

SUPPORTING INFORMATION

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Appendix S1 *Identification of rodent species on the field.*

In order to identify rodent species occurring on the field, we realized a trapping session during exposure of acorns. On 27th of January 2014 one trap was installed close to each dish/cage, and 6 more traps regularly dispersed at 1.5m from the trunk of the focal adult oak. Sixteen traps were hence disposed around each focal adult, for a total of 320 traps. We used standard trap of French National Institute of Agricultural Research, INRA, with dormitory box (Aubry 1950, Gurnell and Flowerdew 1990). Traps were filled with a mixture of seeds and pieces of apples (Aubry 1950, Gurnell and Flowerdew 1990). We checked traps in the morning, 24h after their exposure, on 28 January 2014. Trapped rodents were immediately identified and released close to the cage, to limit stress.

Sixteen rodents were trapped around 9 of the 20 focal adult oaks and were all identified as *Apodemus sylvaticus* (wood mouse).

Animals trapped during this survey were not protected species. Traps used did not stress or harm animals, and animals were immediately released.

References

Aubry, J. (1950) Deux pièges pour la capture de petits rongeurs vivants. *Mammalia*, **14**, 174-177.

Gurnell, J. & Flowerdew, J.R. (1990) *Live-trapping of small mammals: a practical guide* (2nd edition). Occasional Publications of the Mammal Society, London.

Appendix S2 *Lepidopteran species found on adult oak trees.*

Table S2 List of Lepidopteran species found on focal adult oak trees. Extracted from Yguel *et al.* 2011.

| Species | Family | N individuals | Host- specialisation group |
|---|--------------|------------------|----------------------------------|
| <i>Acrobasis repandana</i> (Fabricius, 1798) | Pyralidae | 3 | Monophagous |
| <i>Aglia tau</i> (Linnaeus, 1758) | Saturnidae | 1 | Oligophagous |
| <i>Agriopis aurantaria</i> (Hübner, 1799) | Geometridae | 7 | Oligophagous |
| <i>Aleimma loeflingiana</i> (Linnaeus, 1758) | Tortricidae | 1 | Oligophagous |
| <i>Archips</i> sp. | Tortricidae | 42 | Oligophagous |
| <i>Biston strataria</i> (Hufnagel, 1767) | Geometridae | 1 | Oligophagous |
| <i>Carcina quercana</i> (Fabricius, 1775) | Oecophoridae | 4 | Oligophagous |
| <i>Cyclophora punctaria</i> (Linnaeus, 1758) | Geometridae | 1 | Monophagous |
| <i>Ennomos defoliaria</i> (Clerk, 1759) | Geometridae | 1 | Oligophagous |
| <i>Erannis defoliaria</i> (Clerk, 1759) | Geometridae | 1 | Oligophagous |
| <i>Eupithecia abbreviate</i> (Stephens, 1831) | Geometridae | 1 | Monophagous |
| <i>Hedya nubiferana</i> (Haworth, 1811) | Tortricidae | 18 | Oligophagous |
| <i>Lymantria monacha</i> (Linnaeus, 1758) | Lymantriidae | 5 | Polyphagous |
| <i>Operophtera brumata</i> (Linnaeus, 1758) | Geometridae | 5 | Oligophagous |
| <i>Orgyia antiqua</i> (Linnaeus, 1758) | Lymantriidae | 1 | Polyphagous |

| | | | |
|---|--------------|----|--------------|
| <i>Orthosia cerasi</i> (Fabricius, 1798) | Noctuidae | 18 | Oligophagous |
| <i>Conistra erythrocephala</i> (Denis & Schiffermüller, 1775) | Noctuidae | 14 | Oligophagous |
| <i>Orthosia cruda</i> (Denis & Schiffermüller, 1775) | Pyralidae | 1 | Oligophagous |
| <i>Phycita roborella</i> (Denis & Schiffermüller, 1775) | Drepanidae | 1 | Oligophagous |
| <i>Polyploca ridens</i> (Fabricius, 1787) | Tortricidae | 2 | Monophagous |
| <i>Spilonota ocellana</i> (Denis & Schiffermüller, 1775) | Tortricidae | 1 | Oligophagous |
| <i>Tortrix viridana</i> (Linnaeus, 1758) | Ypsolophidae | 27 | Monophagous |
| <i>Ypsolopha parenthesesella</i> (Linnaeus, 1761) | Ypsolophidae | 9 | Polyphagous |
| <i>Ypsolopha ustella</i> (Clerck, 1759) | Ypsolophidae | 2 | Polyphagous |
| <i>Zeiraphera isertana</i> (Fabricius, 1794) | Tortricidae | 8 | Monophagous |
| <i>Morpho species "B"</i> | ?? | 2 | ?? |
| <i>Morpho species "Q"</i> | Geometridae | 2 | ?? |

Reference

Yguel, B., Bailey, R., Tosh, D.N., Vialatte, A., Vasseur, C., Vitrac, X., Jean, F. & Prinzing, A. (2011) Phytophagy on phylogenetically isolated trees: why hosts should escape their relatives. *Ecology Letters*, **14**, 1117-1124.

Appendix S3 *Identification of mollusk species.*

In order to identify mollusk species present on the field, we used refuge traps that provide a moist refuge for mollusks during their phases of rest (Hommay & Briard 1988). In early May 2015, during the survey of seedling herbivory, we disposed a refuge trap at 4.5m from the trunk of each foal adult oak. The trap, a square of 50 * 50cm, was humidified, and the vegetation was removed if needed.

We checked traps on the next morning before 8h and 5 days later. Only 3 mullusks belonging to the slug pecies *Arion* sp. were trapped. During survey of seedling herbivory, we observed several individuals of *Limax* sp. (probably *Limax cinereoniger*), but no snails. These small numbers do not mean that mollusks were rare. Rather, trapping success and visibility were low as in the oceanic late-successional forest we studied, mollusks could almost always hide and shelter in a moist litter.

Reference

Hommay, G. & Briard, P. (1988) Contribution of trapping to the survey of slugs populations in crop cultures. *Haliotis*, **18**, 55-74.

Appendix S4 *Geographic distribution of the ten tree pairs in the forest of Rennes.*

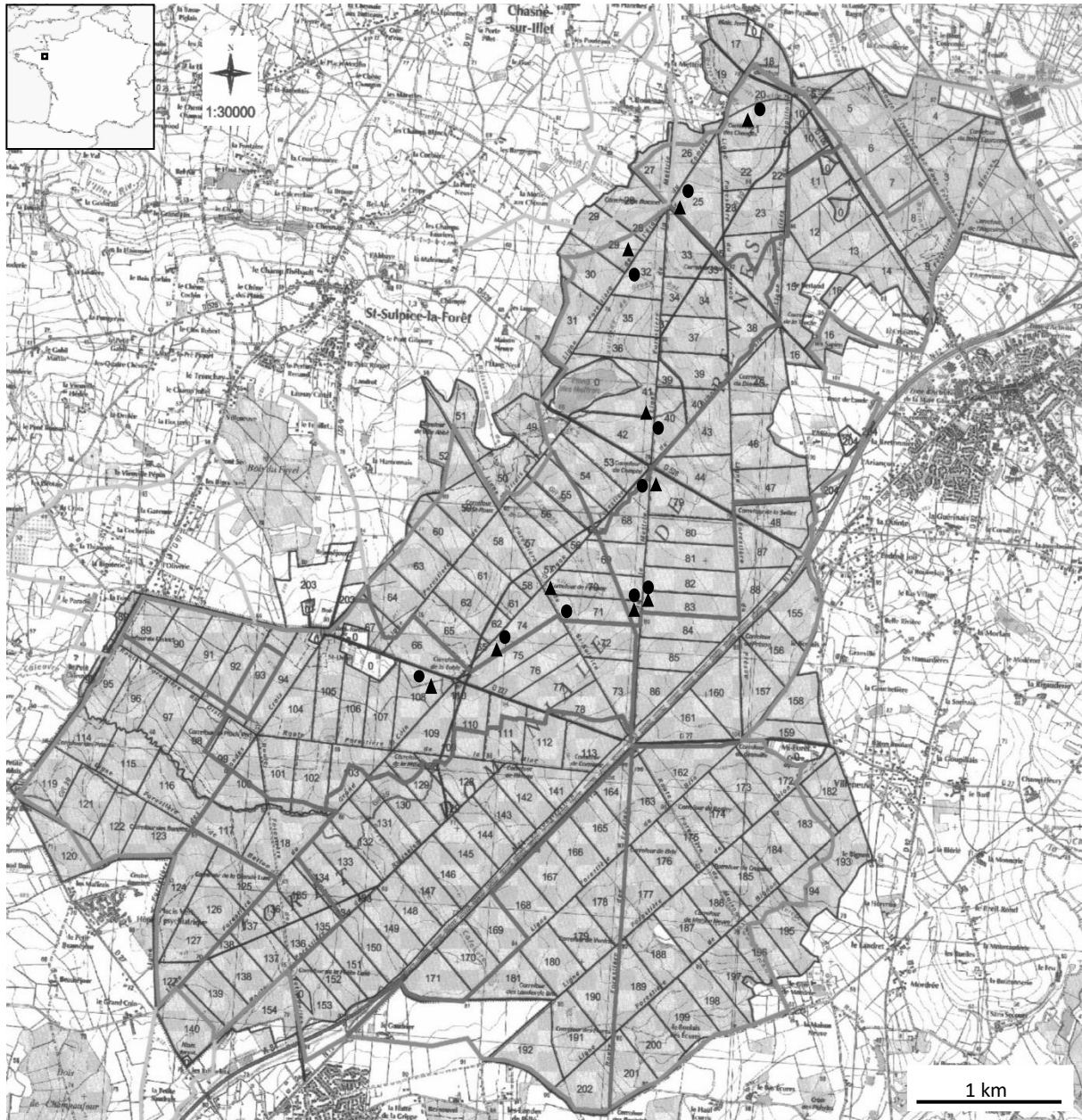


Fig. S4. Within the forest of Rennes, we selected ten pairs of adult oak-trees. Each pair had one tree in the more oak-dominated parcel (●) and one in the more pine-dominated parcel (▲), separated by distances of less than 150 m.

Appendix S5 *Removal of Q. petraea and Q. robur acorns in the field.*

In a pre-experimentation, we tested if acorns of *Q. petraea* were removed more or less than acorns of *Q. robur*. In fall, we harvested acorns from mature oak trees outside the forest and selected viable acorns, as described in the manuscript. Immediately, we placed two cages at 1m from the trunk of each focal adult oak, permitting access to rodents only. We focused on rodents as they are known to eat smaller quantities of acorns than ungulates, and might hence be more selective in their choice of acorns species. One cage contained 10 *Q. petraea* acorns, while the other contained 10 *Q. robur* acorns. We followed acorn removal as described in the manuscript and tested if the delay before acorn removal was species-dependent using an ANOVA. We found no effect of acorn species on the delay before removal ($F_{1,38}=1.66$, $P=0.21$).

Appendix S6 *Identification of the trophic guilds on seedling leaves.*

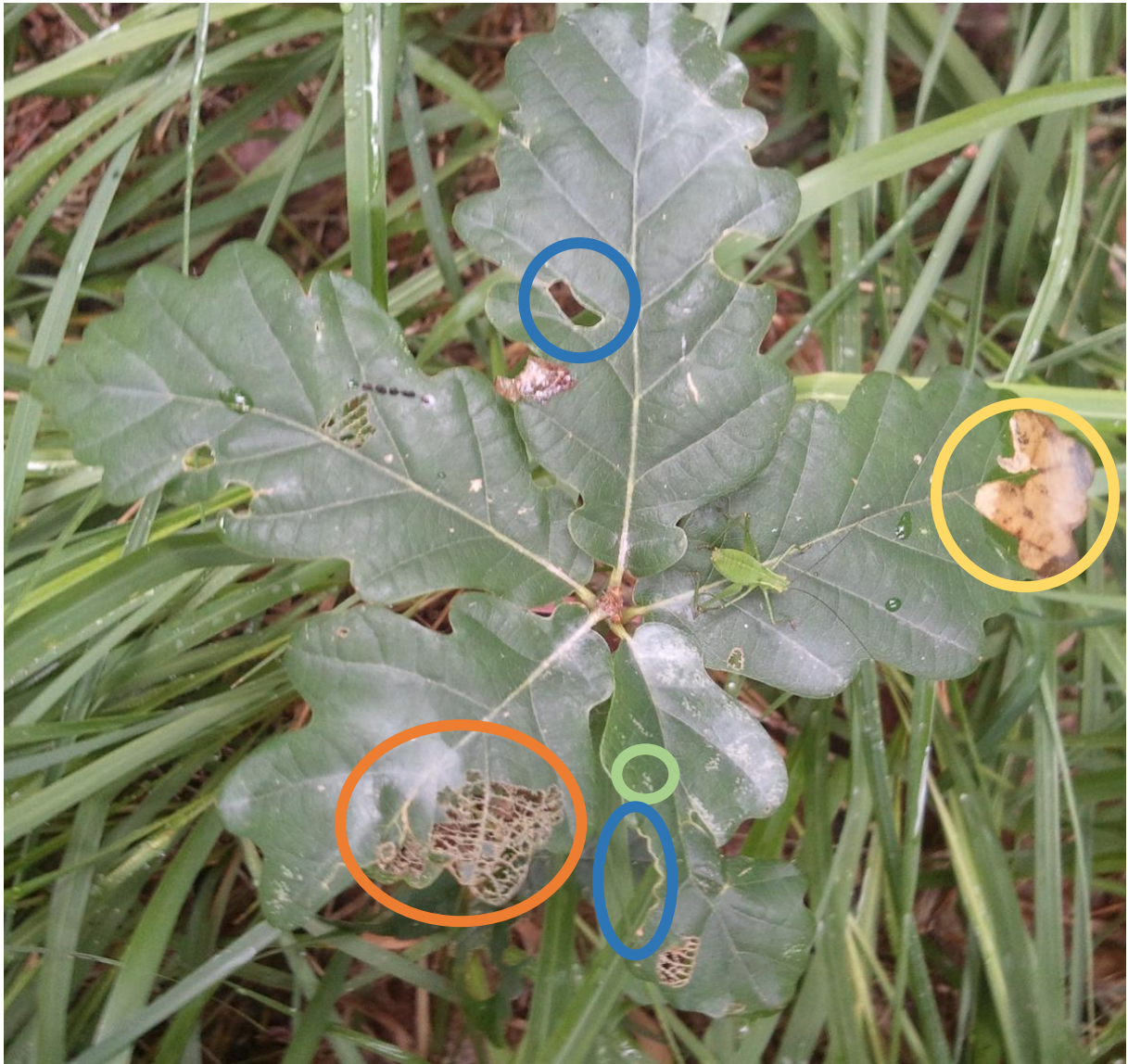


Fig. S6 Damages induced by trophic guilds of invertebrate enemies on an oak seedling. Damages induced by chewers are circled in blue, by skeletonizers in orange, by suckers in green and by miners in yellow. Chewers may be mollusks or insects (mostly lepidopteran larvae, more rarely grasshoppers, Curculionidae or Chrysomelidae); skeletonizers may be insects (Tenthredinoidea larvae, rarely adult grasshoppers); suckers may be insects

(Homoptera, Heteroptera); miners are insects, mostly Microlepidoptera larvae (Castagneyrol *et al.* 2013).

Reference

Castagneyrol, B., Giffard, B., Péré, C. & Jactel, H. (2013) Plant apparency, an overlooked driver of associational resistance to insect herbivory. *Journal of Ecology*, **101**, 418-429.

Appendix S7 Procedure for calculation of phylogenetic isolation from the canopy.

We utilized phylogenetic distances established by Vialatte *et al.* (2010) based on phylogenetic classification (Angiosperm Phylogeny Group 2009 and verified against Angiosperm Phylogeny Group 2016), and also used by Yguel *et al.* (2011; 2014a,b). This phylogenetic distance corresponds to the approximate time, in Million Years Before Present (MYBP), since the evolutionary establishment of the clades of oaks and of a given neighboring tree species (see Table S7a below). For instance, we ranked the comparison between oak and pine species as a comparison between two classes, Gymnosperms and Angiosperms, between which the younger is approximately 140 million years old (the crown age of Angiosperms), and the phylogenetic distance is hence 140 million years. Thus, the younger of the two crown ages represents biologically the time when the oak lineage and the other lineage started to be physically and physiologically distinct from a point of view of enemies and mutualists of the tree. Moreover, this age also avoids giving overly weight to Gymnosperms, in contrast to stem-age distance which would in many cases simply be a descriptor of the presence of Gymnosperms in the neighborhood given the extreme age of the common ancestor of Gymnosperms and Angiosperms (Savard *et al.* 1994).

We calculated the ‘phylogenetic distance from of oak adult from its neighbors’ as the averaged phylogenetic distances of the respective focal adult oak-tree and trees in contact with its crown (Table S7b), using the distances presented in Table S7a below.

Table S7a. Phylogenetic distances between focal species (*Quercus* sp.) and other species found at seedling and/or adult stages, extracted from Yguel *et al.* 2011.

| Species | Phylogenetic rank of separation with oak | | | | | | Distance |
|-------------------------|--|----------|--------|---------|-----------|----------|----------|
| <i>Pinus sylvestris</i> | Spermatophytes | - | - | - | - | - | 140 |
| <i>Abies</i> sp. | Spermatophytes | - | - | - | - | - | 140 |
| <i>Ilex</i> sp. | Angiosperms | Asterids | - | - | - | - | 128 |
| <i>Rhamnus</i> sp. | Angiosperms | Rosids | Fabids | Rosales | - | - | 58.5 |
| <i>Prunus</i> sp. | Angiosperms | Rosids | Fabids | Rosales | - | - | 58.5 |
| <i>Sorbus</i> sp. | Angiosperms | Rosids | Fabids | Rosales | - | - | 58.5 |
| <i>Betula</i> sp. | Angiosperms | Rosids | Fabids | Fagales | Betulacea | - | 54 |
| <i>Carpinus betulus</i> | Angiosperms | Rosids | Fabids | Fagales | Betulacea | - | 54 |
| <i>Fagus sylvatica</i> | Angiosperms | Rosids | Fabids | Fagales | Fagaceae | Fagus | 40 |
| <i>Castanea sativa</i> | Angiosperms | Rosids | Fabids | Fagales | Fagaceae | Castanea | 40 |

Table S7b. List of tree species found in contact with the crown of each of the 20 focal adult oak trees. ‘O’ corresponds to the oak-dominated parcel and ‘P’ to the pine-dominated parcel, extracted from Yguel *et al.* 2011.

| SITE | <i>Quercus</i> <i>robur</i> | <i>Quercus</i> <i>petraea</i> | <i>Fagus</i> <i>sylvatica</i> | <i>Pinus</i> <i>sylvestris</i> | <i>Sorbus</i> <i>torminalis</i> | <i>Abies</i> <i>alba</i> | <i>Castanea</i> <i>sativa</i> | <i>Betula</i> <i>pendula</i> | <i>Carpinus</i> <i>betulus</i> | <i>Rhamnus</i> <i>frangula</i> |
|------|--------------------------------|----------------------------------|----------------------------------|-----------------------------------|------------------------------------|-----------------------------|----------------------------------|---------------------------------|-----------------------------------|-----------------------------------|
| 2 O | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 2 P | 0 | 1 | 2 | 5 | 0 | 0 | 0 | 1 | 0 | 0 |
| 4 O | 1 | 3 | 2 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 4 P | 0 | 1 | 0 | 5 | 0 | 0 | 0 | 1 | 0 | 0 |
| 5 O | 0 | 6 | 4 | 0 | 0 | 0 | 0 | 2 | 0 | 0 |
| 5 P | 0 | 1 | 6 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| 6 O | 0 | 3 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 |
| 6 P | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 1 | 0 | 0 |
| 7 O | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| 7 P | 1 | 1 | 1 | 2 | 0 | 0 | 0 | 1 | 3 | 0 |
| 8 O | 2 | 1 | 1 | 2 | 1 | 0 | 0 | 1 | 0 | 1 |
| 8 P | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 2 | 0 | 0 |
| 9 O | 2 | 5 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 |
| 9 P | 0 | 2 | 2 | 3 | 0 | 0 | 0 | 2 | 0 | 0 |
| 10 O | 0 | 5 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 10 P | 0 | 1 | 1 | 3 | 0 | 0 | 0 | 1 | 0 | 0 |
| 13 O | 5 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| 13 P | 0 | 1 | 3 | 4 | 0 | 0 | 0 | 0 | 1 | 0 |
| X O | 2 | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| X P | 0 | 2 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |

Reference

Angiosperm Phylogeny Group [APG]. (2009) An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG III. *Botanical Journal of the Linnean Society*, **161**, 105-121.

Angiosperm Phylogeny Group (2016) An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG IV. *Botanical Journal of the Linnean Society*, 2016, 181, 1–20.

Savard, L., Li, P., Strauss, S.H., Chase, M.W., Michaud, M. & Bousquet, J. (1994) Chloroplast and nuclear gene sequences indicate Late Pennsylvanian time for the last common ancestor of extant seed plants. *Proceedings of the National Academy of Sciences of the USA*, **91**, 5163-5167.

Vialatte, A., Bailey, R.I., Vasseur, C., Matocq, A., Gossner, M.M., Everhart, D., Vitrac, X., Belhadj, A., Ernoult, A. & Prinzing, A. (2010) Phylogenetic isolation of host trees affects assembly of local Heteroptera communities. *Proceedings of the Royal Society of London B: Biological Sciences*, **277**, 2227-2236.

Yguel, B., Bailey, R., Tosh, D.N., Vialatte, A., Vasseur, C., Vitrac, X., Jean, F. & Prinzing, A. (2011) Phytophagy on phylogenetically isolated trees: why hosts should escape their relatives. *Ecology Letters*, **14**, 1117-1124.

Yguel, B., Bailey, R.I., Villemant, C., Brault, A., Jactel, H. & Prinzing, A. (2014a) Insect herbivores should follow plants escaping their relatives. *Oecologia*, **176**, 521-532.

Yguel, B., Courty, P.E., Jactel, H., Pan, X., Butenschoen, O., Murray, P.J. & Prinzing, A.

(2014b) Mycorrhizae support oaks growing in a phylogenetically distant neighborhood. *Soil Biology and Biochemistry*, **78**, 204-212.

Appendix S8 *Effect of size of, and distance from, adult oak on removal of acorns and herbivory of seedlings.*

Appendix 8. Effect of size of, and distance from, adult oak on removal of acorns (left) and herbivory of seedlings (right). Soil covers around acorns were not recorded for most acorns and are hence not tested. *Treatment* is the exclusion of particular groups of enemies. *Treatment* significantly affected seedling herbivory (Fig. 2) and was hence accounted for, while for acorns only control treatments were considered. Covariates were the random effect *pair*, and the *age of leaves* in models of seedling herbivory. Covariates are not shown. Best subset search was applied and excluded variables are noted "Excl".

| | Acorn-removal delay | | Seedling herbivory | |
|-------------------------------|---------------------|--------|--------------------|---------------|
| | t | p | t | p |
| Treatment | NA | NA | F=4.6621 | 0.0122 |
| Size of conspecific adult | 1.4956 | 0.1385 | -1.8955 | 0.0616 |
| Distance to conspecific adult | 0.3830 | 0.7027 | -1.1323 | 0.2609 |
| Seedling density | NA | NA | -0.9677 | 0.3361 |
| Moss cover | NA | NA | 1.1053 | 0.2724 |
| Tree cover | NA | NA | 0.8177 | 0.4159 |
| Shrub cover | NA | NA | 0.1789 | 0.8584 |
| Herb cover | NA | NA | 1.8754 | 0.0644 |
| Distance*Size | -0.3941 | 0.6945 | 1.8674 | 0.0655 |
| Treatment*Size | NA | NA | F=3.4872 | 0.0655 |
| Exclusion all*size | NA | NA | 2.5552 | 0.0125 |
| Exclusion insects*size | NA | NA | 2.2484 | 0.0273 |
| Treatment*Distance | NA | NA | F=0.7844 | 0.4599 |
| Exclusion all*distance | NA | NA | -0.9727 | 0.3336 |
| Exclusion insects*distance | NA | NA | -1.2338 | 0.2209 |
| adj R ² | 0.0946 | | 0.21 | |
| df error | 85 | | 80 | |