_LTE\_B3ii)

Call:

glm(formula = extinction ~ fLATITUDE + fBASIN, family = quasibinomial,

 data = LTE)

Deviance Residuals:

 Min 1Q Median 3Q Max

-1.41178 -0.28614 0.09095 0.42332 0.95988

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) 2.8905 1.4932 1.936 0.0624 .

fLATITUDEP -0.8110 1.1499 -0.705 0.4861

fLATITUDET 0.8358 0.4875 1.714 0.0968 .

fBASINPanthalassa -1.6740 1.4239 -1.176 0.2490

fBASINTethys -2.3546 1.5076 -1.562 0.1288

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasibinomial family taken to be 0.2688368)

 Null deviance: 11.2997 on 34 degrees of freedom

Residual deviance: 9.3068 on 30 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 5

>

> # find best model

>

> drop1(GLM\_LTE\_B3ii, test = "F")

Single term deletions

Model:

extinction ~ fLATITUDE + fBASIN

 Df Deviance F value Pr(>F)

<none> 9.3068

fLATITUDE 2 10.3885 1.7434 0.1922

fBASIN 2 10.2198 1.4715 0.2457

>

**Model = intrinsic**

> GLM\_LTE\_A4ii <- glm(extinction ~ fMOTILITY + fTIERING + fFEEDING +

+ fCALCIFICATION,

+ family = quasibinomial, data = LTE)

> summary(GLM\_LTE\_A4ii)

Call:

glm(formula = extinction ~ fMOTILITY + fTIERING + fFEEDING +

 fCALCIFICATION, family = quasibinomial, data = LTE)

Deviance Residuals:

 Min 1Q Median 3Q Max

-0.71433 -0.26270 0.09925 0.32029 0.81238

Coefficients: (1 not defined because of singularities)

 Estimate Std. Error t value Pr(>|t|)

(Intercept) 2.7289 1.4630 1.865 0.0849 .

fMOTILITYnonmotile -0.4503 0.8457 -0.532 0.6034

fTIERINGinfaunal -0.4901 0.7625 -0.643 0.5315

fTIERINGpelagic 0.8460 1.5784 0.536 0.6010

fFEEDINGphotosymbiotic 1.5392 2.4689 0.623 0.5438

fFEEDINGpredatory NA NA NA NA

fFEEDINGsuspension 0.6659 0.9222 0.722 0.4831

fCALCIFICATIONmoderate -1.9654 1.2570 -1.564 0.1419

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasibinomial family taken to be 0.2485554)

 Null deviance: 6.1229 on 19 degrees of freedom

Residual deviance: 3.6698 on 13 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 6

>

> # find best model

>

> drop1(GLM\_LTE\_A4ii, test = "F")

Single term deletions

Model:

extinction ~ fMOTILITY + fTIERING + fFEEDING + fCALCIFICATION

 Df Deviance F value Pr(>F)

<none> 3.6698

fMOTILITY 1 3.7409 0.2521 0.6240

fTIERING 1 3.7737 0.3683 0.5544

fFEEDING 2 3.8385 0.2988 0.7467

fCALCIFICATION 1 4.5139 2.9904 0.1074

>

**Model = intrinsic no env**

> GLM\_LTE\_B4ii <- glm(extinction ~ fMOTILITY + fTIERING + fFEEDING +

+ fCALCIFICATION,

+ family = quasibinomial, data = LTE)

> summary(GLM\_LTE\_B4ii)

Call:

glm(formula = extinction ~ fMOTILITY + fTIERING + fFEEDING +

 fCALCIFICATION, family = quasibinomial, data = LTE)

Deviance Residuals:

 Min 1Q Median 3Q Max

-0.8854 -0.2175 0.1099 0.2983 0.8137

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) 0.05624 0.87501 0.064 0.9493

fMOTILITYnonmotile -0.12162 0.47360 -0.257 0.7994

fTIERINGinfaunal -0.28702 0.49595 -0.579 0.5680

fTIERINGpelagic -0.76296 1.31530 -0.580 0.5671

fFEEDINGgrazing -1.16221 1.41697 -0.820 0.4198

fFEEDINGphotosymbiotic 3.15546 1.43793 2.194 0.0377 \*

fFEEDINGpredatory 3.37268 1.53674 2.195 0.0377 \*

fFEEDINGsuspension 1.38256 0.75596 1.829 0.0794 .

fCALCIFICATIONlight -1.68717 1.26360 -1.335 0.1938

fCALCIFICATIONmoderate -0.50346 0.57528 -0.875 0.3898

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasibinomial family taken to be 0.2078436)

 Null deviance: 11.2997 on 34 degrees of freedom

Residual deviance: 5.8432 on 25 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 5

>

> # find best model

>

> drop1(GLM\_LTE\_B4ii, test = "F")

Single term deletions

Model:

extinction ~ fMOTILITY + fTIERING + fFEEDING + fCALCIFICATION

 Df Deviance F value Pr(>F)

<none> 5.8432

fMOTILITY 1 5.8569 0.0588 0.8104

fTIERING 2 5.9886 0.3111 0.7354

fFEEDING 4 9.0390 3.4183 0.0232 \*

fCALCIFICATION 2 6.2321 0.8320 0.4469

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

>

> # best model

>

> GLM\_LTE\_B4iii <- glm(extinction ~ fFEEDING,

+ family = quasibinomial, data = LTE)

> summary(GLM\_LTE\_B4iii)

Call:

glm(formula = extinction ~ fFEEDING, family = quasibinomial,

 data = LTE)

Deviance Residuals:

 Min 1Q Median 3Q Max

-0.94003 -0.24861 0.07654 0.30255 0.81753

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) -0.5878 0.6253 -0.940 0.35471

fFEEDINGgrazing -1.0217 1.2975 -0.787 0.43724

fFEEDINGphotosymbiotic 3.6779 1.2119 3.035 0.00494 \*\*

fFEEDINGpredatory 2.5197 0.7893 3.192 0.00330 \*\*

fFEEDINGsuspension 1.5121 0.6580 2.298 0.02871 \*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasibinomial family taken to be 0.1795301)

 Null deviance: 11.2997 on 34 degrees of freedom

Residual deviance: 6.4135 on 30 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 5

**EToE**

**Model = all**

> GLM\_OAE\_A1ii <- glm(extinction ~ fMOTILITY + fTIERING + fFEEDING +

+ fLATITUDE + fBASIN + fENVIRONMENT +

+ fCALCIFICATION,

+ family = quasibinomial, data = OAE)

> summary(GLM\_OAE\_A1ii)

Call:

glm(formula = extinction ~ fMOTILITY + fTIERING + fFEEDING +

 fLATITUDE + fBASIN + fENVIRONMENT + fCALCIFICATION, family = quasibinomial,

 data = OAE)

Deviance Residuals:

 Min 1Q Median 3Q Max

-0.4337 -0.1391 0.0000 0.2102 0.4509

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) 0.7777 1.1233 0.692 0.5031

fMOTILITYnonmotile 0.7891 0.5491 1.437 0.1785

fTIERINGinfaunal -0.1401 0.4658 -0.301 0.7693

fTIERINGpelagic 1.1627 1.0537 1.103 0.2934

fFEEDINGgrazing 1.1905 0.7983 1.491 0.1640

fFEEDINGphotosymbiotic -1.7160 1.2277 -1.398 0.1897

fFEEDINGpredatory 0.7080 0.9654 0.733 0.4787

fFEEDINGsuspension -0.3624 0.7043 -0.515 0.6170

fLATITUDET -1.0360 0.5591 -1.853 0.0909 .

fBASINTethys 0.8423 0.5712 1.475 0.1683

fENVIRONMENTOffshore -1.3328 0.6372 -2.092 0.0605 .

fENVIRONMENTReef 3.3873 1.8921 1.790 0.1009

fCALCIFICATIONmoderate 0.1033 0.6401 0.161 0.8747

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasibinomial family taken to be 0.1186548)

 Null deviance: 4.1787 on 23 degrees of freedom

Residual deviance: 1.3477 on 11 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 5

>

> # find best model

>

> drop1(GLM\_OAE\_A1ii, test = "F")

Single term deletions

Model:

extinction ~ fMOTILITY + fTIERING + fFEEDING + fLATITUDE + fBASIN +

 fENVIRONMENT + fCALCIFICATION

 Df Deviance F value Pr(>F)

<none> 1.3477

fMOTILITY 1 1.5974 2.0381 0.18117

fTIERING 2 1.4956 0.6036 0.56398

fFEEDING 4 2.0222 1.3763 0.30423

fLATITUDE 1 1.7801 3.5289 0.08705 .

fBASIN 1 1.6114 2.1526 0.17033

fENVIRONMENT 2 2.2438 3.6571 0.06058 .

fCALCIFICATION 1 1.3508 0.0252 0.87681

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

>

> GLM\_OAE\_A1iii <- glm(extinction ~ fENVIRONMENT,

+ family = quasibinomial, data = post)

>

> summary(GLM\_OAE\_A1iii)

Call:

glm(formula = extinction ~ fENVIRONMENT, family = quasibinomial,

 data = post)

Deviance Residuals:

 Min 1Q Median 3Q Max

-1.20688 -0.35287 -0.00746 0.35180 1.15096

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) 0.069080 0.205914 0.335 0.739

fENVIRONMENTOffshore -0.006514 0.308166 -0.021 0.983

fENVIRONMENTReef -1.860839 1.175805 -1.583 0.119

(Dispersion parameter for quasibinomial family taken to be 0.3282142)

 Null deviance: 23.615 on 57 degrees of freedom

Residual deviance: 22.425 on 55 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 4

**Model = all no env**

> GLM\_OAE\_B1ii <- glm(extinction ~ fMOTILITY + fTIERING + fFEEDING +

+ fLATITUDE + fBASIN + fCALCIFICATION,

+ family = quasibinomial, data = OAE)

> summary(GLM\_OAE\_B1ii)

Call:

glm(formula = extinction ~ fMOTILITY + fTIERING + fFEEDING +

 fLATITUDE + fBASIN + fCALCIFICATION, family = quasibinomial,

 data = OAE)

Deviance Residuals:

 Min 1Q Median 3Q Max

-0.72266 -0.16491 0.01584 0.13465 0.39736

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) 1.5538 0.8060 1.928 0.065311 .

fMOTILITYnonmotile 0.6758 0.2645 2.554 0.017111 \*

fTIERINGinfaunal -0.3910 0.2695 -1.451 0.159156

fTIERINGpelagic 1.3641 0.7013 1.945 0.063097 .

fFEEDINGgrazing 0.9163 0.6374 1.438 0.162935

fFEEDINGphotosymbiotic 1.7089 0.7801 2.191 0.038023 \*

fFEEDINGpredatory 0.2133 0.7339 0.291 0.773756

fFEEDINGsuspension -0.1212 0.4878 -0.248 0.805786

fLATITUDEP -1.2973 0.5271 -2.461 0.021108 \*

fLATITUDET -0.2105 0.2368 -0.889 0.382505

fBASINPanthalassa -2.0205 0.5022 -4.023 0.000467 \*\*\*

fBASINTethys -1.8369 0.5214 -3.523 0.001667 \*\*

fCALCIFICATIONlight -1.5820 0.7751 -2.041 0.051937 .

fCALCIFICATIONmoderate 0.2521 0.3502 0.720 0.478244

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasibinomial family taken to be 0.08575427)

 Null deviance: 8.2940 on 38 degrees of freedom

Residual deviance: 2.3843 on 25 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 4

>

> # find best model

>

> drop1(GLM\_OAE\_B1ii, test = "F")

Single term deletions

Model:

extinction ~ fMOTILITY + fTIERING + fFEEDING + fLATITUDE + fBASIN +

 fCALCIFICATION

 Df Deviance F value Pr(>F)

<none> 2.3843

fMOTILITY 1 2.9536 5.9686 0.021967 \*

fTIERING 2 2.8716 2.5548 0.097824 .

fFEEDING 4 3.8265 3.7802 0.015446 \*

fLATITUDE 2 2.9693 3.0667 0.064403 .

fBASIN 2 4.0320 8.6382 0.001406 \*\*

fCALCIFICATION 2 3.0072 3.2653 0.054965 .

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

>

> # motility, feeding, basin and calcification

>

> GLM\_OAE\_B1iii <- glm(extinction ~ fMOTILITY + fFEEDING +

+ fBASIN + fCALCIFICATION,

+ family = quasibinomial, data = OAE)

> summary(GLM\_OAE\_B1iii)

Call:

glm(formula = extinction ~ fMOTILITY + fFEEDING + fBASIN + fCALCIFICATION,

 family = quasibinomial, data = OAE)

Deviance Residuals:

 Min 1Q Median 3Q Max

-1.05867 -0.06024 0.06304 0.17024 0.47845

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) 0.7819 0.7250 1.078 0.28975

fMOTILITYnonmotile 0.5395 0.2818 1.914 0.06551 .

fFEEDINGgrazing 1.0024 0.6641 1.509 0.14200

fFEEDINGphotosymbiotic 1.9016 0.8129 2.339 0.02641 \*

fFEEDINGpredatory 1.3548 0.5620 2.411 0.02249 \*

fFEEDINGsuspension -0.1287 0.5147 -0.250 0.80428

fBASINPanthalassa -1.4785 0.4084 -3.620 0.00111 \*\*

fBASINTethys -1.2531 0.4027 -3.112 0.00415 \*\*

fCALCIFICATIONlight -1.1713 0.7957 -1.472 0.15178

fCALCIFICATIONmoderate 0.2469 0.3424 0.721 0.47666

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasibinomial family taken to be 0.1015277)

 Null deviance: 8.294 on 38 degrees of freedom

Residual deviance: 3.348 on 29 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 4

>

> drop1(GLM\_OAE\_B1iii, test = "F")

Single term deletions

Model:

extinction ~ fMOTILITY + fFEEDING + fBASIN + fCALCIFICATION

 Df Deviance F value Pr(>F)

<none> 3.3480

fMOTILITY 1 3.7264 3.2771 0.0806257 .

fFEEDING 4 6.9142 7.7223 0.0002299 \*\*\*

fBASIN 2 4.8737 6.6073 0.0043207 \*\*

fCALCIFICATION 2 3.7888 1.9088 0.1664198

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

>

> # best model

> GLM\_OAE\_B1iv <- glm(extinction ~ fFEEDING + fBASIN,

+ family = quasibinomial, data = OAE)

> summary(GLM\_OAE\_B1iv)

Call:

glm(formula = extinction ~ fFEEDING + fBASIN, family = quasibinomial,

 data = OAE)

Deviance Residuals:

 Min 1Q Median 3Q Max

-1.06388 -0.16613 0.02477 0.21597 0.51343

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) 0.9920 0.6327 1.568 0.12674

fFEEDINGgrazing 1.0024 0.7081 1.416 0.16656

fFEEDINGphotosymbiotic 2.1544 0.7617 2.828 0.00801 \*\*

fFEEDINGpredatory 1.0702 0.5717 1.872 0.07039 .

fFEEDINGsuspension 0.0665 0.5207 0.128 0.89918

fBASINPanthalassa -1.3316 0.4153 -3.206 0.00305 \*\*

fBASINTethys -1.2164 0.4081 -2.981 0.00546 \*\*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasibinomial family taken to be 0.1154421)

 Null deviance: 8.2940 on 38 degrees of freedom

Residual deviance: 4.1213 on 32 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 4

**Model = extrinsic**

> GLM\_OAE\_A3ii <- glm(extinction ~ fLATITUDE + fBASIN + fENVIRONMENT,

+ family = quasibinomial, data = OAE)

> summary(GLM\_OAE\_A3ii)

Call:

glm(formula = extinction ~ fLATITUDE + fBASIN + fENVIRONMENT,

 family = quasibinomial, data = OAE)

Deviance Residuals:

 Min 1Q Median 3Q Max

-0.82785 -0.19980 0.02194 0.30345 0.68123

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) 0.4679 0.5296 0.884 0.388

fLATITUDET -0.3157 0.4468 -0.707 0.488

fBASINTethys 0.8458 0.5224 1.619 0.122

fENVIRONMENTOffshore -0.4707 0.4937 -0.953 0.352

fENVIRONMENTReef 2.0464 1.9653 1.041 0.311

(Dispersion parameter for quasibinomial family taken to be 0.1625729)

 Null deviance: 4.1787 on 23 degrees of freedom

Residual deviance: 3.2273 on 19 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 5

>

> # find best model

>

> drop1(GLM\_OAE\_A3ii, test = "F")

Single term deletions

Model:

extinction ~ fLATITUDE + fBASIN + fENVIRONMENT

 Df Deviance F value Pr(>F)

<none> 3.2273

fLATITUDE 1 3.3089 0.4802 0.4967

fBASIN 1 3.6534 2.5082 0.1298

fENVIRONMENT 2 3.7659 1.5854 0.2308

>

**Model = extrinsic no env**

> GLM\_OAE\_B3ii <- glm(extinction ~ fLATITUDE + fBASIN,

+ family = quasibinomial, data = OAE)

> summary(GLM\_OAE\_B3ii)

Call:

glm(formula = extinction ~ fLATITUDE + fBASIN, family = quasibinomial,

 data = OAE)

Deviance Residuals:

 Min 1Q Median 3Q Max

-0.85850 -0.31552 -0.02386 0.29006 0.88380

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) 1.76124 0.67687 2.602 0.0136 \*

fLATITUDEP -0.83310 0.70090 -1.189 0.2428

fLATITUDET 0.08532 0.30341 0.281 0.7803

fBASINPanthalassa -1.73653 0.69143 -2.512 0.0169 \*

fBASINTethys -1.53097 0.70095 -2.184 0.0359 \*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasibinomial family taken to be 0.1816417)

 Null deviance: 8.2940 on 38 degrees of freedom

Residual deviance: 6.8489 on 34 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 4

>

> # find best model

>

> drop1(GLM\_OAE\_B3ii, test = "F")

Single term deletions

Model:

extinction ~ fLATITUDE + fBASIN

 Df Deviance F value Pr(>F)

<none> 6.8489

fLATITUDE 2 7.1629 0.7795 0.46668

fBASIN 2 8.2454 3.4663 0.04265 \*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

>

> # best model

>

> GLM\_OAE\_B3iii <- glm(extinction ~ fBASIN,

+ family = quasibinomial, data = OAE)

> summary(GLM\_OAE\_B3iii)

Call:

glm(formula = extinction ~ fBASIN, family = quasibinomial, data = OAE)

Deviance Residuals:

 Min 1Q Median 3Q Max

-1.18153 -0.25543 -0.03494 0.30631 0.86954

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) 1.2160 0.4466 2.723 0.00991 \*\*

fBASINPanthalassa -1.2064 0.5035 -2.396 0.02190 \*

fBASINTethys -0.9534 0.4832 -1.973 0.05621 .

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasibinomial family taken to be 0.175851)

 Null deviance: 8.2940 on 38 degrees of freedom

Residual deviance: 7.1629 on 36 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 4

**Model = intrinsic**

> GLM\_OAE\_A4ii <- glm(extinction ~ fMOTILITY + fTIERING + fFEEDING +

+ fCALCIFICATION,

+ family = quasibinomial, data = OAE)

> summary(GLM\_OAE\_A4ii)

Call:

glm(formula = extinction ~ fMOTILITY + fTIERING + fFEEDING +

 fCALCIFICATION, family = quasibinomial, data = OAE)

Deviance Residuals:

 Min 1Q Median 3Q Max

-0.50167 -0.26405 -0.00598 0.31718 0.51395

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) 0.865721 0.835866 1.036 0.317

fMOTILITYnonmotile 0.586772 0.546392 1.074 0.300

fTIERINGinfaunal -0.408294 0.492615 -0.829 0.420

fTIERINGpelagic 0.792790 1.106530 0.716 0.485

fFEEDINGgrazing 0.718156 0.810390 0.886 0.390

fFEEDINGphotosymbiotic 0.001459 1.107503 0.001 0.999

fFEEDINGpredatory 0.570980 1.078225 0.530 0.604

fFEEDINGsuspension -0.281368 0.685727 -0.410 0.687

fCALCIFICATIONmoderate -0.338089 0.645988 -0.523 0.608

(Dispersion parameter for quasibinomial family taken to be 0.1482437)

 Null deviance: 4.1787 on 23 degrees of freedom

Residual deviance: 2.3502 on 15 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 4

>

> # find best model

>

> drop1(GLM\_OAE\_A4ii, test = "F")

Single term deletions

Model:

extinction ~ fMOTILITY + fTIERING + fFEEDING + fCALCIFICATION

 Df Deviance F value Pr(>F)

<none> 2.3502

fMOTILITY 1 2.5215 1.0938 0.3122

fTIERING 2 2.5248 0.5572 0.5842

fFEEDING 4 2.6545 0.4857 0.7462

fCALCIFICATION 1 2.3916 0.2642 0.6148

>

**Model = intrinsic no env**

> GLM\_OAE\_B4ii <- glm(extinction ~ fMOTILITY + fTIERING + fFEEDING +

+ fCALCIFICATION,

+ family = quasibinomial, data = OAE)

> summary(GLM\_OAE\_B4ii)

Call:

glm(formula = extinction ~ fMOTILITY + fTIERING + fFEEDING +

 fCALCIFICATION, family = quasibinomial, data = OAE)

Deviance Residuals:

 Min 1Q Median 3Q Max

-1.09670 -0.21032 0.05265 0.18855 0.54955

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) -0.60947 0.64645 -0.943 0.3536

fMOTILITYnonmotile 0.32053 0.30686 1.045 0.3049

fTIERINGinfaunal -0.45118 0.31438 -1.435 0.1619

fTIERINGpelagic 1.28321 0.84016 1.527 0.1375

fFEEDINGgrazing 0.77966 0.77486 1.006 0.3226

fFEEDINGphotosymbiotic 2.17951 0.91122 2.392 0.0235 \*

fFEEDINGpredatory 0.18390 0.90933 0.202 0.8411

fFEEDINGsuspension 0.09612 0.56283 0.171 0.8656

fCALCIFICATIONlight -1.14531 0.93795 -1.221 0.2319

fCALCIFICATIONmoderate 0.60790 0.40898 1.486 0.1480

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasibinomial family taken to be 0.1320506)

 Null deviance: 8.2940 on 38 degrees of freedom

Residual deviance: 4.3038 on 29 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 4

>

> # find best model

>

> drop1(GLM\_OAE\_B4ii, test = "F")

Single term deletions

Model:

extinction ~ fMOTILITY + fTIERING + fFEEDING + fCALCIFICATION

 Df Deviance F value Pr(>F)

<none> 4.3038

fMOTILITY 1 4.4486 0.9758 0.33142

fTIERING 2 4.8737 1.9200 0.16479

fFEEDING 4 5.9884 2.8378 0.04223 \*

fCALCIFICATION 2 5.1747 2.9342 0.06910 .

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

>

> # best model

>

> GLM\_OAE\_B4iv <- glm(extinction ~ fFEEDING,

+ family = quasibinomial, data = OAE)

> summary(GLM\_OAE\_B4iv)

Call:

glm(formula = extinction ~ fFEEDING, family = quasibinomial,

 data = OAE)

Deviance Residuals:

 Min 1Q Median 3Q Max

-1.16779 -0.21337 0.07018 0.28404 0.70741

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) -0.2243 0.5481 -0.409 0.6849

fFEEDINGgrazing 1.0024 0.8026 1.249 0.2202

fFEEDINGphotosymbiotic 2.1149 0.8568 2.468 0.0188 \*

fFEEDINGpredatory 1.1659 0.6367 1.831 0.0758 .

fFEEDINGsuspension 0.2016 0.5693 0.354 0.7254

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasibinomial family taken to be 0.1483219)

 Null deviance: 8.294 on 38 degrees of freedom

Residual deviance: 5.546 on 34 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 4

**Triassic background**

Model = all

> GLM\_pre\_A1ii <- glm(extinction ~ fMOTILITY + fTIERING + fFEEDING +

+ fLATITUDE + fBASIN + fENVIRONMENT +

+ fCALCIFICATION,

+ family = quasibinomial, data = pre)

> summary(GLM\_pre\_A1ii)

Call:

glm(formula = extinction ~ fMOTILITY + fTIERING + fFEEDING +

 fLATITUDE + fBASIN + fENVIRONMENT + fCALCIFICATION, family = quasibinomial,

 data = pre)

Deviance Residuals:

 Min 1Q Median 3Q Max

-1.0239 -0.2825 0.0781 0.3665 0.7342

Coefficients: (1 not defined because of singularities)

 Estimate Std. Error t value Pr(>|t|)

(Intercept) 2.307822 1.126560 2.049 0.0479 \*

fMOTILITYnonmotile -0.001491 0.475700 -0.003 0.9975

fTIERINGinfaunal -0.205156 0.553408 -0.371 0.7130

fTIERINGpelagic 0.611297 0.891845 0.685 0.4975

fFEEDINGphotosymbiotic -1.734707 1.161870 -1.493 0.1441

fFEEDINGpredatory NA NA NA NA

fFEEDINGsuspension -0.609533 0.809037 -0.753 0.4561

fLATITUDET -0.369263 0.552370 -0.669 0.5081

fBASINTethys -0.029463 0.632788 -0.047 0.9631

fENVIRONMENTOffshore 0.146258 0.821322 0.178 0.8597

fENVIRONMENTReef -0.438626 0.491499 -0.892 0.3781

fCALCIFICATIONlight -0.778322 0.724403 -1.074 0.2898

fCALCIFICATIONmoderate -0.821088 0.571830 -1.436 0.1597

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasibinomial family taken to be 0.2401432)

 Null deviance: 13.8327 on 47 degrees of freedom

Residual deviance: 9.1254 on 36 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 4

>

> # find best model

>

> drop1(GLM\_pre\_A1ii, test = "F")

Single term deletions

Model:

extinction ~ fMOTILITY + fTIERING + fFEEDING + fLATITUDE + fBASIN +

 fENVIRONMENT + fCALCIFICATION

 Df Deviance F value Pr(>F)

<none> 9.1254

fMOTILITY 1 9.1254 0.0000 0.9976

fTIERING 1 9.1584 0.1302 0.7204

fFEEDING 2 9.7804 1.2920 0.2872

fLATITUDE 1 9.2353 0.4334 0.5145

fBASIN 1 9.1260 0.0021 0.9641

fENVIRONMENT 2 9.3238 0.3912 0.6791

fCALCIFICATION 2 9.6563 1.0471 0.3614

>

**Model = all no env**

> GLM\_pre\_B1ii <- glm(extinction ~ fMOTILITY + fTIERING + fFEEDING +

+ fLATITUDE + fBASIN + fCALCIFICATION,

+ family = quasibinomial, data = pre)

> summary(GLM\_pre\_B1ii)

Call:

glm(formula = extinction ~ fMOTILITY + fTIERING + fFEEDING +

 fLATITUDE + fBASIN + fCALCIFICATION, family = quasibinomial,

 data = pre)

Deviance Residuals:

 Min 1Q Median 3Q Max

-1.30649 -0.24242 0.03913 0.31504 1.06498

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) 0.493783 0.609139 0.811 0.420

fMOTILITYnonmotile 0.132692 0.255165 0.520 0.604

fTIERINGinfaunal -0.249179 0.288659 -0.863 0.390

fTIERINGpelagic 0.422510 0.386715 1.093 0.278

fFEEDINGgrazing -0.221395 0.879548 -0.252 0.802

fFEEDINGother -0.773554 1.111817 -0.696 0.488

fFEEDINGphotosymbiotic -0.867489 0.713520 -1.216 0.227

fFEEDINGpredatory 0.415223 0.689365 0.602 0.549

fFEEDINGsuspension -0.501679 0.610900 -0.821 0.414

fLATITUDEP -0.002709 0.397414 -0.007 0.995

fLATITUDET -0.245379 0.223035 -1.100 0.274

fBASINPanthalassa 0.438921 0.406209 1.081 0.283

fBASINTethys 0.129194 0.440649 0.293 0.770

fCALCIFICATIONlight -0.275846 0.441214 -0.625 0.533

fCALCIFICATIONmoderate -0.048012 0.292650 -0.164 0.870

(Dispersion parameter for quasibinomial family taken to be 0.1870975)

 Null deviance: 24.442 on 100 degrees of freedom

Residual deviance: 17.897 on 86 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 4

> # find best model

>

> drop1(GLM\_pre\_B1ii, test = "F")

Single term deletions

Model:

extinction ~ fMOTILITY + fTIERING + fFEEDING + fLATITUDE + fBASIN +

 fCALCIFICATION

 Df Deviance F value Pr(>F)

<none> 17.897

fMOTILITY 1 17.948 0.2431 0.6232

fTIERING 2 18.279 0.9181 0.4032

fFEEDING 5 19.132 1.1867 0.3224

fLATITUDE 2 18.141 0.5861 0.5587

fBASIN 2 18.465 1.3633 0.2613

fCALCIFICATION 2 17.979 0.1956 0.8227

>

**Model = extrinsic**

> GLM\_pre\_A3ii <- glm(extinction ~ fLATITUDE + fBASIN + fENVIRONMENT,

+ family = quasibinomial, data = pre)

> summary(GLM\_pre\_A3ii)

Call:

glm(formula = extinction ~ fLATITUDE + fBASIN + fENVIRONMENT,

 family = quasibinomial, data = pre)

Deviance Residuals:

 Min 1Q Median 3Q Max

-1.21401 -0.28266 0.08969 0.32510 0.83503

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) 0.9568 0.5688 1.682 0.0998 .

fLATITUDET 0.1052 0.5020 0.210 0.8350

fBASINTethys -0.1877 0.5423 -0.346 0.7309

fENVIRONMENTOffshore 1.0662 0.6413 1.663 0.1036

fENVIRONMENTReef -0.7343 0.3295 -2.229 0.0311 \*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasibinomial family taken to be 0.2421453)

 Null deviance: 13.833 on 47 degrees of freedom

Residual deviance: 11.197 on 43 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 4

>

> # find best model

>

> drop1(GLM\_pre\_A3ii, test = "F")

Single term deletions

Model:

extinction ~ fLATITUDE + fBASIN + fENVIRONMENT

 Df Deviance F value Pr(>F)

<none> 11.197

fLATITUDE 1 11.207 0.0405 0.84141

fBASIN 1 11.226 0.1132 0.73814

fENVIRONMENT 2 13.831 5.0590 0.01064 \*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

>

> # best model

>

> GLM\_pre\_A3iii <- glm(extinction ~ fENVIRONMENT,

+ family = quasibinomial, data = pre)

> summary(GLM\_pre\_A3iii)

Call:

glm(formula = extinction ~ fENVIRONMENT, family = quasibinomial,

 data = pre)

Deviance Residuals:

 Min 1Q Median 3Q Max

-1.2179 -0.2782 0.1173 0.3223 0.8322

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) 0.8824 0.2038 4.330 8.24e-05 \*\*\*

fENVIRONMENTOffshore 1.0400 0.6238 1.667 0.102

fENVIRONMENTReef -0.7314 0.3222 -2.270 0.028 \*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasibinomial family taken to be 0.232193)

 Null deviance: 13.833 on 47 degrees of freedom

Residual deviance: 11.228 on 45 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 4

**Model = extrinsic no env**

> GLM\_pre\_B3ii <- glm(extinction ~ fLATITUDE + fBASIN,

+ family = quasibinomial, data = pre)

> summary(GLM\_pre\_B3ii)

Call:

glm(formula = extinction ~ fLATITUDE + fBASIN, family = quasibinomial,

 data = pre)

Deviance Residuals:

 Min 1Q Median 3Q Max

-1.29562 -0.30561 0.02562 0.39844 1.02334

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) 0.35325 0.39494 0.894 0.373

fLATITUDEP -0.07958 0.38308 -0.208 0.836

fLATITUDET -0.24219 0.22525 -1.075 0.285

fBASINPanthalassa 0.26273 0.39198 0.670 0.504

fBASINTethys 0.02883 0.42502 0.068 0.946

(Dispersion parameter for quasibinomial family taken to be 0.2223776)

 Null deviance: 24.442 on 100 degrees of freedom

Residual deviance: 23.767 on 96 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 3

>

> # find best model

>

> drop1(GLM\_pre\_B3ii, test = "F")

Single term deletions

Model:

extinction ~ fLATITUDE + fBASIN

 Df Deviance F value Pr(>F)

<none> 23.767

fLATITUDE 2 24.025 0.5220 0.5950

fBASIN 2 24.093 0.6592 0.5196

>

**Model = intrinsic**

> GLM\_pre\_A4ii <- glm(extinction ~ fMOTILITY + fTIERING + fFEEDING +

+ fCALCIFICATION,

+ family = quasibinomial, data = pre)

> summary(GLM\_pre\_A4ii)

Call:

glm(formula = extinction ~ fMOTILITY + fTIERING + fFEEDING +

 fCALCIFICATION, family = quasibinomial, data = pre)

Deviance Residuals:

 Min 1Q Median 3Q Max

-0.9961 -0.2672 0.1008 0.3637 0.6452

Coefficients: (1 not defined because of singularities)

 Estimate Std. Error t value Pr(>|t|)

(Intercept) 1.85156 0.84290 2.197 0.0339 \*

fMOTILITYnonmotile -0.06775 0.45827 -0.148 0.8832

fTIERINGinfaunal -0.02356 0.47980 -0.049 0.9611

fTIERINGpelagic 0.78405 0.78742 0.996 0.3254

fFEEDINGphotosymbiotic -1.88930 0.97094 -1.946 0.0587 .

fFEEDINGpredatory NA NA NA NA

fFEEDINGsuspension -0.71681 0.74704 -0.960 0.3431

fCALCIFICATIONlight -0.88807 0.69239 -1.283 0.2070

fCALCIFICATIONmoderate -0.76356 0.55221 -1.383 0.1744

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasibinomial family taken to be 0.2293279)

 Null deviance: 13.8327 on 47 degrees of freedom

Residual deviance: 9.5384 on 40 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 4

>

> # find best model

>

> drop1(GLM\_pre\_A4ii, test = "F")

Single term deletions

Model:

extinction ~ fMOTILITY + fTIERING + fFEEDING + fCALCIFICATION

 Df Deviance F value Pr(>F)

<none> 9.5384

fMOTILITY 1 9.5434 0.0210 0.8854

fTIERING 1 9.5389 0.0023 0.9618

fFEEDING 2 10.6146 2.2568 0.1179

fCALCIFICATION 2 10.0601 1.0941 0.3447

>

**Model = intrinsic no env**

> GLM\_pre\_B4ii <- glm(extinction ~ fMOTILITY + fTIERING + fFEEDING +

+ fCALCIFICATION,

+ family = quasibinomial, data = pre)

> summary(GLM\_pre\_B4ii)

Call:

glm(formula = extinction ~ fMOTILITY + fTIERING + fFEEDING +

 fCALCIFICATION, family = quasibinomial, data = pre)

Deviance Residuals:

 Min 1Q Median 3Q Max

-1.43602 -0.23872 0.07058 0.28717 1.09648

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) 0.55518 0.58195 0.954 0.343

fMOTILITYnonmotile 0.11194 0.25563 0.438 0.663

fTIERINGinfaunal -0.26538 0.27564 -0.963 0.338

fTIERINGpelagic 0.44883 0.38590 1.163 0.248

fFEEDINGgrazing -0.38720 0.80757 -0.479 0.633

fFEEDINGother -0.92316 1.07130 -0.862 0.391

fFEEDINGphotosymbiotic -0.77628 0.66080 -1.175 0.243

fFEEDINGpredatory 0.44291 0.63581 0.697 0.488

fFEEDINGsuspension -0.41397 0.54340 -0.762 0.448

fCALCIFICATIONlight -0.42882 0.42755 -1.003 0.319

fCALCIFICATIONmoderate -0.05979 0.28712 -0.208 0.836

(Dispersion parameter for quasibinomial family taken to be 0.1891681)

 Null deviance: 24.442 on 100 degrees of freedom

Residual deviance: 18.780 on 90 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 4

>

> # find best model

>

> drop1(GLM\_pre\_B4ii, test = "F")

Single term deletions

Model:

extinction ~ fMOTILITY + fTIERING + fFEEDING + fCALCIFICATION

 Df Deviance F value Pr(>F)

<none> 18.780

fMOTILITY 1 18.816 0.1738 0.6777

fTIERING 2 19.212 1.0348 0.3595

fFEEDING 5 19.953 1.1242 0.3533

fCALCIFICATION 2 19.003 0.5347 0.5877

>

**Jurassic background**

**Model = all**

> GLM\_post\_A1ii <- glm(extinction ~ fMOTILITY + fTIERING + fFEEDING +

+ fLATITUDE + fBASIN + fENVIRONMENT +

+ fCALCIFICATION,

+ family = quasibinomial, data = post)

> summary(GLM\_post\_A1ii)

Call:

glm(formula = extinction ~ fMOTILITY + fTIERING + fFEEDING +

 fLATITUDE + fBASIN + fENVIRONMENT + fCALCIFICATION, family = quasibinomial,

 data = post)

Deviance Residuals:

 Min 1Q Median 3Q Max

-1.51234 -0.21406 0.08584 0.31578 0.87603

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) 0.04533 1.14542 0.040 0.9686

fMOTILITYnonmotile 0.44139 0.48417 0.912 0.3668

fTIERINGinfaunal 0.09458 0.44038 0.215 0.8309

fTIERINGpelagic 1.93865 0.90292 2.147 0.0372 \*

fFEEDINGgrazing -0.13636 0.94827 -0.144 0.8863

fFEEDINGphotosymbiotic -1.08787 1.29808 -0.838 0.4064

fFEEDINGpredatory -0.07292 0.99946 -0.073 0.9422

fFEEDINGsuspension -0.81351 0.88483 -0.919 0.3628

fLATITUDET -0.61547 0.42484 -1.449 0.1544

fBASINTethys 1.08666 0.50557 2.149 0.0370 \*

fENVIRONMENTOffshore -1.20987 0.45935 -2.634 0.0115 \*

fENVIRONMENTReef -1.66180 1.39474 -1.191 0.2397

fCALCIFICATIONmoderate 0.15080 0.53518 0.282 0.7794

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasibinomial family taken to be 0.2844998)

 Null deviance: 23.615 on 57 degrees of freedom

Residual deviance: 15.391 on 45 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 4

> # find best model

>

> drop1(GLM\_post\_A1ii, test = "F")

Single term deletions

Model:

extinction ~ fMOTILITY + fTIERING + fFEEDING + fLATITUDE + fBASIN +

 fENVIRONMENT + fCALCIFICATION

 Df Deviance F value Pr(>F)

<none> 15.391

fMOTILITY 1 15.629 0.6965 0.40836

fTIERING 2 16.803 2.0641 0.13878

fFEEDING 4 15.811 0.3069 0.87182

fLATITUDE 1 15.991 1.7543 0.19203

fBASIN 1 16.748 3.9680 0.05246 .

fENVIRONMENT 2 18.316 4.2762 0.01994 \*

fCALCIFICATION 1 15.414 0.0661 0.79830

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

>

> # best model

> GLM\_post\_A1iii <- glm(extinction ~ fBASIN + fENVIRONMENT,

+ family = quasibinomial, data = post)

>

> summary(GLM\_post\_A1iii)

Call:

glm(formula = extinction ~ fBASIN + fENVIRONMENT, family = quasibinomial,

 data = post)

Deviance Residuals:

 Min 1Q Median 3Q Max

-1.39697 -0.23517 0.01493 0.36667 1.15096

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) -0.7316 0.3532 -2.072 0.04309 \*

fBASINTethys 1.2343 0.4345 2.841 0.00633 \*\*

fENVIRONMENTOffshore -0.4401 0.3350 -1.314 0.19450

fENVIRONMENTReef -2.2945 1.1370 -2.018 0.04856 \*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasibinomial family taken to be 0.3009023)

 Null deviance: 23.615 on 57 degrees of freedom

Residual deviance: 19.858 on 54 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 4

**Model = all no env**

> GLM\_post\_B1ii <- glm(extinction ~ fMOTILITY + fTIERING + fFEEDING +

+ fLATITUDE + fBASIN + fCALCIFICATION,

+ family = quasibinomial, data = post)

> summary(GLM\_post\_B1ii)

Call:

glm(formula = extinction ~ fMOTILITY + fTIERING + fFEEDING +

 fLATITUDE + fBASIN + fCALCIFICATION, family = quasibinomial,

 data = post)

Deviance Residuals:

 Min 1Q Median 3Q Max

-1.17245 -0.30500 0.02441 0.33190 0.97939

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) -0.652952 0.840734 -0.777 0.4392

fMOTILITYnonmotile 0.022546 0.265609 0.085 0.9325

fTIERINGinfaunal 0.013179 0.276256 0.048 0.9620

fTIERINGpelagic 0.953836 0.574465 1.660 0.1000 .

fFEEDINGgrazing 1.153372 0.628432 1.835 0.0694 .

fFEEDINGother 1.335053 1.178406 1.133 0.2600

fFEEDINGphotosymbiotic 0.625865 0.691337 0.905 0.3675

fFEEDINGpredatory 1.241876 0.690106 1.800 0.0749 .

fFEEDINGsuspension 0.264316 0.497767 0.531 0.5966

fLATITUDEP 0.180565 0.518066 0.349 0.7282

fLATITUDET -0.004722 0.228922 -0.021 0.9836

fBASINPanthalassa -0.462281 0.516853 -0.894 0.3732

fBASINTethys -0.002421 0.539806 -0.004 0.9964

fCALCIFICATIONlight -0.577693 0.674157 -0.857 0.3935

fCALCIFICATIONmoderate 0.005010 0.354818 0.014 0.9888

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasibinomial family taken to be 0.251139)

 Null deviance: 42.295 on 114 degrees of freedom

Residual deviance: 30.418 on 100 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 4

>

> # find best model

>

> drop1(GLM\_post\_B1ii, test = "F")

Single term deletions

Model:

extinction ~ fMOTILITY + fTIERING + fFEEDING + fLATITUDE + fBASIN +

 fCALCIFICATION

 Df Deviance F value Pr(>F)

<none> 30.418

fMOTILITY 1 30.420 0.0059 0.9387

fTIERING 2 31.094 1.1106 0.3334

fFEEDING 5 32.449 1.3355 0.2555

fLATITUDE 2 30.449 0.0512 0.9501

fBASIN 2 31.475 1.7371 0.1813

fCALCIFICATION 2 30.660 0.3979 0.6728

>

**Model = extrinsic**

> GLM\_post\_A3ii <- glm(extinction ~ fLATITUDE + fBASIN + fENVIRONMENT,

+ family = quasibinomial, data = post)

> summary(GLM\_post\_A3ii)

Call:

glm(formula = extinction ~ fLATITUDE + fBASIN + fENVIRONMENT,

 family = quasibinomial, data = post)

Deviance Residuals:

 Min 1Q Median 3Q Max

-1.42597 -0.23507 0.02656 0.37338 1.14446

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) -0.6267 0.4674 -1.341 0.1857

fLATITUDET -0.1288 0.3728 -0.345 0.7312

fBASINTethys 1.1943 0.4527 2.638 0.0109 \*

fENVIRONMENTOffshore -0.4896 0.3676 -1.332 0.1886

fENVIRONMENTReef -2.2306 1.1610 -1.921 0.0601 .

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasibinomial family taken to be 0.3059362)

 Null deviance: 23.615 on 57 degrees of freedom

Residual deviance: 19.822 on 53 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 4

>

> # find best model

>

> drop1(GLM\_post\_A3ii, test = "F")

Single term deletions

Model:

extinction ~ fLATITUDE + fBASIN + fENVIRONMENT

 Df Deviance F value Pr(>F)

<none> 19.822

fLATITUDE 1 19.858 0.0975 0.75609

fBASIN 1 22.058 5.9786 0.01784 \*

fENVIRONMENT 2 21.794 2.6368 0.08096 .

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

>

> # best model

> GLM\_post\_A3iii <- glm(extinction ~ fBASIN,

+ family = quasibinomial, data = post)

>

> summary(GLM\_post\_A3iii)

Call:

glm(formula = extinction ~ fBASIN, family = quasibinomial, data = post)

Deviance Residuals:

 Min 1Q Median 3Q Max

-1.25583 -0.36205 0.04317 0.45311 1.10095

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) -0.7316 0.3614 -2.024 0.0477 \*

fBASINTethys 0.9141 0.3971 2.302 0.0251 \*

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasibinomial family taken to be 0.3151467)

 Null deviance: 23.615 on 57 degrees of freedom

Residual deviance: 21.850 on 56 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 3

**Model = extrinsic no env**

> GLM\_post\_B3ii <- glm(extinction ~ fLATITUDE + fBASIN,

+ family = quasibinomial, data = post)

> summary(GLM\_post\_B3ii)

Call:

glm(formula = extinction ~ fLATITUDE + fBASIN, family = quasibinomial,

 data = post)

Deviance Residuals:

 Min 1Q Median 3Q Max

-1.18921 -0.41443 0.07206 0.36821 1.23843

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) -0.15073 0.50156 -0.301 0.764

fLATITUDEP 0.09206 0.51178 0.180 0.858

fLATITUDET 0.04691 0.22530 0.208 0.835

fBASINPanthalassa -0.35305 0.50998 -0.692 0.490

fBASINTethys 0.13156 0.51975 0.253 0.801

(Dispersion parameter for quasibinomial family taken to be 0.3064222)

 Null deviance: 42.295 on 114 degrees of freedom

Residual deviance: 40.896 on 110 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 3

>

> # find best model

>

> drop1(GLM\_post\_B3ii, test = "F")

Single term deletions

Model:

extinction ~ fLATITUDE + fBASIN

 Df Deviance F value Pr(>F)

<none> 40.896

fLATITUDE 2 40.917 0.0279 0.9725

fBASIN 2 42.294 1.8799 0.1575

>

**Model = intrinsic**

> GLM\_post\_A4ii <- glm(extinction ~ fMOTILITY + fTIERING + fFEEDING +

+ fCALCIFICATION,

+ family = quasibinomial, data = post)

> summary(GLM\_post\_A4ii)

Call:

glm(formula = extinction ~ fMOTILITY + fTIERING + fFEEDING +

 fCALCIFICATION, family = quasibinomial, data = post)

Deviance Residuals:

 Min 1Q Median 3Q Max

-1.23841 -0.35885 0.07215 0.42268 1.11761

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) 0.48986 0.93482 0.524 0.6026

fMOTILITYnonmotile 0.02496 0.46913 0.053 0.9578

fTIERINGinfaunal -0.16568 0.44754 -0.370 0.7128

fTIERINGpelagic 1.77230 0.92260 1.921 0.0606 .

fFEEDINGgrazing -0.15181 0.97205 -0.156 0.8765

fFEEDINGphotosymbiotic -1.00033 1.12559 -0.889 0.3785

fFEEDINGpredatory -0.20319 1.05564 -0.192 0.8482

fFEEDINGsuspension -0.37252 0.87741 -0.425 0.6730

fCALCIFICATIONmoderate -0.28667 0.51093 -0.561 0.5773

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasibinomial family taken to be 0.3181259)

 Null deviance: 23.615 on 57 degrees of freedom

Residual deviance: 19.476 on 49 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 4

>

> # find best model

>

> drop1(GLM\_post\_A4ii, test = "F")

Single term deletions

Model:

extinction ~ fMOTILITY + fTIERING + fFEEDING + fCALCIFICATION

 Df Deviance F value Pr(>F)

<none> 19.476

fMOTILITY 1 19.477 0.0023 0.9622

fTIERING 2 20.768 1.6259 0.2072

fFEEDING 4 19.804 0.2067 0.9335

fCALCIFICATION 1 19.576 0.2526 0.6175

>

**Model = intrinsic no env**

> GLM\_post\_B4ii <- glm(extinction ~ fMOTILITY + fTIERING + fFEEDING +

+ fCALCIFICATION,

+ family = quasibinomial, data = post)

> summary(GLM\_post\_B4ii)

Call:

glm(formula = extinction ~ fMOTILITY + fTIERING + fFEEDING +

 fCALCIFICATION, family = quasibinomial, data = post)

Deviance Residuals:

 Min 1Q Median 3Q Max

-1.07893 -0.38812 0.07983 0.34490 1.05144

Coefficients:

 Estimate Std. Error t value Pr(>|t|)

(Intercept) -0.617533 0.530221 -1.165 0.2468

fMOTILITYnonmotile -0.029025 0.255465 -0.114 0.9098

fTIERINGinfaunal -0.042630 0.264686 -0.161 0.8724

fTIERINGpelagic 0.810725 0.557628 1.454 0.1490

fFEEDINGgrazing 1.123169 0.615087 1.826 0.0707 .

fFEEDINGother 1.358299 1.150768 1.180 0.2406

fFEEDINGphotosymbiotic 0.410438 0.637146 0.644 0.5209

fFEEDINGpredatory 1.157417 0.682559 1.696 0.0929 .

fFEEDINGsuspension 0.123304 0.467416 0.264 0.7925

fCALCIFICATIONlight -0.452490 0.659257 -0.686 0.4940

fCALCIFICATIONmoderate -0.004989 0.332452 -0.015 0.9881

---

Signif. codes: 0 ‘\*\*\*’ 0.001 ‘\*\*’ 0.01 ‘\*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for quasibinomial family taken to be 0.2494198)

 Null deviance: 42.295 on 114 degrees of freedom

Residual deviance: 31.582 on 104 degrees of freedom

AIC: NA

Number of Fisher Scoring iterations: 4

>

> # find best model

>

> drop1(GLM\_post\_B4ii, test = "F")

Single term deletions

Model:

extinction ~ fMOTILITY + fTIERING + fFEEDING + fCALCIFICATION

 Df Deviance F value Pr(>F)

<none> 31.582

fMOTILITY 1 31.585 0.0106 0.9182

fTIERING 2 32.103 0.8577 0.4271

fFEEDING 5 33.904 1.5293 0.1871

fCALCIFICATION 2 31.732 0.2482 0.7806

>