

**Record 1 of 129****Author(s):** Klinger, R (Klinger, Rob); Rejmanek, M (Rejmanek, Marcel)**Title:** The numerical and functional responses of a granivorous rodent and the fate of Neotropical tree seeds**Source:** ECOLOGY, 90 (6): 1549-1563 JUN 2009

**Abstract:** Despite their potential to provide mechanistic explanations of rates of seed dispersal and seed fate, the functional and numerical responses of seed predators have never been explicitly examined within this context. Therefore, we investigated the numerical response of a small-mammal seed predator, *Heteromys desmarestianus*, to disturbance-induced changes in food availability and evaluated the degree to which removal and fate of seeds of eight tree species in a lowland tropical forest in Belize were related to the functional response of *H. desmarestianus* to varying seed densities. Mark-recapture trapping was used to estimate abundance of *H. desmarestianus* in six 0.5-ha grids from July 2000 to September 2002. Fruit availability and seed fate were estimated in each grid, and two experiments nested within the grids were used to determine (1) the form of the functional response for nine levels of fruit density (2-32 fruits/m<sup>2</sup>), (2) the removal rate and handling times, and (3) the total proportion of fruits removed. The total proportion of fruits removed was determined primarily by the numerical response of *H. desmarestianus* to fruit availability, while removal rates and the proportion of seeds eaten or cached were related primarily to the form of the functional response. However, the numerical and functional responses interacted; *H. desmarestianus* showed strong spatial and temporal numerical responses to total fruit availability, and their density relative to fruit availability resulted in variation in the form of the functional response. Types I, II, and III functional responses were observed, as were density-independent responses, and these responses varied both among and within fruit species. The highest proportions of fruits were eaten when the Type III functional response was detected, which was when fruit availability was high relative to *H. desmarestianus* population density. Numerous idiosyncratic influences on seed fate have been documented, but our results indicate that shifts in the numerical and functional responses of seed predators to seasonal and interannual variation in seed availability potentially provide a general mechanistic explanation for patterns of removal and fate for vertebrate-dispersed seeds.

**ISSN:** 0012-9658**Record 2 of 129****Author(s):** Cole, RJ (Cole, Rebecca J.)**Title:** Postdispersal Seed Fate of Tropical Montane Trees in an Agricultural Landscape, Southern Costa Rica**Source:** BIOTROPICA, 41 (3): 319-327 MAY 2009

**Abstract:** Variation in postdispersal seed fate is an important factor driving patterns of forest regeneration. Because most previous studies have not tracked final seed fate and have commonly equated seed removal with predation without considering the possibility of secondary dispersal, little is known about individual seed mortality factors in successional and degraded habitats. This study tracked the postdispersal fate of large-seeded tropical montane trees in abandoned pasture, young secondary forests, and small forest fragments during two consecutive years in an agricultural landscape in southern Costa Rica. The incidence of secondary dispersal by animals, scatterhoarding in particular, and the effects of seed burial on germination were measured. Overall, seeds survived through germination more often in secondary forests with high levels of mortality occurring in abandoned pastures and forest fragments. The majority of seed mortality was caused by rodent predation in forest fragments, insects and fungal pathogens in secondary forests, and a combination of desiccation, insects, and fungal pathogens in pastures. Seeds were frequently secondarily dispersed in larger forest fragments, whereas they were only rarely moved in pastures and secondary forests. Burial tended to improve germination in pastures and was important for an often scatterhoarded species, *Otoba novogranatensis*, in all habitats. The results of this study suggest that: (1) seed mortality factors differ in response to the type of habitat degradation; (2) large-seeded species have high potential for survival when dispersed to young secondary forests; and (3) seed removal is not a reliable proxy for seed predation, particularly in less degraded forest fragments. La variación en el destino de las semillas posterior a la dispersión es un factor importante que puede determinar patrones de la regeneración de los bosques. Dado que la mayoría de los estudios anteriores no han realizado seguimiento al destino final de las semillas y han equiparado comúnmente la remoción con la predación sobre las mismas, sin tener en cuenta la posibilidad de dispersión secundaria, poco se sabe sobre los factores de la mortalidad de semillas en habitats sucesionales y degradados. Este estudio hizo seguimiento al destino posterior a la dispersión de semillas grandes de árboles tropicales montañosos en pasturas abandonadas, bosques secundarios jóvenes y en pequeños fragmentos de bosque durante dos años consecutivos en un paisaje agrícola del sur de Costa Rica. Se midieron la incidencia de la dispersión secundaria por parte de los animales, particularmente por scatterhoarding (estrategia en la cual se almacenan pequeñas cantidades de alimento en distintos escondites), así como los efectos que tiene el entierro de semillas sobre la germinación. En general, las semillas sobrevivieron hasta la germinación con más frecuencia en los bosques secundarios, teniendo altos niveles de mortalidad en las pasturas abandonadas y en los fragmentos de bosque. Gran parte de la mortalidad de semillas fue causada por la predación de roedores en fragmentos de bosque, de insectos y hongos patógenos en los bosques secundarios, y de una combinación de desecación, insectos y hongos patógenos en los pastos. Las semillas presentaron una frecuente dispersión secundaria en los fragmentos de bosque más grandes, mientras que solo en raras ocasiones se trasladaron en los pastos y los bosques secundarios. El entierro de semillas mostró tendencia a mejorar la germinación en los pastos y fue importante para *Otoba novogranatensis*, especie cuyas semillas son en ocasiones dispersadas por scatterhoarding en todos los habitats. Los resultados de este estudio

sugieren que (1) los factores de mortalidad de semillas difieren en respuesta al tipo de degradación del hábitat, (2) las especies con semillas de gran tamaño tienen un alto potencial de supervivencia cuando se dispersan a bosques secundarios jóvenes, y (3) la remoción de semillas no es un indicador confiable de la predación sobre las mismas, particularmente en fragmentos de bosques menos degradados.

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### Record 3 of 129

**Author(s):** Mizuki, I (Mizuki, Inoue); Takahashi, A (Takahashi, Akiko)

**Title:** Secondary dispersal of *Dioscorea japonica* (Dioscoreaceae) bulbils by rodents

**Source:** JOURNAL OF FOREST RESEARCH, 14 (2): 95-100 APR 2009

**Abstract:** We examined rodent dispersal of *Dioscorea japonica* bulbils. Bulbils dispersed by rodents may travel farther from their parent plants than those dispersed by gravity alone. To confirm the presence of secondary dispersal and the types of vector, we used an automatic camera to photograph animals that approached bulbils. To clarify secondary dispersal distance, we set marked bulbils at eight sites and searched for the bulbils once they were removed from their original locations by a disperser. We took photographs of mice (*Apodemus speciosus*) approaching the bulbils. In June, 10 of 333 bulbils that were moved germinated. We also measured the primary dispersal distance at four sites by dropping bulbils from heights of 0.5, 3.0, and 12.0 m. We then compared primary and secondary dispersal distances. The mean secondary dispersal distance was significantly greater than the primary dispersal distance for dispersal heights of 0.5 and 3.0 m, but less than that for a 12.0-m dispersal height. This indicates that rodents may disperse bulbils farther than gravity alone when bulbils drop from lower heights but they contribute little to dispersal for bulbils that drop from greater heights (e.g., from the top of the canopy). Thus, we confirmed the occurrence of rodent dispersal of bulbils and rodents might to some extent contribute to the dispersal and establishment of bulbils.

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### Record 4 of 129

**Author(s):** Munoz, A (Munoz, Alberto); Bonal, R (Bonal, Raul); Diaz, M (Diaz, Mario)

**Title:** Ungulates, rodents, shrubs: interactions in a diverse Mediterranean ecosystem

**Source:** BASIC AND APPLIED ECOLOGY, 10 (2): 151-160 2009

**Abstract:** Ungulate abundance has increased dramatically worldwide, having strong impacts on ecosystem functioning. High ungulate densities can reduce the abundance, diversity and/or body condition of small mammals, which has been attributed to reductions in cover shelter and food availability by ungulates. The densities of wild ungulates have increased recently in high-diversity Mediterranean oak ecosystems, where acorn-dispersing small rodents are keystone species. We analysed experimentally ungulate effects on seed-dispersing rodents in two types of oak woodland: a forest with dense shrub layer and in dehesas lacking shrubs. Ungulates had no significant effects on vegetation structure or rodent body mass, but they reduced dramatically rodent abundance in the lacking-shrub dehesas. In the forest, ungulates modified the spatial distribution and space use of rodents, which were more concentrated under shrubs in the presence than in the absence of ungulates. Our results point to the importance of shrubs in mediating ungulate-rodent interactions in Mediterranean areas, suggesting that shrubs serve as shelter for rodents against ungulate physical disturbances such as soil compaction, trampling or rooting. Holm oak seedling density was reduced by ungulates in dehesa plots, but not in forests. Acorn consumption by ungulates may reduce oak recruitment to a great extent. Additionally, we suggest that ungulates may have a negative effect on oak regeneration processes by reducing the abundance of acorn-dispersing rodents. Given that shrubs seem to mediate ungulate effects on acorn dispersers, controlled shrub encroachment could be an effective alternative to ungulate population control or ungulate exclusion for the sustainability of the high-diversity Mediterranean oak ecosystems. (C) 2008 Gesellschaft für Ökologie. Published by Elsevier GmbH. All rights reserved.

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### Record 5 of 129

**Author(s):** Zhang, H (Zhang, Hongmao); Zhang, Z (Zhang, Zhibin)

**Title:** Endocarp thickness affects seed removal speed by small rodents in a warm-temperate broad-leaved deciduous forest, China

**Source:** ACTA OECOLOGICA-INTERNATIONAL JOURNAL OF ECOLOGY, 34 (3): 285-293 NOV-DEC 2008

**Abstract:** Seed traits are important factors affecting seed predation by rodents and thereby the success of recruitment. Seeds of many tree species have hard hulls. These are thought to confer mechanical protection, but the effect of endocarp thickness on seed predation by rodents has not been well investigated. Wild apricot (*Prunus armeniaca*), wild peach (*Amygdalus davidiana*), cultivated walnut (*Juglans regia*), wild walnut (*Juglans mandshurica* Maxim) and Liaodong oak (*Quercus liaotungensis*) are very common tree species in northwestern Beijing city, China. Their seeds vary greatly in size, endocarp thickness, caloric value and tannin content. This paper aims to study the effects of seed traits on seed removal speed of these five tree species by small rodents in a temperate deciduous forest, with emphasis on the effect of endocarp thickness. The results indicated that speed of removal of

seeds released at stations in the field decreased significantly with increasing endocarp thickness. We found no significant correlations between seed removal speed and other seed traits such as seed size, caloric value and tannin content. In seed selection experiments in small cages, Pere David's rock squirrel (*Sciurotamias davidianus*), a large-bodied, strong-jawed rodent, selected all of the five seed species, and the selection order among the five seed species was determined by endocarp thickness and the ratio of endocarp mass/seed mass. In contrast, the Korean field mouse (*Apodemus peninsulae*) and Chinese white-bellied rat (*Niviventer confucianus*), with relatively small bodies and weak jaws, preferred to select small seeds like acorns of *Q liaotungensis* and seeds of *P. armeniaca*, indicating that rodent body size is also an important factor affecting food selection based on seed size. These results suggest endocarp thickness significantly reduces seed removal speed by rodents and then negatively affects dispersal fitness of seeds before seed removal of tree species in the study region. However, effect of endocarp thickness on final dispersal fitness needs further investigation because it may increase seed caching and survival after seed removal. (C) 2008 Elsevier Masson SAS. All rights reserved.

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#### Record 6 of 129

**Author(s):** Wang, B (Wang, Bo); Chen, J (Chen, Jin)

**Title:** Tannin concentration enhances seed caching by scatter-hoarding rodents: An experiment using artificial 'seeds'

**Source:** ACTA OECOLOGICA-INTERNATIONAL JOURNAL OF ECOLOGY, 34 (3): 379-385 NOV-DEC 2008

**Abstract:** Tannins are very common among plant seeds but their effects on the fate of seeds, for example, via mediation of the feeding preferences of scatter-hoarding rodents, are poorly understood. In this study, we created a series of artificial 'seeds' that only differed in tannin concentration and the type of tannin, and placed them in a pine forest in the Shangri-La Alpine Botanical Garden, Yunnan Province of China. Two rodent species (*Apodemus latronum* and *A. chevrieri*) showed significant preferences for 'seeds' with different tannin concentrations. A significantly higher proportion of seeds with low tannin concentration were consumed in situ compared with seeds with a higher tannin concentration. Meanwhile, the tannin concentration was significantly positively correlated with the proportion of seeds cached. The different types of tannin (hydrolysable tannin vs condensed tannin) did not differ significantly in their effect on the proportion of seeds eaten in situ vs seeds cached. Tannin concentrations had no significant effect on the distance that cached seeds were carried, which suggests that rodents may respond to different seed traits in deciding whether or not to cache seeds and how far they will transport seeds. (C) 2008 Elsevier Masson SAS. All rights reserved.

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#### Record 7 of 129

**Author(s):** Kunz, BK (Kunz, Britta Kerstin); Linsenmair, KE (Linsenmair, Karl Eduard)

**Title:** Seed size selection by olive baboons

**Source:** PRIMATES, 49 (4): 239-245 OCT 2008

**Abstract:** Seed size is an important plant fitness trait that can influence several steps between fruiting and the establishment of a plant's offspring. Seed size varies considerably within many plant species, yet the relevance of the trait for intra-specific fruit choice by primates has received little attention. Primates may select certain seed sizes within a species for a number of reasons, e.g. to decrease indigestible seed load or increase pulp intake per fruit. Olive baboons (*Papio anubis*, Cercopithecidae) are known to select seed size in unripe and mature pods of *Parkia biglobosa* (Mimosaceae) differentially, so that pods with small seeds, and an intermediate seed number, contribute most to dispersal by baboons. We tested whether olive baboons likewise select for smaller ripe seeds within each of nine additional fruit species whose fruit pulp baboons commonly consume, and for larger seeds in one species in which baboons feed on the seeds. Species differed in fruit type and seed number per fruit. For five of these species, baboons dispersed seeds that were significantly smaller than seeds extracted manually from randomly collected fresh fruits. In contrast, for three species, baboons swallowed seeds that were significantly longer and/or wider than seeds from fresh fruits. In two species, sizes of ingested seeds and seeds from fresh fruits did not differ significantly. Baboons frequently spat out seeds of *Drypetes floribunda* (Euphorbiaceae) but not those of other plant species having seeds of equal size. Oral processing of *D. floribunda* seeds depended on seed size: seeds that were spat out were significantly larger and swallowed seeds smaller, than seeds from randomly collected fresh fruits. We argue that seed size selection in baboons is influenced, among other traits, by the amount of pulp rewarded per fruit relative to seed load, which is likely to vary with fruit and seed shape.

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#### Record 8 of 129

**Author(s):** Munoz, A (Munoz, Alberto); Bonal, R (Bonal, Raul)

**Title:** Are you strong enough to carry that seed? Seed size/body size ratios influence seed choices by rodents

**Source:** ANIMAL BEHAVIOUR, 76: 709-715 Part 3 SEP 2008

**Abstract:** Granivorous rodents prefer large seeds because they offer a higher nutrient content, but such preferences may be counterbalanced by the higher costs of handling and transporting larger seeds. We hypothesized that this compromise underlying foraging decisions depends simultaneously on the size of both seeds and rodents. A given seed offers a fixed amount of resources, but the costs of handling and transporting that seed could increase as the rodent size decreases. We designed a laboratory experiment to assess explicitly whether seed choices depend on the size of both seeds and rodents. As a model, we used two different-sized species, the Algerian mouse *Mus spretus* (8-15 g) and the wood mouse *Apodemus sylvaticus* (18-40 g), that face the decision of choosing Holm oak (*Quercus ilex*) acorns from 0.5 to 15 g under natural conditions. The probability of seed removal decreased as the ratio of seed size to rodent size increased in both rodent species. Seeds heavier than 60% of the rodent's mass led to substantial decreases in acorn removal and seeds heavier than 70% of the rodent's mass were in no case removed. This critical value limited the choice of the largest seeds by the smaller species, but not by the larger one. Therefore, the larger species selected larger acorns and with a wider variance in size than the smaller species. Our results show the importance of considering jointly the sizes of seeds and rodents in the study of foraging decisions and seed dispersal behaviour by granivorous rodents. (C) 2008 The Association for the Study of Animal Behaviour. Published by Elsevier Ltd. All rights reserved.

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### Record 9 of 129

**Author(s):** Broncano, MJ (Jose Broncano, Maria); Rodrigo, A (Rodrigo, Anselm); Retana, J (Retana, Javier)

**Title:** Post-dispersal seed predation in *Pinus halepensis* and consequences on seedling establishment after fire

**Source:** INTERNATIONAL JOURNAL OF WILDLAND FIRE, 17 (3): 407-414 2008

**Abstract:** In the present study, we analyse the spatiotemporal patterns of seed predation and the consequences of this predation in the establishment of new *Pinus halepensis* individuals. Rodents were the main predators of *P. halepensis* seeds in burned areas, while predation by ants was considerably lower. Concerning spatiotemporal patterns of seed predation, the results obtained indicate that, although there were some small differences among distances or among seasons, removal of *P. halepensis* seeds was consistently very high in all situations, whether close to or far from the unburned margins, in pine or mixed forests, in different sites and in all sampling periods throughout the year. We analysed the role of seed predation on the modulation of post-fire regeneration of *P. halepensis*. Just after fire, no differences in seedling density were found between plots with or without rodent exclusion, probably owing to the high density of seeds on the ground and the low density of rodents affected by fire. One year after fire, when rodent populations had recovered in burned areas and seeds were much less abundant, the combination of addition of seeds and rodent exclusion led to an increase in pine seedling establishment.

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### Record 10 of 129

**Author(s):** Perez-Ramos, IM (Perez-Ramos, Ignacio M.); Maranon, T (Maranon, Teodoro)

**Title:** Factors affecting post-dispersal seed predation in two coexisting oak species: Microhabitat, burial and exclusion of large herbivores

**Source:** FOREST ECOLOGY AND MANAGEMENT, 255 (8-9): 3506-3514 MAY 15 2008

**Abstract:** Post-dispersal seed predation can cause an important "bottleneck" in the natural regeneration of many oak populations. In this study, we experimentally quantified post-dispersal seed predation for two oak species - *Quercus canariensis* and *Quercus suber* - coexisting in a Mediterranean forest located in southern Spain. Acorn predation was monitored for 2 consecutive years in two different forest sites, with a total of 3360 acorns experimentally dispersed among different types of microhabitat. Most of the acorns were removed (probably by rodents) and assumed to be consumed. Patterns of post-dispersal acorn predation varied depending on various factors. There was a significant effect of oak species, *Q. suber* acorns being removed faster and in a higher proportion than those of *Q. canariensis*. There were also significant effects of burial and microhabitat: the highest predation rates occurred for acorns set on the ground surface (not buried), and especially in the most-densely vegetated microhabitats, where rodents usually show a higher activity. The lowest predation rates appeared in the years and forest sites where the estimated seed production - and consequently the natural resource availability - was higher, thus supporting the predator satiation hypothesis. The use of fences to exclude large herbivores did not significantly decrease the probability of acorn predation. Moreover, in microhabitats located under dense shrubs, losses of acorns were higher inside fenced plots than outside, probably as an indirect consequence of an increase in rodent populations. Based on the results obtained in this study, we discuss the consequences of seed predation on the natural regeneration of oaks and make some practical recommendations for assisted regeneration in oak restoration plans. (C) 2008 Elsevier B.V. All rights reserved.

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### Record 11 of 129

**Author(s):** Tamura, N (Tamura, N.); Hayashi, F (Hayashi, F.)

**Title:** Geographic variation in walnut seed size correlates with hoarding behaviour of two rodent species

**Source:** ECOLOGICAL RESEARCH, 23 (3): 607-614 MAY 2008

**Abstract:** Seeds of the Japanese walnut, *Juglans ailanthifolia*, are usually scatter-hoarded by two rodent species, the Japanese squirrel *Sciurus lis* and the field mouse *Apodemus speciosus*, but only by the latter in several areas where *S. lis* is absent. We examined seed-size-mediated interactions of these three species across a wide geographic range. Field tracking of walnuts with miniature radio-transmitters revealed that squirrels hoarded larger seeds more frequently and at greater distances than smaller seeds. In contrast, mice hoarded smaller seeds more frequently and transported them farther than larger seeds. These seed dispersers could affect the evolution of seed size because seeds hoarded at sites farther from source trees are known to survive better until germination and as seedlings. We expect that larger seeds may be advantageous in regeneration if the main seed dispersers are squirrels, whereas smaller seeds may be advantageous if mice are the dominant dispersers. These predictions were supported by the fact that seed size was smaller on islands inhabited only by mice and at the edge of the squirrel distribution, compared to areas where mice and squirrels are both common.

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#### Record 12 of 129

**Author(s):** Norris, D (Norris, Darren); Peres, CA (Peres, Carlos A.); Michalski, F (Michalski, Fernanda); Hinchsliffe, K (Hinchsliffe, Kay)

**Title:** Terrestrial mammal responses to edges in Amazonian forest patches: a study based on track stations

**Source:** MAMMALIA, 72 (1): 15-23 2008

**Abstract:** Examining edge effects is imperative to developing effective conservation and management strategies in fragmented landscapes as they are a key component of how landscape change influences habitat quality. Although medium- to large-bodied mammals are recognised as key components of tropical forests, their responses to forest edges remain poorly documented. Here, we describe how five species of medium- to large-bodied terrestrial neotropical mammals respond to forest-pasture edges along 17 forest patches (ranging in size from 5-4714 ha) and two continuous areas of Amazonian forest in Alta Floresta, Brazil. Tracks from two rodent (*Dasyprocta agouti* and *Agouti paca*) and three ungulate species (*Tayassu tajacu*, *Mazama gouazoubira* and *Tapirus terrestris*) were recorded over 4900 sand track station nights during a 4-month study period. When species occurrences were compared between patch size classes we found a significant interaction between patch size and distance from the nearest forest edge only for ungulates. We discuss the cost-effectiveness of monitoring protocols for large terrestrial mammals in tropical forests based on sand track stations, and how edge effects and patch size can modulate species abundance and distribution.

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#### Record 13 of 129

**Author(s):** Ness, JH (Ness, J. H.); Morin, DF (Morin, D. F.)

**Title:** Forest edges and landscape history shape interactions between plants, seed-dispersing ants and seed predators

**Source:** BIOLOGICAL CONSERVATION, 141 (3): 838-847 MAR 2008

**Abstract:** Ant-dispersed plants are often conspicuously rare in young forests and near forest edges. We monitored the distributions of five ant-dispersed plant taxa, the seed-collecting ant community, and variation in seed predation pressure by rodents in a 350-acre mesic forest in northern New York, USA to assess the incidence and effect of plant-animal interactions within the context of landscape history and proximity to forest edges. Sample plots were located in young and older forest stands (distinguished based on an 1880 map for forest cover) at varying distances from the forest edge. All five plant taxa were rarer in plots near forest edges, although diversity was more strongly influenced by landscape history. A sixth herbaceous species, one dispersed by vertebrates, was not influenced by forest edge proximity. The most effective seed-collecting ant, *Aphaenogaster rudis*, was less common in forest edge plots relative to interior plots, and predation pressure by small mammals was almost twice as great in plots near forest edges. Exclusion experiments demonstrated that ants (mutualists) and rodents (seed predators) compete for access to seeds, that ants can provide seeds some protection from mammal predation in most plots, and that the density of ant-dispersed plants is correlated with the proportion of rodent-accessible seeds that are collected by *Aphaenogaster*. Greater predation pressure and a paucity of ant mutualists may contribute to the rarity of ant-dispersed plants in edge habitats relative to forest interiors. (c) 2008 Elsevier Ltd. All rights reserved.

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#### Record 14 of 129

**Author(s):** Suchomel, J (Suchomel, Josef); Heroldova, M (Heroldova, Marta)

**Title:** Effect of seed crop of trees on the abundance and body parameters of granivorous mammals in isolated forest stands of Southern Moravia (Czech Republic)

**Source:** POLISH JOURNAL OF ECOLOGY, 56 (1): 181-186 2008

**Abstract:** Effects of heavy seed crop (mainly oak mast) in year 2003 and 2004 (no seed crops) on small mammal communities in three isolated stands of broad leaved lowland forests (area 60-280 ha) with different management were studied in southern Moravia in three sites: (1) close-to-nature not managed floodplain forest Ulmeto-Fraxinetum carpineum (FF), (2) managed forest - Carpineto-Quercetum acerosum (MF), (3) pheasantry - Ulmeto-Fraxinetum carpineum, Saliceto-Alnetum and Carpineto-Quercetum acerosum, with a considerable number of biotopes including open areas (PH). We presumed the influence of seed production on mammal species, especially granivorous rodents. In the most numerous species (*Apodemus flavicollis* (Mel.), *A. sylvaticus* (L.) and *Myodes glareolus* (Pallas)) the demographic parameters (abundance, sex ratio), body mass, and body length were compared between populations in 2003 and 2004 in each stand. Animals were trapped in snap mousetraps laid out in lines. In 2003 reproduction of both *Apodemus* sp. was extended to November in contrast to 2004, when it ceased already in the end of summer. Individual body mass of animals were significantly higher in 2004 vs. 2003 in all three species (*A. flavicollis*,  $P = 0.01$ ; *A. sylvaticus*,  $P < 0.01$  and *Myodes glareolus*,  $P < 0.05$ ) but body length was higher only in case of *A. sylvaticus* ( $P < 0.01$ ). The forest stands under study in an intensively managed agroecosystem in southern Moravia play an important role as a refuge for small mammals.

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#### Record 15 of 129

**Author(s):** Puttker, T (Puettker, Thomas); Meyer-Lucht, Y (Meyer-Lucht, Yvonne); Sommer, S (Sommer, Simone)

**Title:** Fragmentation effects on population density of three rodent species in secondary Atlantic Rainforest, Brazil

**Source:** STUDIES ON NEOTROPICAL FAUNA AND ENVIRONMENT, 43 (1): 11-18 APR 2008

**Abstract:** We investigated the population density of the two common rodent species *Akodon montensis*, *Oligoryzomys nigripes*, and the more specialized endemic *Delomys sublineatus* in secondary forest fragments of the highly endangered coastal Atlantic Rainforest. Linear regression was used to examine relationships between population density and four landscape variables. We tested the hypothesis that rare species, which are more affected by fragmentation than the common species, should decrease in population density with decreasing fragment size while the density of common generalist species should be unaffected or increase in smaller fragments. The results revealed that *A. montensis* and *O. nigripes* showed no significant association to any landscape variable. The density of *D. sublineatus* showed a strong tendency to a positive correlation to fragment size as well as a negative correlation to edge density. The results underline the importance of large and connected forest remnants in the Atlantic Rainforest to guarantee an effective protection of endemic small mammal species.

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#### Record 16 of 129

**Author(s):** Kitamura, S (Kitamura, Shumpei); Yumoto, T (Yumoto, Takakazu); Poonswad, P (Poonswad, Pilai); Suzuki, S (Suzuki, Shunsuke); Wohandee, P (Wohandee, Prawat)

**Title:** Rare seed-predating mammals determine seed fate of *Canarium euphyllum*, a large-seeded tree species in a moist evergreen forest, Thailand

**Source:** ECOLOGICAL RESEARCH, 23 (1): 169-177 JAN 2008

**Abstract:** Natural seed deposition patterns and their effects on post-dispersal seed fate are critical to tropical tree recruitment. The major dispersal agents of the large-seeded tree *Canarium euphyllum* in Khao Yai National Park, Thailand, are large frugivorous birds such as hornbills, which generated spatially heterogeneous seed deposition patterns because they regurgitated seeds at perching trees and conspecific and heterospecific feeding trees. We investigated the fate of seeds dispersed in this manner using seed removal experiments and automatic camera trapping. Seeds placed experimentally around conspecific feeding trees had higher removal rates than seeds placed elsewhere. These effects were likely mediated by two seed-eating rodents, the Indochinese ground squirrel (*Menetes berdmorei*) and the giant long-tailed rat (*Leopoldamys sabanus*). Consequently, the spatial patterns generated by hornbills had consequences for post-dispersal seed fates, particularly whether or not the seeds were removed by rodents. Primary dispersal by hornbills does alter seed fate by altering the probability of rodent-seed interaction, but the ultimate impact of dispersal by hornbills will depend on how important rodent scatterhoarding is to seed germination and seedlings. Given that major seed dispersers of *C. euphyllum* are now absent or rare in degraded forests in tropical Asia, it is becoming increasingly important to understand the roles of scatterhoarding rodents in these altered habitats in this region.

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#### Record 17 of 129

**Author(s):** Mendoza, E (Mendoza, Eduardo); Dirzo, R (Dirzo, Rodolfo)

**Title:** Seed-size variation determines interspecific differential predation by mammals in a neotropical rain forest

**Source:** OIKOS, 116 (11): 1841-1852 NOV 2007

**Abstract:** It has been suggested that the anthropogenically driven loss of herbivorous mammals might lead to changes in the recruitment patterns of tropical rain forest plants, but few studies have examined the explicit mechanisms that might account for this effect. Here we propose a conceptual model linking differential mammalian defaunation and differential plant recruitment. We

posit that in the absence of medium/large herbivores but with small rodent granivores still present (i.e. differential defaunation), predation pressure will be greater on small-seeded species than on large-seeded species. We tested such differential predation hypothesis (DPH) by means of a series of experiments directed to assess: 1) seed consumption by small rodents in laboratory cages; 2) seed-removal rates in small rodent enclosures in the field and 3) removal of seeds placed on the forest floor and exposed to either the full complement of mammals or only small rodents. Seeds used in the experiments were arranged in pairs consisting of species from the same taxonomic family but with a contrasting size (large, small). We found: 1) a significantly greater consumption of smaller seeds (a 2.3- to 20.5-fold difference) in cages and 2) a significantly greater removal of small-seeded species (a 3.7- to 65-fold difference) in field enclosures. Results of seed removal experiments in free-access plots and selective enclosures were more complex, with a general absence of significant differences among treatments but we found that predation was in general concentrated on small-seeded species and small rodents were the predominant visitors to the plots. This, together with the overall short distance of dispersal among large seeds suggest that in differentially defaunated forests large-seeded species are more likely to escape predation. We posit that such size related differential predation may lead to the floristic impoverishment observed in some defaunated forests.

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### Record 18 of 129

**Author(s):** Rydgren, K (Rydgren, Knut); Okland, RH (Okland, Rune H.); Pico, FX (Pico, F. Xavier); de Kroon, H (de Kroon, Hans)

**Title:** Moss species benefits from breakdown of cyclic rodent dynamics in boreal forests

**Source:** ECOLOGY, 88 (9): 2320-2329 SEP 2007

**Abstract:** Bryophytes have increased in abundance in northern regions, and climate changes have been proposed to account for this change. However, changes in the population dynamics of microtine rodents may also contribute to changes in bryophyte abundance. New evidence indicates a tendency for microtine rodent population oscillations to change from periodicity of 3-5 years to become irregular or acyclic. The impact on ecosystem functioning is potentially great. We study the impact of variation in microtine rodent population characteristics, such as cycle length and amplitude, on the population dynamics of the boreal, clonal moss *Hylocomium splendens*. We use experimental and observational demographic data to construct 127 scenarios representing all combinations of disturbance type (gap formation and/or clipping), period (cyclic with 4, 6, 12, or 24 years between rodent peaks; or acyclic with constant or stochastically varying annual disturbance severity) and disturbance severity (fraction of individuals affected by disturbance in each year relative to the maximum disturbance carried out in the field experiment; seven levels). Population data collected in the field during 13 years were used as a baseline scenario. By subjecting all scenarios to stochastic matrix modeling, we demonstrate considerable impact of microtine rodent on the population dynamics of *H. splendens*, most notably when rodent populations fluctuate with short periods and high peak disturbance severities. Under the same average disturbance severity, *H. splendens* population growth rates are highest in acyclic scenarios and are progressively reduced with increasing peak disturbance severities (i.e., with increasing period). Stochastic elasticity analyses show that in less variable environments mature segment survival contributes more to the population growth rate, while in more variable environments the regeneration pathway (branching of older parts of the plant) plays a stronger role, inevitably leading to lower population fitness. Our results support the hypothesis that breakdown of cyclic rodent population dynamics accentuates increase in the abundance of *H. splendens* and other large bryophytes in boreal forests in Norway, observed empirically in recent years and primarily ascribed to climatic change.

**ISSN:** 0012-9658

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### Record 19 of 129

**Author(s):** Boulay, R (Boulay, Raphael); Carro, F (Carro, Francisco); Soriguer, RC (Soriguer, Ramon C.); Cerda, X (Cerda, Xim)

**Title:** Synchrony between fruit maturation and effective dispersers' foraging activity increases seed protection against seed predators

**Source:** PROCEEDINGS OF THE ROYAL SOCIETY B-BIOLOGICAL SCIENCES, 274 (1625): 2515-2522 OCT 22 2007

**Abstract:** The evolution of pollination and seed dispersal mutualisms is conditioned by the spatial and temporal co-occurrence of animals and plants. In the present study we explore the timing of seed release of a myrmecochorous plant (*Helleborus foetidus*) and ant activity in two populations in southern Spain during 2 consecutive years. The results indicate that fruit dehiscence and seed shedding occur mostly in the morning and correspond to the period of maximum foraging activity of the most effective ant dispersers. By contrast, ant species that do not transport seeds and/or that do not abound near the plants are active either before or after *H. foetidus* diaspores are released. Experimental analysis of diet preference for three kinds of food shows that effective ant dispersers are mostly scavengers that readily feed on insect corpses and sugars. Artificial seed depots suggest that seeds deposited on the ground out of the natural daily time window of diaspore releasing are not removed by ants and suffer strong predation by nocturnal rodents *Apodemus sylvaticus*. Nevertheless, important inter-annual variations in rodent populations cast doubts on their real importance as selection agents. We argue that traits allowing synchrony between seed presentation and effective partners may constitute a crucial pre-adaptation for the evolution of plant-animal mutualisms involving numerous animal partners.

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### Record 20 of 129

**Author(s):** Munoz, A (Munoz, Alberto); Bonal, R (Bonal, Raul)

**Title:** Rodents change acorn dispersal behaviour in response to ungulate presence

**Source:** OIKOS, 116 (10): 1631-1638 OCT 2007

**Abstract:** Small rodents are prominent seed predators, but they also favour plant recruitment as seed dispersers. The direct interactions of ungulates on plants are more one-sided and negative, as they mainly reduce plant recruitment through predation on seeds and seedlings. The effects of small rodents and ungulates on plant recruitment have been considered and studied as independent episodes within plant regeneration cycles. However, ungulate-rodent interactions and their potential effects on plant regeneration have not been considered so far. A number of studies have recently documented ungulate effects on the abundance, diversity and spatial distribution of small rodents. Here, we hypothesize that ungulates may also affect rodent seed dispersal behaviour. We monitored acorn dispersal by small rodents (*Mus spretus* and *Apodemus sylvaticus*) in oak woodlands with and without exclosures for large ungulates, mainly red deer, *Cervus elaphus*, and wild boar, *Sus scrofa*. The study was carried out in a typical Mediterranean Holm oak, *Quercus ilex*, forest throughout the acorn fall season in 2003 and 2004. We found that, in both years, the proportion of acorns cached and not recovered in the short-term was, on average, lower in the presence (1.4%) than in the absence (19.9%) of ungulates. Acorn dispersal distances were not affected by ungulate presence in either year. However, ungulates had an effect on the spatial distribution of dispersed seeds; rodents apparently avoided shrubs as caching sites in both years. This result was interpreted as a behavioural response to reduce the risk of cache pilferage by conspecifics, which are closely associated with shrubs in presence, but not in absence, of ungulates. Potential effects of different densities of rodents or predators were discarded, as none of them differed between the areas with and without ungulates. The present study found significant interactions between heterospecific seed and seedling consumers that had been considered as independent episodes within tree regeneration cycles. As a result of such interactions, ungulates may have negative indirect effects on oak recruitment by reducing (1) acorn caching frequency, and (2) the proportion of acorns cached under shrubs, key nurse-plants for the establishment of Holm oak seedlings in Mediterranean areas.

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### Record 21 of 129

**Author(s):** Pons, J (Pons, Josep); Pausas, JG (Pausas, Juli G.)

**Title:** Rodent acorn selection in a Mediterranean oak landscape

**Source:** ECOLOGICAL RESEARCH, 22 (4): 535-541 JUL 2007

**Abstract:** *Quercus suber*, *Quercus ilex* and *Quercus coccifera* (Cork, Holm and Kermes oaks, respectively) are common evergreen oak species that coexist in the landscapes of the western part of the Mediterranean basin. Rodents are the main acorn predators and thus one of the main factors for understanding recruitment patterns in oaks. In this paper we analyse to what extent mice prefer acorns from one oak species over another in three oak species studied using acorn removal experiments and video tape recordings. Twenty labelled acorns from each of the three *Quercus* species (60 acorns) were placed in 40 cm x 40 cm quadrats on each plot. Because selection might vary as a result of the vegetation context, we performed the trials in the five main vegetation types within the study area (four replicates in each vegetation type) in order to control for habitat influences on rodent acorn preferences (a total of 20 plots). The removal of 1,200 acorns occurred within 68 days. Mice removed 98.7% of the acorns. *Q. ilex* acorns were preferred over *Q. suber* and *Q. coccifera* in all vegetation types except in pine forest, where no acorn preferences were detected. Acorn removal rates differed with vegetation type, correlating positively with shrub cover. The distance at which acorns were displaced by rodents (mean = 4.6 m +/- 5.1 SD) did not differ between acorn species, but varied among vegetation types. Bigger acorns of *Q. coccifera* were selected only after *Q. ilex* and *Q. suber* acorns were depleted, while no size selection was detected for the latter two species. Thus, we conclude that rodents show preference for some oak acorns and that landscape context contributes significantly to rodent activities and decisions.

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**DOI:** 10.1007/s11284-006-0053-5

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### Record 22 of 129

**Author(s):** Li, HJ (Li, Hongjun); Zhang, ZB (Zhang, Zhibin)

**Title:** Effects of mast seeding and rodent abundance on seed predation and dispersal by rodents in *Prunus armeniaca* (Rosaceae)

**Source:** FOREST ECOLOGY AND MANAGEMENT, 242 (2-3): 511-517 APR 30 2007

**Abstract:** Mast seeding is a very common phenomenon in plants that are dispersed by seed scatter-hoarding animals. This reproductive strategy has been explained as adaptation to satiate predators, and predator abundance affect the seed availability and the extent of satiation. We studied how mast seeding and rodent abundance co-influenced seed predation and dispersal by rodents in *Prunus armeniaca* (Rosaceae) in the Dongling mountain of Beijing, China. We tracked the individual seeds marked with coded tin tags. The effects of seed crop size and rodent density were examined in May, August and October of a mast year (2000) and a non-mast year (2001). The seed removal rate was slower in mast seeding year than that in non-mast seeding year. There

were more scatter hoarding and less larder hoarding with farther seed dispersal distance in the mast seeding year than that in the non-mast seeding year. The seed removal rates were positively correlated to the rodent abundance when data of six seasons of 2 years were pooled. There was high proportion of buried seeds in spring for both years. These results indicate that mast seeding and/or low rodent density increases scatter hoarding and dispersal distance, and then benefit seeding regeneration under effect of predator satiation; photoperiod seems not be very important in determining scatter hoarding activities of rodent in spring in the study region. (c) 2007 Elsevier B.V. All rights reserved.

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### Record 23 of 129

**Author(s):** Wilson, DJ (Wilson, Deborah J.); Wright, EF (Wright, Elaine F.); Canham, CD (Canham, Charles D.); Ruscoe, WA (Ruscoe, Wendy A.)

**Title:** Neighbourhood analyses of tree seed predation by introduced rodents in a New Zealand temperate rainforest

**Source:** ECOGRAPHY, 30 (1): 105-119 FEB 2007

**Abstract:** House mice *Mus musculus* and other introduced rodents represent a novel source of predation on tree seeds in New Zealand forests. In the northern temperate forests where these rodents are native, spatial and temporal variation in tree seed production can result in dramatic fluctuations in the distribution and abundance of seed predators, with subsequent feedbacks on the distribution and abundance of seedlings. We use neighbourhood models to examine variation in rodent predation on seeds of 4 tree species of the temperate rainforests of New Zealand as a function of 1) spatial variation in local canopy composition and 2) spatial and temporal variation in mouse activity. We placed seeds throughout mapped stands of mixed forests in alluvial valley bottoms and on elevated marine terraces in the Waitutu Forest, South Island. The risk of predation on seeds of 2 dominant canopy trees - rimu *Dacrydium cupressinum* and mountain beech *Nothofagus solandri* var. *cliffortioides*- peaked in neighbourhoods dominated by those species and by silver beech *N. menziesii*, particularly in a year of plentiful seed rain from these species. The risk of predation on rimu and beech seed was also related to measures of local mouse activity. These relationships suggest that the highest local abundance of mice was concentrated in rimu and beech neighbourhoods because of the food provided by seed rain from those trees. Predation on seed of miro *Prumnopitys ferruginea*, which is eaten by rats but not mice, was low in rimu neighbourhoods and where mouse activity was high. These patterns may reflect spatial segregation in the activity of rats versus mice within stands. Our results suggest that the spatial distribution of canopy trees translates into predictable patterns of variation in mouse activity and seed predation. Heterogeneity in rodent activity and seed predation within stands may have important implications for tree population dynamics.

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### Record 24 of 129

**Author(s):** Gworek, JR (Gworek, Jennifer R.); Wall, SBV (Wall, Stephen B. Vander); Brussard, PF (Brussard, Peter F.)

**Title:** Changes in biotic interactions and climate determine recruitment of Jeffrey pine along an elevation gradient

**Source:** FOREST ECOLOGY AND MANAGEMENT, 239 (1-3): 57-68 FEB 15 2007

**Abstract:** The mechanisms by which climate affects recruitment and loss of plants and the interactions between those plants and other organisms (e.g., pathogens, granivores, seed dispersers) have seldom been studied in the context of plant response to climate change. We examined how climate influences Jeffrey pine (*Pines jeffreyi*) recruitment, mortality, and species interactions at three elevation zones (low, mid, high) across its elevation range (1550-2470 m) in the semi-arid Carson Range of western Nevada. Local climate was correlated with several aspects of stand structure, including smaller trees, slower growth rates, greater predation by seed insects, and higher tree mortality at low elevation. Cone crop was not affected by elevation, but there were more mature trees and more filled seeds per cone at mid- and high elevations. Populations of seed-caching rodents were largest at mid-elevation, but sufficient rodents were present at all elevations to cause rapid removal and dispersal of pine seeds. Seedling emergence from rodent caches was greatest at low and middle elevation, but seedling survival was best at middle and high elevations. The number of saplings was greatest at mid-elevation sites. These results suggest a retracting population at low elevation (high adult tree mortality and low recruitment), a rapidly expanding population at mid-elevation (low adult tree mortality and high recruitment), and a slowly expanding population at high elevation (low adult tree mortality and low recruitment). These demographic patterns foreshadow a shift in distribution upslope over future decades, driven by changes in climate and facilitated by biotic interactions. (c) 2006 Elsevier B.V. All rights reserved.

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### Record 25 of 129

**Author(s):** Lopez-Barrera, F (Lopez-Barrera, Fabiola); Manson, RH (Manson, Robert H.); Gonzalez-Espinosa, M (Gonzalez-Espinosa, Mario); Newton, AC (Newton, Adrian C.)

**Title:** Effects of varying forest edge permeability on seed dispersal in a neotropical montane forest

**Source:** LANDSCAPE ECOLOGY, 22 (2): 189-203 FEB 2007

**Abstract:** Hard (high-contrast with pastures) and soft (low-contrast with old-fields) forest edges created by slash-and-burn agriculture have become common landscape features in regions dominated by neotropical montane forest. However, little is known about the impacts of such edge types on forest regeneration dynamics. The consequences of varying forest edge permeability for oak acorn dispersal were investigated in a forest mosaic in the Highlands of Chiapas, Mexico. Rates of acorn production and removal, as well as the abundance and composition of small mammal seed consumers, were monitored along these different edge types (hard vs. soft) at specific distances from forest edges into forest patches and adjacent grasslands during two consecutive years. Results show that acorn removal declined significantly only in grasslands of sites characterised by hard edges (Logistic regression,  $P < 0.05$ ). Movements of metal-tagged acorns support the hypothesis that soft edges are more permeable to small mammals, with rodents moving acorns up to 15 m into grasslands of sites with soft edges. In sites with hard edges, higher rates of acorn dispersal were recorded from the forest edge towards the forest interior. *Peromyscus* spp. were the main acorn predators and/or dispersers of acorns present in our study sites. Rates of acorn removal during a non-masting year were greater than the subsequent mast-seeding year (85% removal within 138 days vs. 75% within 213 days), demonstrating that mast seeding may allow some seeds to escape predation. The implications of these results for oak dispersal and regeneration along edges in fragmented tropical forest landscapes are discussed.

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**DOI:** 10.1007/s10980-006-9020-3

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### Record 26 of 129

**Author(s):** Vander Wall, SB (Vander Wall, Stephen B.); Esque, T (Esque, Todd); Haines, D (Haines, Dustin); Garnett, M (Garnett, Megan); Waitman, BA (Waitman, Ben A.)

**Title:** Joshua tree (*Yucca brevifolia*) seeds are dispersed by seed-caching rodents

**Source:** ECOSCIENCE, 13 (4): 539-543 2006

**Abstract:** Joshua tree (*Yucca brevifolia*) is a distinctive and charismatic plant of the Mojave Desert. Although floral biology and seed production of Joshua tree and other yuccas are well understood, the fate of Joshua tree seeds has never been studied. We tested the hypothesis that Joshua tree seeds are dispersed by seed-caching rodents. We radioactively labelled Joshua tree seeds and followed their fates at five source plants in Potosi Wash, Clark County, Nevada, USA. Rodents made a mean of 30.6 caches, usually within 30 m of the base of source plants. Caches contained a mean of 5.2 seeds buried 3-30 mm deep. A variety of rodent species appears to have prepared the caches. Three of the 836 Joshua tree seeds (0.4%) cached germinated the following spring. Seed germination using rodent enclosures was nearly 15%. More than 82% of seeds in open plots were removed by granivores, and neither microsite nor supplemental water significantly affected germination. Joshua tree produces seeds in indehiscent pods or capsules, which rodents dismantle to harvest seeds. Because there is no other known means of seed dispersal, it is possible that the Joshua tree-rodent seed dispersal interaction is an obligate mutualism for the plant.

**ISSN:** 1195-6860

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### Record 27 of 129

**Author(s):** Chung, KPS (Chung, Kylie P. S.); Corlett, RT (Corlett, Richard T.)

**Title:** Rodent diversity in a highly degraded tropical landscape: Hong Kong, South China

**Source:** BIODIVERSITY AND CONSERVATION, 15 (14): 4521-4532 DEC 2006

**Abstract:** The diverse ecological roles played by different rodent species mean that the loss of some species and superabundance of others could potentially influence a wide range of ecological processes. Hong Kong (22 degrees N, 114 degrees E), with seven million people in a land area of 1100 km<sup>2</sup>, could be considered a 'worst case scenario' for the survival of mammalian diversity. Existing information on rodents in Hong Kong was compiled from previous published and unpublished studies, and additional trapping was conducted at 17 non-urban sites. The rodent fauna of modern Hong Kong consists of eight species of rats and mice (*Bandicota indica*, *Mus caroli*, *M. musculus*, *Niviventer fulvescens*, *Rattus norvegicus*, *R. rattus*, *R. tanezumi*, *R. sikkimensis*: Muridae), one porcupine (*Hystrix brachyura*: Hystricidae), and one recently introduced tree squirrel (*Callosciurus erythraeus*: Scuridae). Six of the murids are urban or agricultural commensals, so only the porcupine and two murids, *N. fulvescens* and *R. sikkimensis*, are likely survivors of Hong Kong's pre-deforestation native rodent fauna. The two murids co-dominate in forest and shrubland, but can also move through grassland, which has probably enabled their survival through repeated cycles of fragmentation and regrowth. Additional forest rodents that may have inhabited Hong Kong in the past are tentatively identified from information on their recent distributions in the region. One possible ecological consequence of Hong Kong's depleted rodent fauna is a shift in the balance between seed predation and seed dispersal, in favor of the former.

**ISSN:** 0960-3115

**DOI:** 10.1007/s10531-005-5102-9

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### Record 28 of 129

**Author(s):** Borchert, M (Borchert, Mark)

**Title:** Seed fate of *Marah macrocarpus* (Cucurbitaceae) following fire: do seedlings recruit from rodent burrows?

**Source:** ECOLOGICAL RESEARCH, 21 (5): 641-650 SEP 2006

**Abstract:** For numerous species in fire-prone ecosystems, the passage of fire triggers the release of large quantities of seeds within 2 years of the fire. This special case of masting has been described for species in an array of floras, but few studies have followed the fates of seeds liberated into the postfire environment. In this study, I followed the fates of 990, magnet-bearing *Marah macrocarpus* seeds sown at three seed densities in a large, high-intensity burn area. Seeds disappeared over 6.6 months and removal at all three densities became negatively density-dependent in late summer until all seeds disappeared in mid winter. I recovered only 5% of the magnets, mostly from rodent tunnels. Based on the recovery of magnets, I estimate rodents moved similar to 91% of the seeds belowground. Seed burial trials showed that seedlings established from seeds buried up to 16 cm whereas seeds sown on the surface did not germinate. Seedlings also readily established from burial in soils with 50% rock fragments as well as from artificial tunnels in both pot and field experiments. Excavation of 50 natural seedlings suggested up to 20% established in rodent burrows. Findings of this study suggest that ecologists may have underestimated the role of burrows as locations for recruitment of large-seeded species.

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**DOI:** 10.1007/s11284-006-0171-0

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### Record 29 of 129

**Author(s):** Garcia-Castano, JL (Garcia-Castano, Juan Luis); Kollmann, J (Kollmann, Johannes); Jordano, P (Jordano, Pedro)

**Title:** Spatial variation of post-dispersal seed removal by rodents in highland microhabitats of Spain and Switzerland

**Source:** SEED SCIENCE RESEARCH, 16 (3): 213-222 SEP 2006

**Abstract:** Few data are available and little is known about spatial variation in post-dispersal seed removal at different levels throughout the geographic range of a plant species. Here, we compare post-dispersal seed removal by rodents within and among sites in two distinct regions, the south-eastern Spanish Mediterranean highlands and the Swiss Jura. Seed removal was assessed experimentally for four fleshy-fruited species (*Berberis vulgaris*, *Crataegus monogyna*, *Rosa* spp. and *Taxus baccata*) in heterogeneous sites with distinct microhabitats. A factorial general linear model (GLM) analysis was used to evaluate the relative influence of species-specific seed traits on removal at three spatial levels (microhabitat, site and region). In both highland ecosystems, live trapping revealed that rodents were the main seed removers: *Apodemus sylvaticus* was observed in both regions, whereas *A. flavicollis* and *Clethrionomys glareolus* occurred only at the Swiss sites. There was a significant difference in seed removal between regions, and the preferences of the rodents varied among plant species and microhabitats. Variation in rodent presence explained some differences in seed removal between regions and among microhabitats. Finally, the effect of rodent presence on seed removal differs due to both regional and microhabitat effects.

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**DOI:** 10.1079/sr2006245

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### Record 30 of 129

**Author(s):** Midgley, GF (Midgley, G. F.); Hughes, GO (Hughes, G. O.); Thuiller, W (Thuiller, W.); Rebelo, AG (Rebelo, A. G.)

**Title:** Migration rate limitations on climate change-induced range shifts in Cape Proteaceae

**Source:** DIVERSITY AND DISTRIBUTIONS, 12 (5): 555-562 SEP 2006

**Abstract:** Modelling of climate change-induced species range shifts has generally addressed migration limitations inadequately, often assuming 'null' migration or instantaneous 'full' migration extremes. We describe methods for incorporating simple migration rate assumptions into multispecies modelling, using the Proteaceae of the Cape Floristic Region. Even with optimistic migration assumptions, range loss projections more closely approximate null migration than full migration assumptions. Full migration results were positively skewed by few species with large range increases, an overestimate eliminated by dispersal-limited migration rate assumptions. Wind- and ant/rodent-dispersed species responded differently to climate change. Initially larger ranges of wind-dispersed species were more strongly reduced by climate change, despite far greater assumed dispersal distances - we suggest that these well-dispersed species populate more marginal areas of potential range, causing lower resilience to climatic changes at range margins. Overall, range loss rate slowed with advancing climate change, possibly because species ranges contracted into core areas most resilient to climate change. Thus, a consideration of simple dynamics of range change (rather than single step, present-future comparisons of range) provide new insights relevant for conservation strategies, in particular, and for guiding monitoring efforts to detect and gauge the impacts of climate change on natural populations.

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**DOI:** 10.1111/j.1366-9516.2006.00273.x

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### Record 31 of 129

**Author(s):** Rey, PJ (Rey, Pedro J.); Ramirez, JM (Ramirez, Jose M.); Sanchez-Lafuente, AM (Sanchez-Lafuente, Alfonso M.)

**Title:** Seed- vs. microsite-limited recruitment in a myrmecochorous herb

**Source:** PLANT ECOLOGY, 184 (2): 213-222 JUN 2006

**Abstract:** Dispersal in myrmecochorous herbs is frequently short-distance and this might limit patch occupancy. Here we ask whether recruitment and patch occupancy in the myrmecochore *Helleborus foetidus* are seed- or microsite-limited and what role dispersal plays in recruitment limitation. In pine forests from two widely separated mountain systems in the Iberian Peninsula, we performed two seed addition experiments to explore the nature of recruitment limitation in this perennial herb. In an introduction

experiment, we added seeds in patches far from reproductive individuals, which rarely receive any seed. In an augmentation experiment, we added seeds in patches beneath reproductive plants. Each experiment considered three main factors: seed addition (added or not added), rodent exclusion (excluded or not excluded), and microhabitat (scrub-covered or not scrub-covered). The augmentation experiment tests whether recruitment is limited by seed availability (exploring also the possible role of rodent granivory in such limitation) while the introduction experiment tests whether the empty patches occur either because they are unsuitable for the species (microsite limitation) or due to a low probability of seed arrival (dispersal limitation). Adding seeds almost always increased seedling emergence and recruitment, demonstrating that recruitment in this species is seed-limited and refuting the possibility of microsite limitation. The comparison of the introduction and augmentation experiments indicated that *Helleborus* recruitment dynamics and patch occupancy are constrained by additive effects of fecundity and dispersal limitation.

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**DOI:** 10.1007/s11258-005-9066-3

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### Record 32 of 129

**Author(s):** Iida, S

**Title:** Dispersal patterns of *Quercus serrata* acorns by wood mice in and around canopy gaps in a temperate forest

**Source:** FOREST ECOLOGY AND MANAGEMENT, 227 (1-2): 71-78 MAY 15 2006

**Abstract:** The hypothesis of directed dispersal presumes that seeds can arrive at favorable sites for establishment more frequently than expected by chance as a result of seed dispersal by particular agents. Canopy gaps are generally favorable sites for seed establishment and survival. To test this hypothesis, the pattern of seed dispersal by wood mice in and around canopy gaps was investigated in broad-leaved deciduous forest. The study was conducted in a temperate deciduous forest in the northern part of the Kanto region of central Japan. A total of 360 magnet-equipped *Quercus serrata* acorns were placed on forest floors in and around two canopy gaps in the autumn of 1994, and were tracked with a magnetic locator the following spring. Of the 160 acorns detected, 16 (10%) were sound, and the remaining 144 (90%) had lost their germination ability due to predation by wood mice. Furthermore, of the 160 acorns detected, 82 (51%) were transported to destinations close to wood debris or tree bases; 132 (83%) were hoarded at nest-related sites, with 69 (43%) being hoarded at sites that met both criteria (i.e., nest-related sites close to wood debris or tree bases). This tendency of transporting seeds to woody structures was common to the three seed source categories (within canopy gaps, at the edge of canopy gaps, and about 10 m beyond the edge of canopy gaps). At one of the two gaps, transportation of acorns toward canopy gap by wood mice from the edge and the outside of the canopy gap were observed. This seed transport in the direction of canopy gaps was attributed to the preference of wood mice for various types of woody debris for refuge and/or habitat. Survival ratio of acorns hoarded close to wood structure was significantly lower than those of acorns hoarded at the destinations discontinuous with wood structure. Light levels at the acorn storage sites were not increased by dispersal. However, light levels at the acorn destinations under a thicket of fallen branches, and beside trunks or limbs of fallen trees were higher than, and equivalent to, those of areas distant from wood debris, respectively. This may be because most of such debris was in canopy gaps. These results do not clearly support the directed dispersal hypothesis for seed dispersal by wood mice; however, these results still suggest the possibility of it. (c) 2006 Elsevier B.V. All rights reserved.

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### Record 33 of 129

**Author(s):** Galetti, M; Donatti, CI; Pires, AS; Guimaraes, PR; Jordano, P

**Title:** Seed survival and dispersal of an endemic Atlantic forest palm: the combined effects of defaunation and forest fragmentation

**Source:** BOTANICAL JOURNAL OF THE LINNEAN SOCIETY, 151 (1): 141-149 MAY 2006

**Conference Title:** International Symposium on the Biology of the Palm Family

**Conference Date:** APR 06-08, 2005

**Conference Location:** Kew, ENGLAND

**Conference Host:** Linnean Soc & Royal Botan Gardens

**Abstract:** About 45 palm species occur in the Atlantic forest of Brazil, and most of them are affected by loss of seed dispersers resulting from forest fragmentation and hunting. Here we report the effects of habitat loss and defaunation on the seed dispersal system of an endemic palm, *Astrocaryum aculeatissimum*. We evaluated seed removal, insect and rodent seed predation, and scatter-hoarding in nine sites, ranging from 19 ha to 79 000 ha. We report the seedling, juvenile and adult palm densities in this range of sites. Endocarps remaining beneath the parent palm had a higher probability of being preyed upon by insects in small, mostly fragmented and more defaunated sites. The frequency of successful seed removal, scatter-hoarding and consumption by rodents increased in the larger, less defaunated sites. Successful removal and dispersal collapsed in small (< 1000 ha), highly defaunated sites and frequently resulted in low densities of both seedlings and juveniles. Our results indicate that a large fraction of Atlantic forest palms that rely on scatter-hoarding rodents may become regionally extinct due to forest fragmentation and defaunation. Current management practices including palm extraction and hunting pressure have a lasting effect on Atlantic forest palm regeneration by severely limiting successful recruitment of prereproductive individuals. (c) 2006 The Linnean Society of London.

**ISSN:** 0024-4074

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**Record 34 of 129****Author(s):** Xiao, ZS; Zhang, ZB**Title:** Nut predation and dispersal of Harland Tanoak *Lithocarpus harlandii* by scatter-hoarding rodents**Source:** ACTA OECOLOGICA-INTERNATIONAL JOURNAL OF ECOLOGY, 29 (2): 205-213 MAR-APR 2006

**Abstract:** Plants that use the propagule to co-opt animals as dispersal agents must balance the costs of seed predation with the benefits of dispersal. Successful post-dispersal germination is a key metric that reflects these costs and benefits. By tracking individual nuts with coded tin-tags over 3 years (2000-2003), this study quantified nut predation and dispersal of harland tanoak (*Lithocarpus harlandii*) by seed-caching rodents in a subtropical evergreen broadleaved forest in the Duiangyan Region of Sichuan Province, Southwest China. We found that tanoak seedlings established from rodent-generated caches in the primary stands over a 12-month post-dispersal period. Our results indicate that seed-caching rodents are effective dispersers of tanoak nuts, but dispersal effectiveness varies among years and stands, probably due to mast seeding of harland tanoak or community-level seed availability according to the predator satiation hypothesis. Some nut traits in tanoak species, e.g. large seed size, hard nut husk, lower tannin and mast seeding, are important characteristics for seed dispersal by scatter-hoarding rodents, compared with oak species with higher tannin content. (c) 2006 Elsevier SAS. All rights reserved.

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**Record 35 of 129****Author(s):** Jones, FA; Hamrick, JL; Peterson, CJ; Squiers, ER**Title:** Inferring colonization history from analyses of spatial genetic structure within populations of *Pinus strobus* and *Quercus rubra***Source:** MOLECULAR ECOLOGY, 15 (3): 851-861 MAR 2006

**Abstract:** Many factors interact to determine genetic structure within populations including adult density, the mating system, colonization history, natural selection, and the mechanism and spatial patterns of gene dispersal. We examined spatial genetic structure within colonizing populations of *Quercus rubra* seedlings and *Pinus strobus* juveniles and adults in an aspen-white pine forest in northern Michigan, USA. A 20-year spatially explicit demographic study of the forest enables us to interpret the results in light of recent colonization of the site for both species. We assayed 217 *Q. rubra* seedlings and 171 *P. strobus* individuals at 11 polymorphic loci using nine allozyme systems. Plant genotypes and locations were used in an analysis of spatial genetic structure. *Q. rubra* and *A. strobus* showed similar observed levels of heterozygosity, but *Q. rubra* seedlings have less heterozygosity than expected. *Q. rubra* seedlings show spatial genetic clumping of individuals on a scale to 25 m and levels of genetic relatedness expected from the clumped dispersion of half-siblings. In contrast, *P. strobus* has low levels of genetic relatedness at the smallest distance class and positive spatial genetic structure at scales < 10 m within the plot. The low density of adult *Q. rubra* outside the study plot and limited, spatially clumped rodent dispersal of acorns is likely responsible for the observed pattern of spatial genetic structure and the observed heterozygote deficit (i.e. a Wahlund effect). We attribute weaker patterns observed in *P. strobus* to the longer dispersal distance of seeds and the historical overlap of seed shadows from adults outside of the plot coupled with the overlap of seed shadows from younger, more recently established reproductive adults. The study demonstrates the utility of long-term demographic data in interpreting mechanisms responsible for generating contemporary patterns of genetic structure within populations.

**ISSN:** 0962-1083**DOI:** 10.1111/j.1365-294X.2005.02830.x

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**Record 36 of 129****Author(s):** Xiao, ZS; Jansen, PA; Zhang, ZB**Title:** Using seed-tagging methods for assessing post-dispersal seed fate in rodent-dispersed trees**Source:** FOREST ECOLOGY AND MANAGEMENT, 223 (1-3): 18-23 MAR 1 2006

**Abstract:** Seed tagging is widely used for tracking seeds during dispersal by seed-caching animals. No studies, however, have fully examined the effects of seed tagging on post-dispersal seed fate. We studied how two seed tagging techniques - thread-marking and wire tin-tagging - affected seed fate by placing tagged and untagged seeds in simulated seed sources and caches and comparing removal rates and fates, and by comparing seedling establishment between tagged and untagged seeds. Tagging had little effect on whether seeds were eaten or dispersed, though both marking methods significantly delayed seed removal by rodents. Both marking methods proved effective for retrieving removed seeds and their fates, but because rodents bit off thread not wire, wire tin-tagging yielded a much higher recovery rate and more accurate estimation of seed fate. We found little difference in dispersal distance between the tagging methods. Piercing of the cotyledons negatively affected seedling emergence in one of two seed species tested. Wire tin tags are a suitable alternative for tracking seeds where seed-caching rodents tend to cut or detach thread marks and yield results comparable to thread-marking. However, both seed tagging methods may underestimate seed dispersal and survival due to delayed removal and damage of the cotyledons by piercing. (c) 2005 Elsevier B.V. All rights reserved.

**ISSN:** 0378-1127**DOI:** 10.1016/j.foreco.2005.10.054

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**Record 37 of 129****Author(s):** Tomback, DF; Schoettle, AW; Chevalier, KE; Jones, CA**Title:** Life on the edge for limber pine: Seed dispersal within a peripheral population**Source:** ECOSCIENCE, 12 (4): 519-529 2005

**Abstract:** Interactions within populations at the periphery of a species' range may depart from those in populations more centrally located. Throughout its core range, limber pine (*Pinus flexilis*, Pinaceae) depends on Clark's nutcrackers (*Nucifraga columbiana*, Corvidae) for seed dispersal. Nutcrackers, however, rarely visit the Pawnee National Grassland peripheral population of limber pine on the eastern Colorado plains. Using live mammal trapping, fluorescent pigment tracking of disseminated seeds, and limber pine seed germination experiments in the field, we tested the hypothesis that limber pine seeds in this peripheral isolate are dispersed by nocturnal rodents. Live trapping and tracking indicated that deer mice (*Peromyscus maniculatus*, Muridae) and Ord's kangaroo rats (*Dipodomys ordii*, Heteromyidae) are the likely seed dispersers in this population. Rodents cached seeds in surface caches on tree leaf litter, rock, or soil substrate or buried them under soil, tree litter, or plants. Seeds cached under soil and plants, as opposed to surface caches, accounted for the greater number of stored seeds. Numbers of seeds per cache for buried caches was significantly higher than numbers of seeds for surface caches. The largest caches on average were those buried under plants. Also, we found that some rodent caches contained one or more seeds up to 27 d after the caches were made. In experiments simulating observed cache types, we determined that most cache types, but especially buried caches, had some germination potential. Rodents disseminated seeds over shorter distances than do nutcrackers, possibly explaining previously observed genetic substructuring in the Pawnee population. Seed dispersal by rodents also precludes the metapopulation dynamics typical of limber pine in its core range, and may lead to the loss of peripheral populations over time.

**ISSN:** 1195-6860

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**Record 38 of 129****Author(s):** Guimaraes, PR; Kubota, U; Gomes, BZ; Fonseca, RL; Bottcher, C; Galetti, M**Title:** Testing the quick meal hypothesis: The effect of pulp on hoarding and seed predation of *Hymenaea courbaril* by red-rumped agoutis (*Dasyprocta leporina*)**Source:** AUSTRAL ECOLOGY, 31 (1): 95-98 FEB 2006

**Abstract:** Red-rumped agoutis (*Dasyprocta leporina*) are important seed dispersers/predators of Neotropical large-seeded plants. Several species of seeds cached by agoutis have an edible reward, in contrast to temperate rodent-dispersed diaspores. The quick meal hypothesis states that the presence of a reward such as edible pulp will enhance the efficiency of rodents as seed dispersers by satiating the animal and, consequently, reducing seed predation and enhancing hoarding. In this study, this hypothesis was tested using as the reference system the pulp and seeds of *Hymenaea courbaril*. Seeds with and without pulp were offered to agoutis and the behaviour of each individual was recorded. Since the probability of predation and hoarding were complementary, we used the probability of predation. The proportion of agoutis that preyed on at least one seed was similar for seeds with (42.8% of individuals) and without (40.0% of individuals) pulp. In agoutis that preyed upon at least one seed, the probability that they killed a seed did not differ between seeds with (0.17 +/- 0.03) and without (0.20 +/- 0.08) pulp. Hence, these results do not support the 'quick meal hypothesis'.

**ISSN:** 1442-9985**DOI:** 10.1111/j.1442-9993.2006.01554.x

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**Record 39 of 129****Author(s):** Xiao, ZS; Zhang, ZB; Wang, YS**Title:** Effects of seed size on dispersal distance in five rodent-dispersed fagaceous species**Source:** ACTA OECOLOGICA-INTERNATIONAL JOURNAL OF ECOLOGY, 28 (3): 221-229 NOV-DEC 2005

**Abstract:** We studied the effect of seed size on dispersal by comparing dispersal distances in five rodent-dispersed fagaceous species (*Lithocarpus harlandii*, *Quercus variabilis*, *Q. serrata*, *Cyclobalanopsis glauca*, *Castanopsis fargesii*) with different seed size. We tracked individual seeds with coded tin-tags in two stands over 3 years in a subtropical evergreen broadleaved forest in the Dujiangyan Region of Sichuan Province, Southwest China. Our seed tracking data indicate that dispersal distances (including mean, maximum and distribution range) of seeds in primary caches and of seeds eaten after dispersal significantly increased with seed size, for both stands and all years. In addition, larger seeds (*L. harlandii* and *Q. variabilis*) were re-cached more often than smaller ones, which further reduced the relative density among caches and extended dispersal distances. Our findings indicate that greater dispersal distances for larger seeds might benefit the evolution of differences in seed size, and that scatter-hoarding might be advantageous for rodent-dispersed tree species. (c) 2005 Elsevier SAS. All rights reserved.

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**Record 40 of 129****Author(s):** Walters, M; Milton, SJ; Somers, MJ; Midgley, JJ**Title:** Post-dispersal fate of *Acacia* seeds in an African savanna

**Source:** SOUTH AFRICAN JOURNAL OF WILDLIFE RESEARCH, 35 (2): 191-199 OCT 2005

**Abstract:** African Acacia species are often major contributors to the progressive increase in the woody component of savannas, a phenomenon commonly referred to as bush encroachment. In Hluhluwe-iMfolozi Park, the numbers of adult *Acacia nilotica* (L.) Willd. Ex Del. subsp. *kraussiana* (Benth.) Brenan trees per hectare far exceed those of *A. karroo* Hayne adults. The relative dominance is reversed in the juvenile stage with *A. karroo* outnumbering *A. nilotica* threefold outside closed woodlands. We experimentally investigated the effects of location, structural habitat type, species, predator type and rodent presence on the level of post-dispersal seed predation in an attempt to explain species dominance in Hluhluwe-iMfolozi Park. Post-dispersal predation of *A. karroo* seeds (21.8%) was higher than that of *A. nilotica* (12.7%). Predation levels depended on site, structural habitat type, level of protection from different predator types and rodent presence/absence. There was more rodent predation in tall grass areas (26.0%) than grazing lawn (10.7%) or canopy areas (15.2%), and most seeds (19.7%) were lost from unprotected control groups. Rodent presence was a significant factor in a model aiming to determine reasons for unexplained seed disappearance. Post-dispersal predation of seeds could not account for the differences in success between *A. karroo* and *A. nilotica* in Hluhluwe-iMfolozi Park.

**ISSN:** 0379-4369

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#### Record 41 of 129

**Author(s):** Cheng, JR; Xiao, ZS; Zhang, ZB

**Title:** Seed consumption and caching on seeds of three sympatric tree species by four sympatric rodent species in a subtropical forest, China

**Source:** FOREST ECOLOGY AND MANAGEMENT, 216 (1-3): 331-341 SEP 12 2005

**Abstract:** Because it is difficult and often impossible to distinguish dispersal, consumption and caching of seeds among different rodent species in the field, the differences of sympatric rodent species in affecting seed fates and forest regeneration are often unknown. To understand the different impact of four sympatric rodent species on seed fates of three sympatric tree species, we studied the food-hoarding behavior of Edward's long-tailed rats (*Leopoldamys edwardsi*), Chestnut rats (*Niviventer fulvescens*), Himalayan rats (*Rattus nitidus*) and Norway rats (*R. norvegicus*) on seeds of three sympatric tree species: Cork oak (*Quercus variabilis*), Serrate oak (*Q. serrata*) and Oil tea (*Camellia oleifera*) in a subtropical forest in the Dujiangyan Region, Sichuan Province, China. Consumption and caching of tagged seeds by rodents was measured in enclosures (10 m x 10 m) from September to December 2003. The results showed that Edward's long-tailed rats scatter-hoarded seeds of the three tree species. They scatter-hoarded Serrate oak significantly less than Cork oak (with large seed size) and Oil tea (with high energy). The transport distances of Serrate oak by all the four rodent species were significantly shorter than those of Cork oak and Oil tea. The cache sizes of the three seed species were all small. Most seeds were cached under grass or shrubs in the enclosure. In terms of the population abundance and food preference, Edward's long-tailed rats imposed most and the largest impact on seed fate of the three tree species. The results supported our hypothesis that sympatric rodent species may affect seed fate and forest regeneration differently. Only Edward's long-tailed rats might benefit the seed recruitment of Cork oak, Serrate oak and Oil tea, while the other three rodent species were purely seed-eater and thus might contribute little to seed regeneration of the three dominant tree species. (c) 2005 Elsevier B.V. All rights reserved.

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#### Record 42 of 129

**Author(s):** Ruscoe, WA; Elkinton, JS; Choquenot, D; Allen, RB

**Title:** Predation of beech seed by mice: effects of numerical and functional responses

**Source:** JOURNAL OF ANIMAL ECOLOGY, 74 (6): 1005-1019 NOV 2005

**Abstract:** 1. The functional response of post-dispersal seed predators (house mouse, *Mus musculus*) to absolute densities of southern beech seed (*Nothofagus solandri* var. *cliffortioides*) was studied in laboratory and field trials. House mice showed a Type II (hyperbolic) functional response to seed availability and this was not modified by the presence of an alternative food source.

2. Maximum daily intake rate of beech seeds during field trials averaged 1042 seeds mouse<sup>-1</sup>. This is sufficient to provide house mice with both the energy and protein required for growth and reproduction.

3. We explicitly incorporated the functional response into the numerical response of house mice to beech seed, measured for field populations monitored in a New Zealand beech forest. House mice showed a strong numerical response to beech seed intake rate that was modified by some density-dependent mechanism(s).

4. We developed a model that simulated seedfall, house mouse population growth and seed reserve depletion over one year. We found that the previously reported decline in house-mouse populations in beech forests during spring and summer is likely to be related to spring beech seed germination that renders seed no longer available as a food source for house mice.

5. From our simulation model it does not appear that house-mouse populations can completely eat-out beech seed reserves prior to germination in a year of large seedfall. 'Masting' behaviour in New Zealand native beech trees is therefore sufficient to satiate an eruptive population of an exotic mammalian omnivore, despite the lack of a long co-evolutionary interaction.

**ISSN:** 0021-8790

**DOI:** 10.1111/j.1365-2656.2005.00998.x

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**Record 43 of 129****Author(s):** Vander Wall, SB; Kuhn, KM; Gworek, JR**Title:** Two-phase seed dispersal: linking the effects of frugivorous birds and seed-caching rodents**Source:** OECOLOGIA, 145 (2): 282-287 SEP 2005

**Abstract:** Frugivorous birds disperse the seeds of many fruit-bearing plants, but the fate of seeds after defecation or regurgitation is often unknown. Some rodents gather and scatter hoard seeds, and some of these may be overlooked, germinate, and establish plants. We show that these two disparate modes of seed dispersal are linked in some plants. Rodents removed large (> 25 mg) seeds from simulated bird feces (pseudofeces) at rates of 8-50%/day and scatter hoarded them in soil. Ants (*Formica sibylla*) also harvested some seeds and carried them to their nests. Rodents carried seeds 2.5 +/- 3.2 m to cache sites (maximum 12 in) and buried seeds at 8 +/- 7 min depth. Enclosure studies suggest that yellow pine chipmunks (*Tamias amoenus*) and deer mice (*Peromyscus maniculatus*) made the caches. In spring, some seeds germinated from rodent caches and established seedlings, but no seedlings established directly from pseudofeces. This form of two-phase seed dispersal is important because each phase offers different benefits to plants. Frugivory by birds permits relatively long-range dispersal and potential colonization of new sites, whereas rodent caching moves seeds from exposed, low-quality sites (bird feces on the ground surface) to a soil environment that may help maintain seed viability and promote successful seedling establishment.

**ISSN:** 0029-8549**DOI:** 10.1007/s00442-005-0125-1

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**Record 44 of 129****Author(s):** Roth, JK; Vander Wall, SB**Title:** Primary and secondary seed dispersal of bush chinquapin (Fagaceae) by scatterhoarding rodents**Source:** ECOLOGY, 86 (9): 2428-2439 SEP 2005

**Abstract:** Seed dispersal often occurs in two or more discrete stages, but the effects of the latter stages of dispersal on successful recruitment have seldom been measured. We investigated the relative contributions of primary and secondary seed dispersal of Sierra bush chinquapin (*Castanopsis sempervirens*; Fagaceae) to seedling establishment. Rodents (mostly yellow pine chipmunks, *Tamias amoenus*) harvested chinquapin nuts rapidly during a three-week period starting in mid-August and scatterhoarded most nuts (81%) in the ground. Most initial (primary) caches contained one nut (range = 1-5 nuts) buried 10-23 mm deep within 46 m of source shrubs. Rodents subsequently retrieved 95% of these nuts and recached at least 33% elsewhere (secondary caches), at lower densities and up to 64 m from source plants. By winter, 41% and 21% of nuts harvested from shrubs remained in scatter caches in 1999 and 2000, respectively. Only 10 caches (4 primary and 6 secondary caches) present in winter 1999 (7.8%), and no caches from winter 2000, produced seedlings the following spring. All seedlings died during the first growing season because of rodent grazing and desiccation.

Despite low seedling survival in this study, chinquapin appears to be dependent upon scatterhoarding rodents for seedling recruitment. Secondary dispersal is an important aspect of chinquapin dispersal. Secondary caches contributed more to chinquapin seedling recruitment than primary caches; 2.5% of primary caches and 5.6% of secondary caches produced seedlings. This study suggests that, for propagules that move repeatedly during dispersal, a clear understanding of the dynamics of seed dispersal can be gained only by following seed movements, determining the transition probabilities between different stages of dispersal, and assessing the contribution of each stage of seed dispersal to plant recruitment.

**ISSN:** 0012-9658

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**Record 45 of 129****Author(s):** Garcia, D; Obeso, JR; Martinez, I**Title:** Rodent seed predation promotes bird-dispersed trees in temperate differential recruitment among secondary forests**Source:** OECOLOGIA, 144 (3): 435-446 JUL 2005

**Abstract:** We investigated the role of seed predation by rodents in the recruitment of the fleshy-fruited trees *Taxus baccata*, *Ilex aquifolium* and *Crataegus monogyna* in temperate secondary forests in NW Spain. We measured the densities of dispersed seeds, early emerged seedlings, established recruits and adults, at four sites over a period of 2 years. Seed predation among species was compared by seed removal experiments and analysis of rodent larder-hoards. The three species differed markedly in local regeneration patterns. The rank order in the seed rain following decreasing seed density was *Ilex*, *Taxus* and *Crataegus*. However, *Crataegus* established 3.3 times more seedlings than *Taxus*. For all species, there was a positive linear relationship between the density of emerged seedlings and seed density, suggesting that recruitment was seed-rather than microsite-limited. A consistent pattern of seed selection among species was exerted by rodents, which preferred *Taxus* and, secondarily, *Ilex* seeds to *Crataegus* seeds. Predation ranking was the inverse of that of seed protection against predators, measured as the mass of woody coat per mass unit of the edible fraction. Recruitment potential, evaluated as the ratio of seedlings to seeds, was negatively related to seed predation, with the rank order *Crataegus*>*Ilex*>*Taxus*. The selective early recruitment limitation exerted by predation may have a demographic effect in the long term, as judged by the positive relationship between early seedling emergence and the density of established recruits. By modulating the pre-emptive competition for seed safe sites, rodents may preclude the progressive exclusion of species that produce low numbers of seeds (i.e. *Crataegus*) by those dominant in seed number (i.e. *Ilex*, *Taxus*), or at least foster the evenness for site occupation among seedlings of different species.

**ISSN:** 0029-8549

DOI: 10.1007/s00442-005-0103-7

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#### Record 46 of 129

**Author(s):** Russo, SE

**Title:** Linking seed fate to natural dispersal patterns: factors affecting predation and scatter-hoarding of *Virola calophylla* seeds in Peru

**Source:** JOURNAL OF TROPICAL ECOLOGY, 21: 243-253 Part 3 MAY 2005

**Abstract:** Natural seed deposition patterns and their effects on post-dispersal seed fate are critical in tropical tree recruitment. Previous research showed that the key dispersal agent of the neotropical tree, *Virola calophylla*, is the spider monkey (*Ateles paniscus*). Spider monkeys generate a heterogeneous seed deposition pattern because they scatter-disperse seeds diurnally, whereas they clump-disperse seeds at their sleeping sites. The recruitment consequences of this pattern were investigated using manipulative experiments and observations. Scatter-hoarding by spiny rats (*Proechimys* spp.) caused little rearrangement of the initial seed deposition pattern because they moved seeds only short distances. Seed survival to the seedling stage depended negatively on conspecific seed density and positively on the distance from the nearest adult *V. calophylla* female. These effects were likely mediated by two important seed predators, spiny rats and beetles (Scolytidae). Furthermore, spider monkeys' seed deposition patterns influenced seed survival. Scatter-dispersed and experimentally dispersed seeds had the highest survival. Conversely, clump-dispersed seeds at sleeping sites, which are far from *V. calophylla* females, and non-dispersed seeds had equally low survival, suggesting that conspecific density- and distance-dependence acted independently and did not explain all variation in seed survival. Instead, other characteristics of the seed deposition pattern, such as the multi-specific assemblage of seeds at sleeping sites, also affected post-dispersal seed fates.

**ISSN:** 0266-4674

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#### Record 47 of 129

**Author(s):** Xiao, ZS; Zhang, ZB; Wang, YS

**Title:** The effects of seed abundance on seed predation and dispersal by rodents in *Castanopsis fargesii* (Fagaceae)

**Source:** PLANT ECOLOGY, 177 (2): 249-257 APR 2005

**Abstract:** Based on the animal dispersal hypothesis and the predator satiation hypothesis, we examined the effects of seed abundance at both population (i.e., mast seeding) and community levels on seed predation and dispersal of *Castanopsis fargesii* (Fagaceae), a rodent-dispersed mast species in Eastern Asia. In a subtropical evergreen broadleaved forest in the Dujiangyan region of Sichuan Province, China, individual seeds with coded tin tags were tracked in two contrasting stands (seed-poor and seed-rich) over two years (2000, a low-seed year; 2001, a high-seed year). Our results showed that: (1) small rodents did not harvest the tagged seeds of *C. fargesii* more rapid in the high-seed year than in the low-seed year in either stand. But, seed harvest was significantly faster in the seed-rich stand than in the seed-poor stand. (2) The removal proportion was significantly lower in the high-seed year than in the low-seed year for either stand, but the removal proportion was slightly higher in the seed-poor stand than in the seed-rich stand. This indicates that high seed abundance decreases seed removal (predator satiation hypothesis). (3) There were only small differences about seed caching, seed survival and seedling establishment of *C. fargesii* between years and stands. During the survey, no cached seeds survived to germinate in the spring for both stands and years. (4) Mean dispersal distances of the cached seeds are much shorter in the high-seed year (3.1 m) than in the low-seed year (8.1 m) in the seed-rich stand, though similar trend is not examined in the seed-poor stand. Our results indicate that seed predation and dispersal of *C. fargesii* are influenced by both mast seeding and community-level seed abundance, which is not completely consistent with either the animal dispersal hypothesis or the predator satiation hypothesis, but seems more related to the predator satiation hypothesis.

**ISSN:** 1385-0237

DOI: 10.1007/s11258-005-2321-9

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#### Record 48 of 129

**Author(s):** Orrock, JL; Damschen, EI

**Title:** Corridors cause differential seed predation

**Source:** ECOLOGICAL APPLICATIONS, 15 (3): 793-798 JUN 2005

**Abstract:** Corridors that connect disjunct populations are heavily debated in conservation, largely because the effects of corridors have rarely been evaluated by replicated, large-scale studies. Using large-scale experimental landscapes, we found that, in addition to documented positive effects, corridors also have negative impacts on bird-dispersed plants by affecting seed predation, and that overall predation is a function of the seeds' primary consumer (rodents or arthropods). Both large-seeded *Prunus serotina* and small-seeded *Rubus allegheniensis* experienced greater predation in connected patches. However, *P. serotina* experienced significantly less seed predation compared to *R. allegheniensis* in unconnected patches, due to decreased impacts of rodent seed predators on this large-seeded species. Viewed in light of previous evidence that corridors have beneficial impacts by increasing pollination and seed dispersal, this work demonstrates that corridors may have both positive and negative effects for the same plant species at different life stages. Moreover, these effects may differentially affect plant species within the same community: seeds primarily consumed by rodents suffer less predation in unconnected patches. By shifting the impact of rodent and arthropod seed predators, corridors constructed for plant conservation could lead to shifts in the seed bank.

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**Record 49 of 129**

**Author(s):** Ness, JH; Bressmer, K

**Title:** Abiotic influences on the behaviour of rodents, ants, and plants affect an ant-seed mutualism

**Source:** ECOSCIENCE, 12 (1): 76-81 2005

**Abstract:** Deserts are open environments characterized by striking shifts in temperature and light regimes. We hypothesized that the abiotic environment mediates the interaction between an ant-dispersed plant, *Datura wrightii* (Solanaceae), ant mutualists, and rodent seed predators in the Sonoran Desert. Field experiments contrasting diurnal and nocturnal seed collection rates in the presence of ants only, vertebrates only, and in the presence of both groups indicated that 85% of seed collection by mammalian seed predators occurred at night (between 1900 and 0700). Seed collection by ants, in contrast, was similar between day and night, although seed collection decreased during very hot days and very bright nights. The total number of seeds collected by both groups foraging separately exceeded the number removed when both groups shared access to seed depots, suggesting that ants and rodents compete for seeds. However, *D. wrightii* plants dehiscence 86% of their fruits between 0700 and 1900, increasing the likelihood of seed collection by ant mutualists rather than rodent seed predators. Dehiscence was sensitive to environmental cues: greenhouse plants kept at constant temperature and humidity dehiscence 47% of their fruits between 0700 and 1900. Additional field experiments demonstrated that seed-collecting ants transported seeds considerable distances to their nests, microsites that can be rich in nutrients. The mean (SE) seed dispersal distance was 6.1 +/- 0.5 m, the longest mean dispersal distance yet reported for an ant-dispersed seed.

ISSN: 1195-6860

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**Record 50 of 129**

**Author(s):** Wehncke, EV; Dalling, JW

**Title:** Post-dispersal seed removal and germination selected tree species dispersed by *Cebus capucinus* on Barro Colorado Island, Panama

**Source:** BIOTROPICA, 37 (1): 73-80 MAR 2005

**Abstract:** Dispersal quality an important component of seed disperser effectiveness, may strongly affect the rate of plant recruitment. Here we evaluated the quality of *Cebus* monkey dispersal by comparing the secondary removal fate and germination of fresh and *Cebus*-ingested seeds of nine tree species on Barro Colorado Island, Panama. Overall, rates of secondary seed removal by vertebrates were low, with most *Cebus* defecations remaining undisturbed for extended periods on the forest floor. Only four of 30 feces were completely buried by dung beetles, and we found significantly higher vertebrate removal of defecated seeds than control seeds for only one species, *Cordia bicolor*. Seed germination varied greatly between plant taxa. Seeds of 3 out of 9 species showed significantly higher percent germination after monkey gut passage than control fresh seeds. Germination times tended to be shorter for defecated than for control seeds but were significantly different only for one of nine species, *Cecropia insignis*. Low rates of seed removal from *Cebus* feces, coupled with high germination probabilities, suggest high dispersal effectiveness for *Cebus* and contrasts strongly with patterns of post-dispersal seed fate recorded for other primate species.

ISSN: 0006-3606

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**Record 51 of 129**

**Author(s):** McConkey, KR

**Title:** Influence of faeces on seed removal from gibbon droppings in a dipterocarp forest in Central Borneo

**Source:** JOURNAL OF TROPICAL ECOLOGY, 21: 117-120 Part 1 JAN 2005

ISSN: 0266-4674

DOI: 10.1017/S0266467404001968

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**Record 52 of 129**

**Author(s):** Weckerle, CS; Rutishauser, R

**Title:** Gynoecium, fruit and seed structure of Paullinieae (Sapindaceae)

**Source:** BOTANICAL JOURNAL OF THE LINNEAN SOCIETY, 147 (2): 159-189 FEB 2005

**Abstract:** Despite an emphasis on fruit characters in Paullinieae taxonomy, few detailed morphological and anatomical studies of the gynoecia, fruits and seeds exist. The aims of the present study were (1) to provide a detailed documentation of gynoecium, fruit and seed structure and ontogeny in selected Paullinieae taxa; (2) to determine whether the gynoecium, seed and seedling provide additional characters of systematic value within the tribe; and (3) to relate the structural findings to mechanisms of fruit dehiscence and dispersal within these taxa. Newly described characters of systematic value within Paullinieae are shape and surface of the obturator, type of pollen tube transmitting tract, indumentum of the inner and outer surface of the carpels, ovary wall anatomy, aril anatomy, pseudo-hilum form, seedling germination mode and structure of first leaves. The fruits of *Paullinia* are septifragal, and conspicuous colour contrasts between the pericarp, aril and seed in most species of this genus are suggestive of a bird dispersal syndrome. Interestingly, it appears that relatively minor structural changes are associated with switches to rodent

dispersal in *Paullinia sphaerocarpa* and water dispersal in *R. clathrata* and *R. hystrix*. Anemochorous fruits are septifragal (*Cardiospermum* and *Urvillea*) or schizocarpic (*Houssayanthus*, *Lophostigma*, *Serjania*). They are structurally similar and *Cardiospermum* with septifragal capsules may also show septicial dehiscence. (C) 2005 The Linnean Society of London, Botanical Journal of the Linnean Society.

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### Record 53 of 129

**Author(s):** Lambert, TD; Malcolm, JR; Zimmerman, BL

**Title:** Effects of mahogany (*Swietenia macrophylla*) logging on small mammal communities, habitat structure, and seed predation in the southeastern Amazon Basin

**Source:** FOREST ECOLOGY AND MANAGEMENT, 206 (1-3): 381-398 FEB 15 2005

**Abstract:** Vast areas of the Amazon have been subjected to low-intensity selective logging for high value timber species such as mahogany (*Swietenia macrophylla*). Although the ecological consequences of such logging are often assumed to be minimal, few studies have directly tested this assumption. In this paper we examine the effects of various intensities of mahogany logging on small mammal communities, habitat structure, and seed predation in the southeastern Amazon Basin. We sampled small mammal communities using live traps at two logged and two unlogged sites. Within each site, we established five, 1 ha sampling grids that sampled the range of logging damage (in the case of logged sites) or mahogany densities (in the case of unlogged sites). Grids were sampled with 10 trap stations on the ground, 10 in the understory (at 1-3 m in height), and five in the canopy (at approximately 10 m in height) during three, 10-night trapping sessions over the course of the 10-month study. We measured a suite of forest structure and small mammal food resource (insect and fruit abundances) variables at each station and mahogany and peanut seed predation rates were measured at five locations per grid. We captured a total of 817 individuals of eight marsupial and 17 rodent species in 29,500 trap nights. Neither mahogany density across unlogged grids nor logging damage across logged grids were significantly correlated with variation in any of the measured habitat variables, seed predation rates, or measures of small mammal resource abundance. However, site-specific means for several variables (volume of downed wood, number of vines per tree, number of vines, number of herbaceous stems, and understory density) were higher in logged than unlogged sites, but significantly so in only two cases (number of vines per tree, volume of downed wood). When pooled, the logged grids had higher small mammal abundances and species richness than unlogged grids; however, predation of mahogany seeds and peanuts did not differ significantly between the two site types. When the two logged sites were analyzed separately, the effects of logging were found to be very different at the two sites. One of the logged sites showed few effects of logging and had similar forest structure and small mammal communities to the unlogged sites, whereas the other logged site demonstrated effects consistent with previous reports on logging, including increased small mammal abundances, increased seed predation, and decreases in seedling and sapling densities as a function of increasing levels of logging damage. This study provides evidence that the ecological consequences of mahogany logging are strongly dependent on local site features; however, the overall effects of the logging appeared to be small, suggesting that areas that have been subjected to only low-levels of logging can still make valuable contributions to conservation. (C) 2004 Elsevier B.V. All rights reserved.

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### Record 54 of 129

**Author(s):** Borchert, M

**Title:** Vertebrate seed dispersal of *Marah macrocarpus* (Cucurbitaceae) after fire in the Western Transverse Ranges of California

**Source:** ECOSCIENCE, 11 (4): 463-471 2004

**Abstract:** The geophytic, perennial vine *Marah macrocarpus* resprouts vigorously from an underground tuber after chaparral fires and produces numerous large (1,400 mg), non-dormant seeds. Studies of the postfire response of *M. macrocarpus* were conducted at two sites. At the main study site, the number of stems per plant was highest in the first 2 y after fire but declined rapidly in the third year. Seed yield peaked in the first year and was estimated to be about 8,469 seeds ( $\cdot$ ) ha<sup>-1</sup>. The largest plants produced seeds, but despite prolific resprouting and growth, only 22% of the population set seed. Most seeds fell within 1.3 m of the centre of the parent plant. Over a 3-y period, I tracked the fate of magnet-bearing seeds. Rodents, primarily *Dipodomys agilis* and *Peromyscus* spp., dispersed and cached seeds in the burn area 13.6  $\pm$  9.5 m (mean  $\pm$  SD) from parent plants. In the first year, four seedlings (2%) established from 200 marked seeds; all seedlings originated from multi-seed rodent caches. In the second year, rodents consumed or larder hoarded all 300 experimental seeds, and in the third year, they cached 69 of 300 seeds at two locations. At another site after a different fire, western scrub jays (*Aphelocoma californica*) buried 16% of seeds in shallow, single-seed caches within 25 m of artificial sowings and transported the remaining 84% of the seeds beyond 60 m.

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### Record 55 of 129

**Author(s):** Fleury, M; Galetti, M

**Title:** Effects of microhabitat on palm seed predation in two forest fragments in southeast Brazil

**Source:** ACTA OECOLOGICA-INTERNATIONAL JOURNAL OF ECOLOGY, 26 (3): 179-184 DEC 2004

**Abstract:** The establishment of plants depends crucially on where seeds are deposited in the environment. Some authors suggest that in forest understory seed predation is lower than in gaps, and higher than at the forest edge. However, most studies have been carried out in large forest patches and very little is known about the effects of microhabitat conditions on seed predation in forest fragments. We evaluated the effects of three microhabitats (gaps, forest edge, and understory) on seed predation of two palm species (*Euterpe edulis* and *Syagrus romanzoffiana*) in two semi-deciduous forest fragments (230 and 2100 ha) in southeast Brazil. Our objective was to test two hypotheses: (1) Low rodent abundance in small fragments as a result of meso-predator action levels leads to lower seed predation in small fragments. (2) Most mammal species in small fragments are generalists with respect to diet and habitat, so that seed predation is similar in different microhabitats (gaps, forest edge and understory) in the small fragment, but not in the larger one. The study community of small fragments is usually composed of generalist species (in diet and habitat aspects), so we expected the same rate of seed predation among microhabitats (gaps, forest edge and understory) in the tested smaller fragment. The experiment was carried out in the dry season (for *E. edulis*) and in the wet season (for *S. romanzoffiana*) in 1999. We conclude that post-dispersal seed predation in forest fragments can be directly connected with mammal communities, reflecting their historical and ecological aspects. (C) 2004 Elsevier SAS. All rights reserved.

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### Record 56 of 129

**Author(s):** Jansen, PA; Bongers, F; Hemerik, L

**Title:** Seed mass and mast seeding enhance dispersal by a neotropical scatter-hoarding rodent

**Source:** ECOLOGICAL MONOGRAPHS, 74 (4): 569-589 NOV 2004

**Abstract:** Many tree species that depend on scatter-hoarding animals for seed dispersal produce massive crops of large seeds at irregular intervals. Mast seeding and large seed size in these species have been explained as adaptations to increase animal dispersal and reduce predation. We studied how seed size and seed abundance simultaneously influenced seed dispersal and predation by scatter-hoarding rodents in the large-seeded rain forest tree *Carapa procera* (Meliaceae) in French Guiana. We individually tracked the fates of 3000 seeds, using remote video monitoring and thread-marking. Seed size was manipulated by broadly varying intraspecific seed mass, whereas effects of seed abundance were examined by tracking seeds in three seed-rich years and two seed-poor years. The hypotheses, that seed mass and seed abundance both enhance dispersal success and that seed abundance reinforces the effect of seed mass, were supported by the results. Most seeds were removed by the scatter-hoarding rodent red acouchy (*Myoprocta acouchy*) and subsequently were buried in scattered, single-seeded caches up to distances >100 m. Seeds that were not removed failed to establish seedlings. Seed removal was slower, pre-removal seed predation was greater, and seed dispersal was less far in seed-rich years than in seed-poor years, suggesting poorer dispersal under seed abundance. However, this was more than counterbalanced by a disproportionately greater survival of cached seeds in seed-rich years. The per capita probability of seed survival and seedling establishment was at least 4(1/2) times greater under seed abundance. Large seeds were removed faster, were more likely to be scatter-hoarded, and were dispersed farther away than smaller ones, resulting in a higher probability of seedling establishment for larger seeds. Size discrimination was greater under seed abundance, albeit only during seed removal. Overall, large seeds shed in rich years had the highest probability of seedling establishment. Hence, both larger seed size and greater seed abundance stimulate rodents to act more as dispersers and less as predators of seeds. We conclude that scatter-hoarding rodents can select for both large seed crops and large seeds, which may reinforce mast seeding.

**ISSN:** 0012-9615

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### Record 57 of 129

**Author(s):** Iida, S

**Title:** Indirect negative influence of dwarf bamboo on survival of *Quercus* acorn by hoarding behavior of wood mice

**Source:** FOREST ECOLOGY AND MANAGEMENT, 202 (1-3): 257-263 DEC 1 2004

**Abstract:** To clarify the influence of dwarf bamboo (*Sasa* spp.) on patterns of seed dispersal by wood mice, the destinations of 480 magnet-inserted acorns (*Quercus mongolica* var. *grosseserrata*) were tracked with a magnetic locator from autumn to the following spring at two adjoining sites in a broad-leaved deciduous forest, a *Sasa*-removed site and a *Sasa*-growing site. The disappearance speed of acorns placed at the *Sasa*-growing site was higher than at the *Sasa*-removed site. Of the 480 acorns, 285 (59.4%) were located in the spring. At the *Sasa*-removed site, acorns that were placed at 5 m and 15 m from the border of *Sasa* coverage tended to be transported to the adjoining *Sasa*-growing site. Meanwhile, the acorns placed at the *Sasa*-growing site tended to remain there. The details of transported site and the depth frequency distribution of acorns differed between the sites. The percent of surviving acorns found at the *Sasa*-growing site (1.1%) was significantly lower than that of acorns found at the *Sasa*-removed site (15.9%). These different patterns of seed dispersal by wood mice seemed to be caused by the strong habitat preference of wood mice for a site with rich forest floor vegetation. These results suggest that dense *Sasa* coverage not only directly inhibits regeneration of *Quercus* trees by shading their seedlings, but also indirectly inhibits their regeneration by providing a suitable habitat for wood mice and thereby causing high predation pressure for acorns at post-dispersal. Furthermore, this predation pressure of mice on acorns may operate even 15 m outside the *Sasa* coverage, showing rather negative consequences for directed dispersal. (C) 2004 Elsevier B.V. All rights reserved.

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**Record 58 of 129****Author(s):** DeMattia, EA; Curran, LM; Rathcke, BJ**Title:** Effects of small rodents and large mammals on Neotropical seeds**Source:** ECOLOGY, 85 (8): 2161-2170 AUG 2004

**Abstract:** The direct and indirect effects of seed predation by a Neotropical community of small rodents and large mammals were examined in a 1.5-year enclosure experiment in Corcovado National Park, Costa Rica. This park has an intact terrestrial mammalian community, including small rodents and large mammalian seed predators, an essential condition to quantify the dynamics of seed predation. To measure seed predation, three enclosure treatments (1.2 m radius x 1.5 m tall) in two forest types (primary vs. secondary forest) were monitored: (1) fenced enclosures that excluded large mammals, (2) fenced enclosures that excluded both large and small mammals, and (3) open controls. Tethered seeds were added from nine common species of canopy trees and lianas (seven families), and seed removal was measured from February 2001 to July 2002. Small rodents had significant negative effects on four of the nine seed species tested, and the effects of small rodents on seed, predation differed significantly from the effects of large mammals and insect/fungal pathogens. Small-rodent seed predation (both rates and total proportion destroyed) did not differ between secondary and primary forest habitats. Throughout the enclosure study, small-rodent populations were marked and recaptured to document their community composition and densities. Small-rodent population fluctuations were observed, and shifts in composition directly affected species-specific and community-wide seed predation. Fewer seeds were destroyed when small-rodent abundance was low. Small-rodent population fluctuations also had an indirect effect, reversing the relative importance of small rodents and large mammals and resulting in large mammals becoming the primary seed predators. This change did not only decrease total seed predation for some species; it had the additional effect of moving from a primarily negative interaction (seed predation from the small rodents) to the varied interactions of seed predation and seed dispersal (scatter-hoarding). This research illustrated that small-rodent community fluctuations are a mechanism responsible for variability in the process of Neotropical seedling regeneration.

**ISSN:** 0012-9658

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**Record 59 of 129****Author(s):** Pizo, MA; Vieira, EM**Title:** Granivorous birds as potentially important post-dispersal seed predators in a Brazilian forest fragment**Source:** BIOTROPICA, 36 (3): 417-423 SEP 2004

**Abstract:** In tropical forests, rodents exert a prominent role as post-dispersal seed predators, while other vertebrates apparently have a minor effect on seed predation. In some forest fragments in southeast Brazil, however, the density of rodents is unusually low, whereas terrestrial granivorous birds are abundant. In this study, we used seeds of a second-growth tree (*Croton priscus*, Euphorbiaceae) to investigate experimentally the relative importance of rodents and birds as seed predators in a forest fragment. We also estimated the density of terrestrial granivorous birds and trapped small mammals. Results indicate that, as a consequence of decreased rodent population and increased bird abundance, the latter are at least as important as the former as the main post-dispersal seed predators of *C priscus*. We interpret such apparent imbalance in the interaction between *C priscus* and their seed predators as a possible consequence of forest fragmentation.

**ISSN:** 0006-3606

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**Record 60 of 129****Author(s):** Xiao, ZS; Zhang, ZB; Wang, YS**Title:** Impacts of scatter-hoarding rodents on restoration of oil tea *Camellia oleifera* in a fragmented forest**Source:** FOREST ECOLOGY AND MANAGEMENT, 196 (2-3): 405-412 JUL 26 2004

**Abstract:** Few studies have evaluated the role of seed dispersal by animals (especially scatter-hoarding rodents) in natural restoration in fragmented forests. In order to assess the potential benefits of oil tea from natural dispersal by seed-caching rodents, we tracked the individual seeds with coded tin tags of oil tea *Camellia oleifera* (Theaceae), an economically important evergreen shrubs, by establishing artificial seed sources (mimicking natural seed rain) in a secondary stand (i.e. *Camellia*-poor stand, where no oil tea shrubs grow) in a fragmented forest in the Dujiangyan Region of Sichuan Province, China. Our results indicate that the total survival of the released seeds was zero, which confirms the hypothesis that poor seeding regeneration may be caused by poor seed sources and subsequent high rodent predation in fragmented secondary forests. As small rodents repeatedly handled the tagged seeds, the proportions of seed consumption (i.e. eaten) and removal were constant in both Dispersal I and Dispersal II, but the caching proportion significantly decreased and the missing proportion significantly increased. Our results also indicate that seed-caching rodents are important in promoting natural regeneration of oil tea through scatter-hoarding seeds in soil: (1) seed removal was high (91.2%); (2) many removed seeds were found to be cached (48.2% for the relocated seeds); (3) dispersal distances of the cached seeds ranged from 0 to 38 m (mean, 7.9 m); (4) 81.3% of the caches (including primary and secondary caches) contained only one seed. Therefore, seed-caching rodents could have the potential to help restore natural populations of oil tea if we increase oil tea seed sources in the *Camellia*-poor stands. (C) 2004 Elsevier B.V. All rights reserved.

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**Record 61 of 129****Author(s):** Ordóñez, JL; Retana, J**Title:** Early reduction of post-fire recruitment of *Pinus nigra* by post-dispersal seed predation in different time-since-fire habitats**Source:** ECOGRAPHY, 27 (4): 449-458 AUG 2004

**Abstract:** This study analyses the effects of post-dispersal predation of *Pinus nigra* seeds on the initial recruitment of this species in areas burned by large wildfires, where *P. nigra* shows very low regeneration. In three different habitats obtained in a gradient of time since fire in Catalonia (NE Spain), we have evaluated the effects of seed predators (ants, rodents and birds) on post-dispersal seed removal and early seedling establishment of *P. nigra* by using selective exclosures limiting their access to seeds. Ants were the most efficient seed predator group, followed by rodents and birds. The contribution of each group to overall predation showed large seasonal variations. The first seeds dispersed in winter were mainly predated by rodents, which also registered their highest abundance in this season of the year. In spring, at the end of the natural dissemination period of *P. nigra* seeds, ants became the major predators, this fact coinciding with their increased abundance. Birds showed the lowest predation values. In the seedling establishment experiment, only in the exclusion treatment of the three predator groups was there initial establishment in all habitats, especially in the recently burned area, where there was seedling establishment in all exclusion treatments. The post-dispersal seed predation by different animal groups and low seedling emergence in the different habitats obtained in this study, together with the low seed availability of *P. nigra* seeds in burned areas, do not predict a favourable outlook for the natural post-fire recolonization of this species, which might even affect its overall distribution area in the region.

**ISSN:** 0906-7590

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**Record 62 of 129****Author(s):** Beck, H; Gaines, MS; Hines, JE; Nichols, JD**Title:** Comparative dynamics of small mammal populations in treefall gaps and surrounding understorey within Amazonian rainforest**Source:** OIKOS, 106 (1): 27-38 JUL 2004

**Abstract:** Variation in food resource availability can have profound effects on habitat selection and dynamics of populations. Previous studies reported higher food resource availability and fruit removal in treefall gaps than in the understorey. Therefore, gaps have been considered "keystone habitat" for Neotropical frugivore birds. Here we test if this prediction would also hold for terrestrial small mammals. In the Amazon, we quantified food resource availability in eleven treefall gaps and paired understorey habitats and used feeding experiments to test if two common terrestrial rodents (*Oryzomys megacephalus* and *Proechimys* spp.) would perceive differences between habitats. We live-trapped small mammals in eleven gaps and understorey sites for two years, and compared abundance, fitness components (survival and per capita recruitment) and dispersal of these two rodent species across gaps and understorey and seasons (rainy and dry). Our data indicated no differences in resource availability and consumption rate between habitats. Treefall gaps may represent a sink habitat for *Oryzomys* where individuals had lower fitness, apparently because of habitat-specific ant predation on early life stages, than in the understorey, the source habitat. Conversely, gaps may be source habitat for *Proechimys* where individuals had higher fitness, than in the understorey, the sink habitat. Our results suggest the presence of source-sink dynamics in a tropical gap-understorey landscape, where two rodent species perceive habitats differently. This may be a mechanism for their coexistence in a heterogeneous and species-diverse system.

**ISSN:** 0030-1299

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**Record 63 of 129****Author(s):** Christian, CE; Stanton, ML**Title:** Cryptic consequences of a dispersal mutualism: Seed burial, elaiosome removal, and seed-bank dynamics**Source:** ECOLOGY, 85 (4): 1101-1110 APR 2004

**Abstract:** In moving seeds from one location to another, dispersers define the ecological context that a plant will experience throughout its lifetime. Because seed deposition sites may benefit one plant life cycle stage but not others, dispersal may give rise to a conflict between a plant's dispersal needs (e.g., predator escape) and its requirements for successful establishment (e.g., suitable habitat). In this study, we assessed the effects of two components of seed dispersal by ants (seed burial depth and elaiosome removal) at several stages during the recruitment of *Leucospermum truncatulum*, an ant-dispersed plant from the fynbos shrublands of South Africa. A seed-predator exclusion experiment revealed that the removal of elaiosomes significantly reduced rodent predation on seeds buried 1 cm deep and increased the viability of seeds that were not consumed. In contrast, we found that elaiosomes had no effect on the probability of a living seed emerging as a seedling. In a seed burial depth experiment in which predators were not excluded, deeper burial significantly enhanced seed survival, but this benefit came at the expense of reduced seedling emergence, delayed emergence, and smaller cotyledon size. Despite the potential importance of these seedling characteristics, elaiosomes and burial depth had no significant effect on seedling survival through the first year of this study. In contrast, burial depth had strong positive effects on the fraction of seeds that persisted in the seed bank. Although dormant individuals may die before germinating and reproducing, those that persist at greater soil depths can play a crucial role in rescuing populations from local extinction in unpredictable environments. Given the extreme variability in fire frequency in fynbos, the net effect of seed dispersal by ants on plant populations will depend on how temporal fluctuations in fire regimes influence cost-benefit thresholds related to seed dormancy and seed mortality.

**ISSN:** 0012-9658

**Record 64 of 129****Author(s):** Hollander, JL; Vander Wall, SB**Title:** Effectiveness of six species of rodents as dispersers of singleleaf pinon pine (*Pinus monophylla*)**Source:** OECOLOGIA, 138 (1): 57-65 JAN 2004

**Abstract:** The effectiveness of six species of rodents as dispersers of singleleaf pinon pine (*Pinus monophylla*) was investigated in field enclosures. The rodent species were Panamint kangaroo rat (*Dipodomys panamintinus*), Great Basin pocket mouse (*Perognathus parvus*), pinyon mouse (*Peromyscus truei*), deer mouse (*Peromyscus maniculatus*), least chipmunk (*Tamias minimus*), and white-tailed antelope ground squirrel (*Ammospermophilus leucurus*). Five measures of seed harvesting and caching behavior were assessed and used to calculate the effect of species on the probability of effective dispersal (i.e., movement of seeds to potential establishment sites) of pinon pine seeds. These measures were proportion of seeds harvested, proportion of harvested seeds that were scatter hoarded, relative dispersion of scatter-hoarded seeds, seedling emergence and seedling establishment. To evaluate the effects of the last two variables, a 2-year study of seed germination and seedling establishment was conducted in the field. Seedling survival was 72-90% for seedlings emerging from 1-4 cm deep but was markedly lower from surface caches and for depths >4 cm. All seedlings in the open microsite perished before the end of the first year, whereas 38-97% of seedlings under shrubs survived. Cache size did not affect seedling survival over the 2 years, but large caches reduced the total number of potential establishment sites. All six species harvested over 90% of the pinon seeds presented and scatter hoarded from 31% (pocket mouse) to 66% (chipmunk) of the seeds they harvested. Pinon mice and deer mice distributed seeds to more caches sites (i.e., put fewer seeds in caches) than the other species and, consequently, created more potential establishment sites. All species scatter hoarded seeds at depths suitable for seedling emergence, but pocket mice and pinon mice cached under shrubs more than the other species, the microhabitat where seedlings had the greatest probability of establishing. Factors that had the greatest effect on the probability of effective dispersal were microhabitat selection and cache size.

**ISSN:** 0029-8549**DOI:** 10.1007/s00442-003-1393-2

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**Record 65 of 129****Author(s):** Harrison, SK; Regnier, EE**Title:** Postdispersal predation of giant ragweed (*Ambrosia trifida*) seed in no-tillage corn**Source:** WEED SCIENCE, 51 (6): 955-964 NOV-DEC 2003

**Abstract:** Giant ragweed seeds have high nutritional value, consisting of 47% crude protein and 38% crude fat, and may be an important food source for rodent and invertebrate populations in agricultural and early successional ecosystems. We investigated temporal patterns of postdispersal giant ragweed seed predation on the soil surface of a no-tillage cornfield as affected by involucre (seed dispersal unit) size and presence or absence of crop residue. Cage exclusion experiments indicated that rodents and invertebrates were the principal predators of giant ragweed seed, and total predation of involucre over a 12-mo period beginning in November was 88%. Rodents were the greatest predators of giant ragweed involucre during fall and winter, and cumulative predation by February 1 in treatments with rodent access ranged from 39 to 43%. In contrast, giant ragweed involucre predation by invertebrates occurred mainly from May 1 to November 1. When rodent access to involucre was prevented, total involucre predation by invertebrates over a 12-mo period ranged from 57 to 78%. Rodents showed an initial preference for large involucre (> 4.8-mm diameter), and invertebrates preferred small involucre (< 4.8-mm diameter). Involucre covered with corn plant residue underwent less predation by rodents from November to February than uncovered involucre, but residue cover had no effect on seed predation by invertebrates. In a laboratory feeding trial, the carabid *Harpalus pensylvanicus* preferred seed of smooth pigweed and yellow foxtail to giant ragweed seed, suggesting that giant ragweed seed is an incidental rather than a preferred food source for some carabids. Because giant ragweed exhibits relatively low fecundity and short seed bank persistence, results of this study suggest that postdispersal predation may directly reduce giant ragweed recruitment the next year by reducing new seed bank inputs. However, seed losses from predation alone may be insufficient to maintain giant ragweed populations below economic threshold levels in no-tillage cornfields.

**ISSN:** 0043-1745

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**Record 66 of 129****Author(s):** Borchert, M; Johnson, M; Schreiner, DS; Wall, SBV**Title:** Early postfire seed dispersal, seedling establishment and seedling mortality of *Pinus coulteri* (D. Don) in central coastal California, USA**Source:** PLANT ECOLOGY, 168 (2): 207-220 SEP 2003

**Abstract:** Seedling recruitment in many highly serotinous populations of *Pinus coulteri* on California's central coast depends almost entirely on periodic, stand-replacing fire. Compared to serotinous pines of the Mediterranean Basin, little detailed information is available on the postfire demography of California closed-cone pines, including *P. coulteri*. In September 1996 a wildfire burned the 760-ha American Canyon Research Natural Area (RNA). Using aerial photography, we mapped burn severity of *P. coulteri*-chaparral woodlands and forests within the RNA. From May to September of 1997, we also quantified seedling establishment and mortality in relation to biophysical site characteristics including fire severity. Seventy-six percent of *P. coulteri* forests and woodlands experienced high-severity burns, 9% moderate-severity burns, and 15% low-severity or unburned. Of the 53 plots used for seedling counts, 70% were high-severity, 26% moderate-severity, and 4% low-severity. Seedling densities 13

months postfire were low (0.21 m(-2)), but seedling mortality also was low (8.4%). Aerial seed bank size increased from north-facing to south-facing slopes and from high-severity to low-severity burns. Seedling recruitment was unrelated to burn severity and increased with the size of the canopy seed bank (cone density). Many seedlings established from rodent seed caches; 23% of the seedlings established in clumps from seeds cached by *Dipodomys agilis*, *Chaetodipus californicus* and *Peromyscus maniculatus*. *Pinus coulteri* seeds have low potential for dispersal by wind, but secondary dispersal by rodents moves seeds away from source trees and into neighboring chaparral. We discuss the potential importance of rodent seed caching to postfire demography of California and Mediterranean serotinous pines.

ISSN: 1385-0237

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#### Record 67 of 129

**Author(s):** Stapp, P; Polis, GA

**Title:** Influence of pulsed resources and marine subsidies on insular rodent populations

**Source:** OIKOS, 102 (1): 111-123 JUL 2003

**Abstract:** Inputs of marine resources contribute to high consumer densities on small, barren islands in the and Gulf of California, Mexico. Episodes of rainfall associated with El Nino Southern Oscillation (ENSO) events, however, stimulate plant growth and seed production and replenish soil detritus and seed banks. We studied the effects of marine inputs and pulsed ENSO resources on rodent populations on islands before, during and after the strong 1997-1998 ENSO event. Stable isotope analysis was used to determine rodent diets. During dry years, *P. maniculatus* consumed marine prey near shore and on small islands, and were much more abundant in these areas than farther inland and on larger islands. Captures were particularly concentrated near shore on three islands inhabited by *Chaetodipus rudinoris*, a granivore that was numerous in inland areas. Following the ENSO, *Peromyscus maniculatus* increased in abundance by 408%, compared to only 160% for *C. rudinoris*, and new individuals invaded inland areas. *P. maniculatus* populations declined sharply the following year, however, whereas *C. rudinoris* populations remained relatively stable. In response to ENSO conditions, *P. maniculatus* ate more seeds on islands with *C. rudinoris* than on islands without *C. rudinoris*. *P. maniculatus* also increased less markedly and declined more quickly in abundance where *C. rudinoris* was present. We speculate that *P. maniculatus* is capable of rapid numerical response to resource pulses but depends on marine foods during dry years. *C. rudinoris* is restricted to islands with sufficient seed resources, but maintains stable populations by exploiting low-density seeds and caching seeds from wet years. On islands with both species, *C. rudinoris* restricts *P. maniculatus* to near-shore areas via interference, but spillover consumption of seeds by subsidized *P. maniculatus* may limit the response of *C. rudinoris* to ENSO resources. Combined with differences in life history and dispersal abilities, these ecological factors help explain the distinct biogeographic distributions of these rodents on Gulf islands.

ISSN: 0030-1299

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#### Record 68 of 129

**Author(s):** Theimer, TC

**Title:** Intraspecific variation in seed size affects scatterhoarding behaviour of an Australian tropical rain-forest rodent

**Source:** JOURNAL OF TROPICAL ECOLOGY, 19: 95-98 Part 1 JAN 2003

ISSN: 0266-4674

DOI: 10.1017/S0266467403003110

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#### Record 69 of 129

**Author(s):** Montiel, S; Montana, C

**Title:** Seed bank dynamics of the desert cactus *Opuntia rastrera* in two habitats from the Chihuahuan Desert

**Source:** PLANT ECOLOGY, 166 (2): 241-248 2003

**Abstract:** In desert environments the main input to the seed bank of many succulents is the seed rain through zoochory while high levels of granivory by rodents, birds and ants are the main cause of subsequent losses. In the patchy environment of arid lands the characteristics of both processes may vary between habitats causing differences in the recruitment of new genets. To test this hypothesis we used populations of the desert cactus *Opuntia rastrera* which has different recruitment rates in the two adjacent habitats where it grows. In *Opuntia*-dominated scrublands (nopaleras, density ca. 4,000 plants/ha) 1 seedling out of 7,000,000 seeds establish, whereas in grasslands (density ca. 100 plants/ha) this ratio is 1:20,000. From 1996 until 1998 the seed rain, seed removal by granivores and seed abundance in the soil were monitored in both habitats. Results showed striking differences in the dynamics of the seed bank of both habitats. Seed rain was 8.5 times bigger in nopaleras than in grasslands. In nopaleras most seeds were removed by rodents while the quantities of seeds removed by rodents, birds and ants in grasslands were similar. One year after dispersal (the time necessary to break seed dormancy) only 6% of original nopalera seeds and 12% of grassland seeds remained. After germination trials only 1% (ca. 15,000 seeds/ha) and 2% (ca. 2,500 seeds/ha) respectively were viable. These differences in the effective seed bank (6 times bigger in nopaleras) can not explain the differences in genet recruitment (which is several orders of magnitude bigger in grasslands). Apparently the between habitat difference in nurse plant availability and in rodent density (which inflict a strong herbivory upon seedlings) can explain the differences in genet recruitment. It is speculated that this between habitat difference in genet recruitment suggests that the species evolved in less extreme environments (e. g. grasslands) than desert scrublands which, in turn, are colonised due to the singular ability of *O. rastrera* for vegetative propagation.

ISSN: 1385-0237

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**Record 70 of 129****Author(s):** Li, HJ; Zhang, ZB**Title:** Effect of rodents on acorn dispersal and survival of the Liaodong oak (*Quercus liaotungensis* Koidz.)**Source:** FOREST ECOLOGY AND MANAGEMENT, 176 (1-3): 387-396 MAR 17 2003

**Abstract:** We used a new method of labeling seeds with small pieces of coded tin-tags to investigate the effect of rodent on the seed fate of Liaodong oak (*Quercus liaotungensis*) in a mountainous area (40degrees00'N, 115degrees30'E) of Beijing, China. In the fall of 1999 and 2000, a total of 1994 and 660 acorns were released and then seed loss was checked. Both sides of the 50 m wide transect were extensively checked to locate the tagged seeds or their fragments. The results indicated that *Apodemus speciosus*, *Rattus confucianus* and *A. agrarius* were potential Liaodong oak acorn predators. Nearly all acorns were consumed by small rodents within 10 days after acorn placement, demonstrating that seed predation was very heavy and that rodent predation contributes to the poor seed regeneration of the oak. The dispersal distances of most seeds were within 20 m. The dispersal distance of the buried seeds was the longest and it was in favor of seed survival and seedling recruitment. Rodents preferred to eat tagged seeds under dense shrub. This is mostly related to predation risk in different micro-environments. Rodents tended to bury the tagged seeds under dense shrub. This burial place of rodent does not favor the seedling recruitment of the oak. The rodents preferred to move seeds to the horizontal and down directions of a slope and this tendency would save energy for rodents. The seedling regeneration rate of tagged acorns were very low in 2 years. Rodent predation is the causative factor of low regeneration of Liaodong oak in the study region. (C) 2002 Elsevier Science B.V. All rights reserved.

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**Record 71 of 129****Author(s):** Obeso, JR; Fernandez-Calvo, IC**Title:** Fruit removal, pyrene dispersal, post-dispersal predation and seedling establishment of a bird-dispersed tree**Source:** PLANT ECOLOGY, 165 (2): 223-233 APR 2003

**Abstract:** The recruitment of a dioecious bird-dispersed tree, the holly *Ilex aquifolium* (Aquifoliaceae), was studied considering the stages of fruit removal by birds, seed rain, post-dispersal seed predation, seed germination and seedling survival. The main objective was to test the effect of different microhabitats within a beech forest on recruitment stages. Migrant thrushes were the main dispersers of this tree whose fruit crops were entirely removed during two study years. Seed rain was greatest beneath holly trees regardless of their sex and lowest in the open sites. Post-dispersal seed predation was examined by two experiments and did not differ between microhabitats despite its quantitative importance (about 70%). Seedling emergence, which probably corresponded to seeds from several cohorts, was greater beneath trees than in open sites and the density of second-yr to 5 cm seedlings depended on the presence-absence of ungulate herbivores and litter. While the former had a detrimental effect, the latter had a beneficial effect on seedling abundance. Seedling survival showed no significant variations between microhabitats but depended on seedling density in some microhabitats (holly, beech). Finally, the initial seed arrival seemed to determine microhabitat suitability for holly seedling establishment. However, under heavy browsing the density of seedlings may be strongly reduced leading to microhabitat homogeneity for holly seedling establishment.

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**Record 72 of 129****Author(s):** Vander Wall, SB**Title:** Masting in animal-dispersed pines facilitates seed dispersal**Source:** ECOLOGY, 83 (12): 3508-3516 DEC 2002

**Abstract:** Masting increases the efficiency of wind pollination and satiates seed predators, but there is little evidence that masting facilitates seed dispersal by animals. Masting in pines was studied over three field seasons by simulating seed crops in synchrony (mast years, autumn 1998 and 1999) or out of synchrony (non-mast year, autumn 2000) with the local population. Rodents removed simulated wind-dispersed Jeffrey pine (*Pinus jeffreyi*) and sugar pine (*Pinus lambertiana*) seeds significantly more rapidly in mast years than in the non-mast year. Radioisotopes were used to follow the fates of individual pine seeds taken from three source trees. Rodents cached nearly all experimental seeds in mast and non-mast years, making 562 caches in 1998, 510 caches in 1999, and 1034 caches in 2000. Mean dispersal distances of seeds in primary caches were 5.9 and 4.6 m (28.6% and 22.1%) farther in the two mast years than in the non-mast year. Rodents often excavated cached seeds and moved them to new sites (secondary caching). During mast years, some seeds were found in as many as three cache sites, but during the non-mast year, the level of secondary caching approximately tripled, with some seeds being found in five or six separate cache sites. Large seed crops were associated with reduced secondary caching of seeds, reduced seed consumption, and greater seed survival in the following spring. Animal-mediated seed dispersal may be a selective force, along with predator satiation and increased efficiency of wind pollination, driving temporal variation in seed production in some large-seeded pines.

ISSN: 0012-9658

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**Record 73 of 129**

**Author(s):** Rey, PJ; Garrido, JL; Alcantara, JM; Ramirez, JM; Aguilera, A; Garcia, L; Manzaneda, AJ; Fernandez, R

**Title:** Spatial variation in ant and rodent post-dispersal predation of vertebrate-dispersed seeds

**Source:** FUNCTIONAL ECOLOGY, 16 (6): 773-781 DEC 2002

**Abstract:** 1. Post-dispersal predation of vertebrate-dispersed seeds has received little attention in the Mediterranean region. We investigated the spatial variation in post-dispersal seed predation of vertebrate-dispersed plants and its potential implications for plant diversity in fleshy fruited plant communities of southern Spain.

2. An experiment was conducted in forests and open scrubland at mid- and high elevations to explore: (a) the possibility of differential seed predation by rodents and granivorous ants; (b) the spatial variation, between and within habitats, in post-dispersal seed predation and predator abundance; and (c) whether the spatial distribution of predation covaries among plant species.

3. Rodents and granivorous ants proved to be important predators of vertebrate-dispersed seeds, and showed significant variation in their preferences for different seed species. Granivorous ant preferences depended on seed size, as seeds heavier than 20 mg were hardly ever removed. Rodents were indifferent to seed size.

4. Sites safe from predators were more frequent at mid-elevations. In contrast to other temperate communities, successional status (open scrubland vs forest) did not determine the probability of predation, probably because ants are more important as seed predators in the early successional stages of Mediterranean habitats than in other temperate communities. The large-scale variations in the occurrence of safe sites for the seeds depended on resource abundance rather than on predator abundance.

5. We found a significant interaction in seed predation rates between microhabitat and seed species at mid-elevations, but not in high-elevation habitats, implying stronger covariance across plant species in the microhabitats adequate for recruitment (e.g. with lower predation risk) at high elevation. This pattern may contribute to the differential plant diversity at mid- and high elevations in Mediterranean fleshy fruited plant communities. Theoretical models predict that seed predators may contribute to the maintenance of species diversity if the spatial distribution of safe sites from predators is uncorrelated across plant species, as it was at mid-elevations.

**ISSN:** 0269-8463

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#### Record 74 of 129

**Author(s):** Leigh, EG; Cosson, JF; Pons, JM; Forget, PM

**Title:** How does the study of forest isolates provide better knowledge about the organization of a tropical forest?

**Source:** REVUE D ECOLOGIE-LA TERRE ET LA VIE: 181-194 Suppl. 8 2002

**Abstract:** Small forested islands isolated from surrounding tropical forest by new reservoirs provide a norm for interpreting the effects of fragmentating the forest by intervening agriculture and pasture, and an effective means of investigating the ecological organization of the mainland forest. Water is a more effective barrier to immigration and a more neutral matrix than field or pasture. On forest fragments isolated by water, the effects of fragmentation are minimally confounded with effects of the matrix, while forest fragments surrounded by fields and pastures may suffer intrusions from fire, domestic animals, and other pests. On small islands, some species will go extinct. If the extinction of a species is followed by increase in its prey or competitors, we may provisionally assume that on the mainland, these prey and competitors are limited by the species now absent from the island. If, when a tree's seed disperser disappears, new seedlings of that tree no longer appear, that tree's regeneration presumably depends on its seed disperser. Islands in new reservoirs are the tropical forest ecologist's closest analogue to the exclusion experiments so effective in understanding the ecology of inter-tidal communities. Small islands in reservoirs can also serve as systems of replicates for experimental analysis of the causes of regulation of selected populations. We review work on small islands isolated in 1914 by Panama's Gatun Lake, islands isolated in 1986 by Venezuela's Lake Guri, and islets isolated in 1994 at Saint-Eugene in French Guiana. The more recently the islands have been isolated, the more can be learned from them. The Saint-Eugene Fragmentation Project is particularly important because it is only one of the three in true rainforest and studies there have been done before and after fragmentation.

**ISSN:** 0249-7395

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#### Record 75 of 129

**Author(s):** Crespin, L; Verhagen, R; Stenseth, NC; Yoccoz, NG; Prevot-Julliard, AC; Lebreton, JD

**Title:** Survival in fluctuating bank vole populations: seasonal and yearly variations

**Source:** OIKOS, 98 (3): 467-479 SEP 2002

**Abstract:** For most organisms, both within-year (i.e. seasonal) and between-year variations in demography are important components in shaping the population dynamic patterns observed on a multiannual scale. These two sources of variation have, however, rarely been studied simultaneously. Most of the recent work on small rodent population dynamics, for example, has focused on between-year variation. Densities of seed- and fruit-eating rodents, such as the bank vole (*Clethrionomys glareolus*), are in particular known to have between-year variation related to seed crop production. Here we report on the analysis of a long-term (1976-1982) capture-mark-recapture (CMR) study of the bank vole in Belgium. The study was done on two grids, an open and a fenced grid. As part of the CMR statistical analysis, we propose a general modelling approach which allows for a detailed understanding of the relative importance of seasonal and between-year variation in survival. We demonstrate that most of the seasonal variation corresponds to a lower apparent survival in spring compared to the rest of the year. During winter, apparent survival was lower on the open grid than on the fenced grid. Dispersal is therefore concluded to be an important determinant of the seasonal pattern. The between-year variation in survival is largely attributable to variation in seed crops, and is comparable in

magnitude to the seasonal variation.

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#### Record 76 of 129

**Author(s):** Munoz, AA; Arroyo, MTK

**Title:** Postdispersal seed predation on *Sisyrinchium arenarium* (Iridaceae) at two elevations in the central Chilean Andes

**Source:** ARCTIC ANTARCTIC AND ALPINE RESEARCH, 34 (2): 178-184 MAY 2002

**Abstract:** Postdispersal seed predation in alpine communities has received surprisingly little attention. We evaluate the magnitude of seed predation by ants and avian granivores in the perennial herb *Sisyrinchium arenarium* through a field experiment at two different elevations (2700 and 2000 in) in the central Chilean Andes. A total of 96 pots, containing 50 seeds each, were placed at each elevation and randomly assigned to one of four treatments: control, bird exclusion, ant exclusion, and total exclusion (wind control). We also compare the activity of ants and avian granivores at the two elevations. Mean percentage seed removal by wind was 23 and 21% at 2700 and 2000 in elevation, respectively. Overall, after subtracting seed loss by wind, seed removal by granivores was low at both sites (2-14%), although it was significantly greater at the higher elevation (2700 m). This was concordant with the greater activity of ants and granivorous birds there. Seed removal by ants was greater than by birds at the higher site (14 vs. 4%, respectively), but did not differ at the lower elevation (3 vs. 2%, respectively). Results contrast with those reported for central Chilean mediterranean-type climate shrublands at lower elevations where avian and rodent granivory is important, while that by ants is low. Future studies considering plant species with different seed characteristics (e.g., size, shape, energetic Value) and taxonomic affiliation will be necessary to assess the general importance of this ecological process in the central Chilean Andes and alpine areas in general.

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#### Record 77 of 129

**Author(s):** Andresen, E

**Title:** Primary seed dispersal by red howler monkeys and the effect of defecation patterns on the fate of dispersed seeds

**Source:** BIOTROPICA, 34 (2): 261-272 JUN 2002

**Abstract:** The effectiveness of a seed disperser depends on the quantity and quality of dispersal. The quality of dispersal depends in large part on factors that affect the post-dispersal fate of seeds, and yet this aspect of dispersal quality is rarely assessed. In the particular case of seed dispersal through endozoochory the defecation pattern produced has the potential of affecting the fate of dispersed seeds and consequently, dispersal quality and effectiveness. In this study, I assessed the effects of dung presence and dung/seed densities on seed predation by rodents and secondary dispersal by dung beetles. In particular, I compared seed fates in clumped defecation patterns, as those produced by howler monkeys, with seed fates in scattered defecation patterns, as those produced by other frugivores. I also determined the prevalence of red howler monkeys (*Alouatta seniculus*) as seed dispersers at the plant community level in Central Amazonia by determining the number of species they dispersed in a 25-month period. I found that dung presence and amount affected rodent and dung beetle behavior. Seed predation rates were higher when dung was present, and when it was in higher densities. The same number of seeds was buried by dung beetles, in clumped versus scattered defecation patterns, but more seeds were buried when they were inside large dung-piles versus small piles. Seed density had no effect on rodent or dung beetle behavior. Results indicate that caution should be taken when categorizing an animal as a high or low quality seed disperser before carefully examining the factors that affect the fate of dispersed seeds. Red howler monkeys dispersed the seeds of 137 species during the study period, which is the highest yet reported number for an *Alouatta* species, and should thus be considered highly prevalent seed dispersers at the plant community level in Central Amazonian terra firme rain forests.

ISSN: 0006-3606

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#### Record 78 of 129

**Author(s):** Villagra, PE; Marone, L; Cony, MA

**Title:** Mechanisms affecting the fate of *Prosopis flexuosa* (Fabaceae, Mimosoideae) seeds during early secondary dispersal in the Monte Desert, Argentina

**Source:** AUSTRAL ECOLOGY, 27 (4): 416-421 JUN 2002

**Abstract:** The fate of seeds during secondary dispersal is largely unknown for most species in most ecosystems. This paper deals with sources of seed output of *Prosopis flexuosa* D.C. (Fabaceae, Mimosoideae) from the surface soil seed-bank. *Prosopis flexuosa* is the main tree species in the central Monte Desert, Argentina. In spite of occasional high fruit production, *P. flexuosa* seeds are not usually found in the soil, suggesting that this species does not form a persistent soil seed-bank. The magnitude of removal by animals and germination of *P. flexuosa* seeds was experimentally analysed during the first stage of secondary dispersal (early autumn). The proportion of seeds removed by granivores was assessed by offering different types of diaspores: free seeds, seeds inside intact endocarps, pod segments consisting of 2-3 seeds, and seeds from faeces of one herbivorous hystricognath rodent, the mara (*Dolichotis patagonum*). The proportion of seeds lost through germination was measured for seeds inside intact endocarps, seeds inside artificially broken endocarps, and free seeds. Removal by ants and mammals is the main factor limiting the formation of a persistent soil seed-bank of *P. flexuosa*: >90% of the offered seeds were removed within 24 h of exposure to granivores in three of four treatments. Seeds from the faeces of maras, on the other hand, were less vulnerable to

granivory than were other types of diaspores. These results suggest that herbivory might be an indirect mechanism promoting seed longevity in the soil (and likely germination) by discouraging granivore attack. On the other hand, germination did not seem to have an important postdispersal impact on the persistence of *P. flexuosa* seeds in the soil. Both direct and indirect interactions between vertebrate herbivores and plants may foster *P. flexuosa*'s seed germination in some South American arid zones.

ISSN: 1442-9985

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#### Record 79 of 129

**Author(s):** Mangan, SA; Adler, GH

**Title:** Seasonal dispersal of arbuscular mycorrhizal fungi by spiny rats in a neotropical forest

**Source:** OECOLOGIA, 131 (4): 587-597 MAY 2002

**Abstract:** Many species of neotropical rodents consume and subsequently disperse viable spores of arbuscular mycorrhizal fungi (AMF). Consequently, rodents may be important determinants of both AMF and tree community composition in neotropical forests. We examined the influence of both availability of other food resources and season on the consumption and subsequent dispersal of AMF spores by *Proechimys semispinosus* (the Central American spiny rat) from seven island populations located in Gatun Lake, Panama over a 13-month period. For each island population, we examined the relationship between monthly spore occurrence in fecal pellets and monthly density of trees and lianas producing ripe fruit. During the last 3 months of this study, five islands were provisioned with extra food, while two islands remained unmanipulated to test experimentally whether spiny rats consumed AMF only as an alternative resource when primary resources (fruit) were scarce. Consumption of AMF was highly seasonal, with spores being most common in fecal samples at the end of the rainy season and least common at the end of the dry season. Cross-correlation analysis and logistic regression analysis indicated that spore occurrence in feces varied synchronously among islands and was related positively to soil moisture and unrelated to natural fruit availability. After inoculation with AMF spores isolated from feces, AMF colonized roots of *Paspalum notatum* (bahia grass) grown in sterilized soil, and total dry weights of host plants increased, confirming the viability of AMF spores passed by spiny rats. The ubiquity of viable spores from several species of AMF occurring in feces of *P. semispinosus* implicates this rodent as an important AMF disperser. Furthermore, dispersal of AMF spores by spiny rats was not limited to ephemeral periods of primary resource scarcity, thus suggesting that *P. semispinosus* may influence tree seedling survival by making spores of their mutualistic fungi available throughout the rainy season, a period critical to the establishment of newly germinated seedlings.

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DOI: 10.1007/s00422-002-0907-7

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#### Record 80 of 129

**Author(s):** Garcia, JDD

**Title:** Interaction between introduced rats and a frugivore bird-plant system in a relict island forest

**Source:** JOURNAL OF NATURAL HISTORY, 36 (10): 1247-1258 JUN 2002

**Abstract:** The seed dispersal system formed by the fleshy-fruited shrub *Viburnum tinus* L. (Caprifoliaceae) and the bird *Erithacus rubecula* L. is known to occur in both the Mediterranean basin and the laurel forest of the Canary Islands. The latter is invaded by the ship rat *Rattus rattus* L. This situation allows (1) the comparison of oceanic island and mainland situations for the bird-plant interaction, and (2) quantification of the possible effects of an invading species on the plant, and thus on the whole seed dispersal system. Fruit removal by birds and rats was studied for *V. tinus* in a laurel forest of Tenerife during a fruiting season to assess patterns of disperser and predator's use of the plant. Fruits were persistent in time and spontaneous fruit loss rate was low. It was exploited by a reduced frugivorous community. Its fruits were dispersed almost exclusively by *E. rubecula* at extremely low rates, whereas *R. rattus* rapidly predated the bulk of the crops. Fruit removal by *E. rubecula* was influenced by vegetation structure and fruit crop size (higher removal rates from gaps or sparse and low canopy patches, and from larger fruit displays). Fruit predation by *R. rattus* was not related to microhabitat or individual plant traits. Fruit removal by *R. rattus* had no apparent influence on the pattern of bird frugivory. However, later in the fruiting season, heavy fruit depletion by rats restrained fruit availability for birds. The mainland (Mediterranean) *V. tinus*-*E. rubecula* dispersal system is strikingly different from this island counterpart in: (1) the virtual irrelevance of rodent seed predation, and (2) the comparatively high incidence of bird frugivory by the exclusive seed disperser, *E. rubecula*.

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DOI: 10.1080/00222930110039594

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#### Record 81 of 129

**Author(s):** Midgley, J; Anderson, B; Bok, A; Fleming, T

**Title:** Scatter-hoarding of Cape Proteaceae nuts by rodents

**Source:** EVOLUTIONARY ECOLOGY RESEARCH, 4 (4): 623-626 MAY 2002

**Abstract:** Most large-seeded shrubs and trees from Mediterranean shrublands are either serotinous (canopy stored seeds) or myrmecochorous (ant-buried). It has been hypothesized that these traits evolved to prevent access to the seeds by rodents. Here we present the first field evidence of a third guild, scatter-hoarding of nuts in the genus *Leucadendron* (Proteaceae) from the south-west Cape. The rodent concerned is *Acomys subspinosus*, a small (<20 g) south-west Cape endemic murid. Seeds are

typically buried singly, less than 2 cm deep and at distances of up to 5 m from seed depots. This finding has implications for the understanding of the evolution of myrmecochory and serotiny in shrublands. It extends the evolution of cached-nuts to a new family and is one of the first records of scatter-hoarding, outside of forests, in the southern hemisphere.

ISSN: 1522-0613

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#### Record 82 of 129

**Author(s):** Dutech, C; Seiter, J; Petronelli, P; Joly, HI; Jarne, P

**Title:** Evidence of low gene flow in a neotropical clustered tree species in two rainforest stands of French Guiana

**Source:** MOLECULAR ECOLOGY, 11 (4): 725-738 APR 2002

**Abstract:** The spatial genetic structure of the neotropical, clustered tree species *Vouacapoua americana* (Aublet) was studied in two natural forest stands (Paracou and Nouragues) in French Guiana. Using eight microsatellite loci, *V. americana* is characterized by a marked genetic structure at small spatial distances (under 30-60 m), in agreement with the limited seed dispersal by rodent species. Gene flow through pollen is also shown to be mainly restricted to less than 100 m. This result suggests that most pollination events (mediated through small insects) are probably limited to within-patches of individuals, which might explain the high genetic differentiation among patches ( $F_{ST} = 0.11$ ) separated by less than 2 km. We also assume that stronger genetic structure in Paracou is likely to be due to lower seed dispersal by rodents, large spatial distances separating patches, or a recent recolonization event.

ISSN: 0962-1083

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#### Record 83 of 129

**Author(s):** Hewitt, N; Kellman, M

**Title:** Tree seed dispersal among forest fragments: II. Dispersal abilities and biogeographical controls

**Source:** JOURNAL OF BIOGEOGRAPHY, 29 (3): 351-363 MAR 2002

**Abstract:** Aim To investigate the medium to long-distance dispersal abilities of temperate hardwood tree species and the ecological controls on dispersal, including distance to and connectivity with seed sources, seed source strength, and species dispersal mechanism and seed size.

Location A fragmented forest system in the Long Point region, Southern Ontario.

Methods Pine plantations were the 'seed traps' in which seedlings of hardwood species were enumerated to indicate past dispersal events. The influence of distance to seed sources, dispersal mechanism and seed mass on the probability of dispersal to plantations were evaluated using logistic analysis. Regression analysis was used to determine the effect of seed source strength (mature tree abundance within 150 m of plantations) on seedling density in plantations. Connectivity was assessed by comparing the strength of correlations between seedling abundance in plantations and the abundance of mature trees around plantations in connected vs. unconnected source areas.

Results Seedling presence in plantations decreased significantly with distance from the nearest potential seed source for species grouped according to dispersal mechanism. Probabilities of seedling presence were greater than or equal to 0.8 at 25 m distances, decreasing to under 0.3 at 175 m distances. While twenty-seven of twenty-nine species were present in at least one plantation with a seed source within 25 m, only thirteen of twenty-seven species occurred in plantations with a seed source greater than or equal to 100 m away, and only nine of twenty-four species in plantations greater than or equal to 150 m from seed sources, indicating limited potentials for interfragment migration. Seed source strength was significantly related to seedling density in plantations for twelve of fifteen species tested, indicating the importance of species commonness to interfragment migration. Connectivity was not related to dispersal frequency in the system, but this finding applies to a relatively well-connected system of forests and plantations and is expected to differ for systems with greater patch isolation. In addition to these general controls, dispersal was related to species dispersal mechanism. Seed size was negatively related to dispersal frequency, but only within the rodent dispersal spectra. Bird-dispersed species appeared to have superior interfragment dispersal abilities, closely followed by lighter seeded rodent- and wind-dispersed species. Large-seeded rodent-dispersed species (*Juglans* spp., *Quercus macrocarpa*) and species lacking well-developed adaptations for dispersers were infrequent in plantations generally, and with the exception of *Q. macrocarpa*, were absent from plantations more than 50 m from seed sources. Species dispersal abilities were ranked according to dispersal mechanism and seed size such that: bird > lighter-seeded rodent = wind > larger-seeded rodent = unspecialized. Main conclusions Distance to seed sources appears to be a key determinant of patch colonization. Infrequent dispersal over distances of >100-150 m for most species in this system raises concerns about the abilities of tree species to be sustained in fragmented forests. For some species, distances of as little as 50 m appear to be isolating, and these, in particular, risk regional extinctions over time scales depending on their local population persistence. Artificial introductions may be needed to maintain fragmented tree populations, particularly for rare species and those with poor dispersal indicated in this study.

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#### Record 84 of 129

**Author(s):** Wright, SJ; Duber, HC

**Title:** Poachers and forest fragmentation alter seed dispersal, seed survival, and seedling recruitment in the palm *Attalea butyracea*, with implications for tropical tree diversity

**Source:** BIOTROPICA, 33 (4): 583-595 DEC 2001

**Abstract:** We examined the interaction between a palm and two bruchid beetles along with several mammal species to explore how poachers and habitat fragmentation may indirectly alter the spatial pattern of seed dispersal, seed predation, and seedling recruitment in central Panama. The large, stony endocarps of *Attalea butyraceae* decay slowly and bear distinctive scars when opened by rodents or beetles. We determined the final distance between endocarps and reproductive trees (which we call an ecologically effective dispersal distance), the predation status of each endocarp, and the distance between seedlings and reproductive trees. The 68 focal trees were divided among 14 sites and four levels of anthropogenic disturbance. Levels of disturbance included full protection from poachers, light and heavy pressure from poachers, and small island habitat fragments. Ecologically effective seed dispersal distances were greatest for protected sites, intermediate for lightly poached sites, and shortest for heavily poached sites and habitat fragments. Seed predation by rodents increased with distance to the nearest reproductive *Attalea* and was greatest for fully protected sites, intermediate for lightly poached sites, and least for heavily poached sites and habitat fragments. Seed predation by beetles reversed the patterns described for seed predation by rodents. Total seed predation by beetles and rodents combined was independent of distance, greatest for fully protected sites, and lower for poached sites and habitat fragments. Seedling densities were always greatest close to reproductive trees; however, the increase in seedling densities close to reproductive trees was minimal for fully protected sites, clearly evident for poached sites, and pronounced for habitat fragments. Increased seedling recruitment near conspecific trees may in time reduce tree diversity where humans disrupt mammal communities.

ISSN: 0006-3606

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### Record 85 of 129

**Author(s):** Longland, WS; Jenkins, SH; Vander Wall, SB; Veech, JA; Pyare, S

**Title:** Seedling recruitment in *Oryzopsis hymenoides*: Are desert granivores mutualists or predators?

**Source:** ECOLOGY, 82 (11): 3131-3148 NOV 2001

**Abstract:** Granivorous animals that cache as well as consume seeds may actually serve as mutualists to their plant resources. Seeds of Indian ricegrass (*Oryzopsis hymenoides*), a perennial bunchgrass in North American deserts, are consumed by various desert granivores and dispersed by seed-caching heteromyid rodents. We used a three-way factorial design at a western Nevada site to selectively exclude or allow access to experimental plots by granivorous rodents and seed harvester ants, and to subsequently follow the fate of radiolabeled Indian ricegrass seeds introduced to the plots. In addition to the presence or absence of rodents or ants, the third experimental treatment factor was to allow "initial caching" of the radiolabeled seeds by single Merriam's kangaroo rats (*Dipodomys merriami*), which were confined to certain plots for one night. Both rodents and ants larder-hoarded seeds in their burrows, but seedlings rarely established from larders. Only rodents also placed seeds in scatterhoards: shallowly buried surface caches distributed about an animal's home range. Following initial caching by a kangaroo rat, the number of seedlings established from scatterhoards was significantly greater (usually by more than an order of magnitude) than those from seeds unharvested by either type of granivore. With no initial caching, rodents reduced seedling recruitment from unharvested seeds but facilitated compensatory seedling recruitment from scatterhoards. Seeds harvested by ants seldom established seedlings. We used a seed fate model to estimate that, on average, rodents and ants harvested 96% and 7%, respectively, of seeds to which they had exclusive access, and that the probability of seedling establishment for a seed harvested by a rodent was an order of magnitude greater than from a seed harvested by an ant and slightly greater than for an unharvested seed. The predicted rank order of seedling recruitment among nine experimental treatments based on expected effects of rodent seed caching closely matched the observed ranking pattern, indicating that rodents determined seedling recruitment patterns of Indian ricegrass. Because rodents harvested such a large majority of seeds and their caches enhanced seedling establishment, they played a central role in the population dynamics of Indian ricegrass.

ISSN: 0012-9658

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### Record 86 of 129

**Author(s):** Ter Steege, H; Hammond, DS

**Title:** Character convergence, diversity, and disturbance in tropical rain forest in Guyana

**Source:** ECOLOGY, 82 (11): 3197-3212 NOV 2001

**Abstract:** The level of tree diversity varies greatly between sites in Guyana and decreases along a gradient from south to north. We conducted a study to understand what controls this gradient of diversity using data from country-wide forest inventories. Analysis of tree diversity on the basis of soil and rainfall effects in an area of 15 x 10(6) ha showed that soil exerts a strong local effect on tree diversity, whereas rainfall, potential evapotranspiration, and length of the dry season do not. Community averages of disturbance-sensitive attributes of trees, such as seed mass or wood density, were not correlated with variation in either rainfall or soil, but were strongly correlated with tree diversity. As such, the forests in central Guyana were characterized by generally a high average wood density, large seeds, and rodent or unassisted dispersal. These forests also displayed the highest single dominance, thus lowest diversity and low percentages of pioneers in the community. The more highly diverse forests in south Guyana showed much lower average community wood density and seed mass, and bird and primate dispersal were more common than in central Guyana. Large-scale spatial variation in diversity and community averages of life history characteristics are here considered the product of local convergence of species with similar characteristics. Characteristics bestowing competitive superiority in environments with little disturbance ultimately lead to a decline in diversity through competitive exclusion, much as that predicted by the intermediate disturbance hypothesis and dynamic equilibrium theory. The more diverse communities are associated with characteristics of superior colonizers: low wood density, small seeds, and good dispersal. Variation in diversity at smaller

spatial scales is strongly affected by soils.

ISSN: 0012-9658

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#### Record 87 of 129

**Author(s):** Maron, JL; Simms, EL

**Title:** Rodent-limited establishment of bush lupine: field experiments on the cumulative effect of granivory

**Source:** JOURNAL OF ECOLOGY, 89 (4): 578-588 AUG 2001

**Abstract:** 1 Plants often suffer substantial loss of seeds to consumers. However, because the seed-to-seedling transition is frequently ignored, quantitative estimates of the effects of seed consumers on plant population dynamics are rare.

2 We examined how post-dispersal seed predation by rodents affected seedling emergence and subsequent adult plant abundance of bush lupine (*Lupinus arboreus*), a large N-fixing shrub common to coastal dunes in California. We monitored patterns of seedling emergence and survival over 3 years for seeds sown into exclosed and control plots.

3 We sowed additional cohorts of seeds in the second and third years and compared interannual variation in emergence patterns.

4 Rodent exclusion substantially reduced seedling emergence, with an average of 109 seedlings emerging over 3 years from 476 seeds sown in rodent exclusion plots vs. 26 from control plots. The intensity of granivory, however, varied between years, with rodent exclusion increasing emergence from seeds sown in year one, but not in year two.

5 Winter seedling mortality, due to cutworm herbivory, was similarly high in rodent-free and control plots, and its net impact was to reduce the difference in seedling abundance. Thus, by mid-summer in each of the three years, there were only marginally more seedlings in rodent-excluded vs. control plots.

6 The cumulative effect of protecting seeds, was, however, large. After 3 years, an average of four adult lupines were established in rodent-free plots, whereas only 0.5 were found in control plots and lupine biomass was more than 5-fold higher in exclusion plots.

7 Taken together, the results indicate that rodents play a critical role by limiting the abundance and biomass of a large N-fixing shrub in dunes.

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#### Record 88 of 129

**Author(s):** Garcia, D; Zamora, R; Gomez, JM; Hodar, JA

**Title:** Frugivory at *Juniperus communis* depends more on population characteristics than on individual attributes

**Source:** JOURNAL OF ECOLOGY, 89 (4): 639-647 AUG 2001

**Abstract:** 1 We investigated the spatio-temporal variation in the interactions between the juniper *Juniperus communis* and its vertebrate frugivores (avian dispersers of *Turdus* spp. and predatory rodents *Apodemus sylvaticus*) in the Mediterranean mountains of south-east Spain.

2 Frugivore activity was evaluated at six sites and for 3 years, in relation to both plant reproductive traits (plant size, cone crop and cone size) and characteristics of the immediate environment (distance to the nearest female, abundance of perches, fruiting environment and habitat).

3 Plant characteristics and levels of frugivory varied strongly among the six populations. Cone production, cone size and frugivory also differed significantly among years for the same population. Avian frugivory was only occasionally affected by density of cones per plant, abundance of perches or abundance of other fruiting species, or by habitat. Rodent predation was positively related only to the density of cones per plant and then only in two sites.

4 Levels of both avian frugivory and rodent predation significantly increased in populations with higher cone production.

5 Both groups of vertebrate frugivores responded to the spatio-temporal variation in cone abundance at a regional scale, discriminating more between juniper populations than between individual plants within a population. The outcome of interactions with frugivores at the individual plant level thus proved more dependent on the whole-population characteristics than on individual attributes.

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#### Record 89 of 129

**Author(s):** Forget, PM; Rankin-De Merona, JM; Julliot, C

**Title:** The effects of forest type, harvesting and stand refinement on early seedling recruitment in a tropical rain forest

**Source:** JOURNAL OF TROPICAL ECOLOGY, 17: 593-609 Part 4 JUL 2001

**Abstract:** Maintenance of high plant diversity in tropical rain forests has been hypothesized to be related to intense seed predation, and studies have shown that the impact of seed-eaters varies according to seed size, forest type and level of disturbance. The hypothesis that seed survival and seedling recruitment depending on seed size, are related to forest type and the intensity of harvesting and stand refinement was therefore tested at Paracou, French Guiana, for three animal-dispersed tree species. Two forest areas, corresponding to two forest types, were selected based on the occurrence of a dominant species, *Eperua falcata* (Caesalpinaceae). Two factors were tested: forest type (*E. falcata*-rich and *E. falcata*-poor) and level of harvesting (unlogged, low intensity of logging, low intensity of logging and thinning liberation by tree-poison girdling) within each forest type. Overall, there was no effect of species nor of logging treatment within forest type after 6 wk. There was only a significant effect of forest type on seed survival in the large-seeded *Carapa procera*, a rodent-dispersed species in the Meliaceae.

In the two medium-sized seed species, *Pradosia cochlearia* and *Manilkara bidentata*, two frugivore-dispersed Sapotaceae, the effect of treatment was overall significant but was also highly variable between plots within treatments. After 1 y, *C. procera* showed little seedling recruitment due to low seed removal and dispersal, and high seed-seedling predation under all conditions. Neither forest type, nor treatment nested within forest type, affected seedling recruitment in *P. cochlearia* whereas *M. bidentata* seedlings were favoured in unlogged conditions at the *E. falcata*-poor forest type. These results suggest that species characteristics (such as seed size and palatability), or local tree diversity and resources for granivores select for contrasting patterns in tree recruitment between forest type in the rodent-dispersed tree species, and these interact with level of tree harvesting and stand refinement in the other frugivore-dispersed tree species.

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#### Record 90 of 129

**Author(s):** Brewer, SW; Webb, MAH

**Title:** Ignorant seed predators and factors affecting the seed survival of a tropical palm

**Source:** OIKOS, 93 (1): 32-41 APR 2001

**Abstract:** In addition to acting as seed predators, some terrestrial mammals bury seeds via scatter hoarding. This study system used two permanent plots in examining the interaction between small rodents and the seeds of the palm *Astrocaryum mexicanum*. We tested how experimental burial, and fruiting status of the parent, distance to the parent, seed size, and microsite characteristics affect the survival of these seeds. Up to 34% of the buried seeds that were exposed only to ignorant rodent foragers (individuals not responsible for burial) survived. In comparison, less than 1% of seeds buried by scatter hoarding rodents survived in previous studies, a percentage that is comparable to the low survival of unburied seeds in this study (<2%). Although unburied seeds had very low survival, increasing distance and/or seed density positively affected survival of unburied seeds. Distance to parent had no effect on buried seed survival.

Buried seed survival was most strongly and significantly determined by the fruiting status of the trees under which they occurred. Seeds experienced significantly greater predation if buried under "parent" trees that fruited during the experiment. Buried seed survival was also negatively affected by germination, as germination may signal the presence of a seed to foraging rodents. There was some indication of a positive effect of tree density on seed survival between the two plots, whereas differences in rodent abundance appear to have no effect on seed survival. Seed size and microsite characteristics had no significant effect on buried seed survival, likely due to the greater proportional effects of other factors and the longevity of *A. mexicanum* seeds. The results of this study were used to generate a hypothetical causal network showing how comparatively low recovery of buried seeds by ignorant foragers combined with processes determining the removal of scatter hoarding foragers from their scattered seed caches may affect seedling recruitment in *A. mexicanum*.

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#### Record 91 of 129

**Author(s):** Theimer, TC

**Title:** Seed scatterhoarding by white-tailed rats: consequences for seedling recruitment by an Australian rain forest tree

**Source:** JOURNAL OF TROPICAL ECOLOGY, 17: 177-189 Part 2 MAR 2001

**Abstract:** The role of white-tailed rats (*Uromys caudimaculatus*) as dispersers of seeds of the Australian tropical rain forest tree *Beilschmiedia bancroftii*, (Lauraceae) was investigated by following the fates of seeds and seedlings over 2 y. Fruits of this tree are too large to be consumed by any avian frugivore except the southern cassowary (*Casuaris casuaris*), and the only other native mammal capable of dispersing the seeds is the musky rat kangaroo (*Hypsiprionodon moschatus*). However, neither of these species has been documented to disperse the seeds of this tree. During a mast year, white-tailed rats cached seeds an average of 13 m from parent trees in a variety of microsites. Although none of the 61 cached seeds followed in this study survived to germination, comparison of seed, cache and seedling distributions suggested that most seedlings arose from rat-cached seeds. White-tailed rats cached seeds in both mast and non-mast years, but the time seeds remained on the forest floor and in caches was significantly shorter in non-mast years, suggesting that synchronous seed production increases the probability that some caches survive to germination. Because white-tailed rats are the most common and widespread native mammal capable of dispersing large-seeds, this study suggests that they may play an important role in the seed and seedling dynamics of large-seeded tree species in Australian tropical rain forests.

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#### Record 92 of 129

**Author(s):** Boyd, RS

**Title:** Ecological benefits of myrmecochory for the endangered chaparral shrub *Fremontodendron decumbens* (Sterculiaceae)

**Source:** AMERICAN JOURNAL OF BOTANY, 88 (2): 234-241 FEB 2001

**Abstract:** *Fremontodendron decumbens* grows in a single county in central California, USA. Prior research showed that its elaiosome-bearing seeds are dispersed by the harvester ant *Messor andrei*. I tested several hypotheses regarding the positive role of ant-mediated dispersal to *F. decumbens*: (1) Does ant-mediated seed dispersal facilitate seed escape from rodent predation?; (2) Does ant processing of seeds stimulate germination?; (3) Are ant middens more suitable microsites for seed or seedling survival in unburned chaparral areas?; and (4) Do survival benefits of dispersal occur post-fire in the form of differences in

seedling survival probabilities and, if so, why? Results of tests of each hypothesis were: (1) similar percentages of seeds placed on ant middens and under *F. decumbens* shrub canopies were destroyed by rodents, but seeds from which elaiosomes had been removed were more likely to escape rodent predation; (2) seeds processed by ants did not germinate more readily than seeds removed directly from shrub branches; (3) seedling predation was a major cause of mortality in unburned chaparral on both ant middens and under shrubs, and overall seedling survival did not differ between the two microsites; (4) post-burn seedling survival was significantly greater for seedlings dispersed away from *F. decumbens* shrub canopies, because dispersed seedlings were both less likely to be killed by predators and more likely to be growing in a gap created by the fire-caused death of an established shrub. I concluded that the major ecological benefit to *F. decumbens* of ant-mediated seed dispersal was elevated post-fire seedling survival resulting from enhanced escape by dispersed seedlings from both predation and competition.

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#### Record 93 of 129

**Author(s):** Pirie, CD; Walmsley, S; Ingle, R; Jimenez, AP; Magallanes, AS; Kelly, CK

**Title:** Investigations in plant commonness and rarity: a comparison of seed removal patterns in the widespread *Jatropha standleyi* and the endemic *J. chamelensis* (Euphorbiaceae)

**Source:** BIOLOGICAL JOURNAL OF THE LINNEAN SOCIETY, 71 (3): 501-512 NOV 2000

**Abstract:** During early August to late September 1998 we examined seed dispersal in the tree species *Jatropha standleyi* (widespread) and *J. chamelensis* (endemic; Euphorbiaceae) at the Estacion de Biologia Chamela, Jalisco, Mexico. Using general linear models, we found that seed removal from beneath the parental canopy did not differ between the two species and that seed removal was correlated with both seed availability on the ground and rodent predation. We inferred that seed removal was largely mediated by rodents and determined that if a seed was not removed within 4d (approx. 16% chance), it was highly unlikely to be removed at all (approx. 3.5% chance) for both species. We note that although differences in patterns of seed removal may not explain the observed differences in range size, differences between the two species in seed crop size are similar to patterns found in other endemic/widespread species pairs. (C) 2000 The Linnean Society of London.

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#### Record 94 of 129

**Author(s):** Lichter, J

**Title:** Colonization constraints during primary succession on coastal Lake Michigan sand dunes

**Source:** JOURNAL OF ECOLOGY, 88 (5): 825-839 OCT 2000

**Abstract:** 1 Primary succession on coastal sand dunes has generally been presumed to be driven by autogenic environmental change associated with dune stabilization and gradual soil development.  
 2 An extensive chronosequence of dune-capped beach ridges is found adjacent to northern Lake Michigan and the youngest 13 ridges (aged 30-440 years old) show a clear pattern of primary succession and development of a forest ecosystem.  
 3 Seed-addition and seedling-transplant experiments indicated that colonization of young sand dunes by late-successional *Pinus* and *Quercus* species is constrained by limited seed dispersal, seed and seedling desiccation, and seed predation rather than seedling success being constrained by low soil nitrogen availability. Their establishment may therefore depend on coincidence of chance seed dispersal, favourable weather conditions and low rodent densities.  
 4 In addition, episodic burial by sand prevents most species from colonizing young dune ridges, while burial of seedlings by litter limits recruitment on older dune ridges with developing forest. The intensity of competition increases during succession.  
 5 Dune succession is better described as the transient dynamics of colonization and competitive displacement rather than the result of gradual soil development and competitive displacement.

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#### Record 95 of 129

**Author(s):** Cabin, RJ; Marshall, DL; Mitchell, RJ

**Title:** The demographic role of soil seed banks. II. Investigations of the fate of experimental seeds of the desert mustard *Lesquerella fendleri*

**Source:** JOURNAL OF ECOLOGY, 88 (2): 293-302 APR 2000

**Abstract:** 1 Although poorly studied and understood, the post-dispersal movements and fates of seeds may affect critically the subsequent structure of plant communities, particularly in desert ecosystems where seeds can be the most abundant or only viable form of many plant species. We investigated the fate of experimental seeds of the desert mustard *Lesquerella fendleri* by examining seed dispersal and predation, and by quantifying the proportion of seeds that germinated and survived as seedlings in three different microsites within a New Mexico desert shrubland.

2 We found very limited seed dispersal but strong density-dependent seed predation by rodents. There was a significant and consistent microsite effect in the proportion of soil seeds germinating and seedlings surviving to the end of the experiments. We did not find a consistent microsite effect for soil seed persistence, but did find a positive correlation between soil seed persistence and soil seed germination. Overall, these results indicate that seed predation may strongly affect the distribution of the

seed bank, and that the abiotic environment may largely determine the extent to which soil seed populations in turn affect the distribution of emerging surface plants.

3 We present a seed fate model that synthesizes the results of the present and previous empirical investigations of the *Lesquerella* study system. This diagram illustrates how interactions among the abiotic environment, microsite variation and seed genotypes can determine which soil seeds successfully germinate and establish into the surface plant population. We suggest that the demography of desert surface plant populations may depend more on the time between seed inputs and the longevity of these seeds in the soil than on the amount of seeds produced at any one point in time and space.

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#### Record 96 of 129

**Author(s):** Wang, W; Ma, KP; Liu, CR

**Title:** Seed shadow of *Quercus liaotungensis* in a broad-leaved forest in Dongling Mountain

**Source:** ACTA BOTANICA SINICA, 42 (2): 195-202 FEB 2000

**Abstract:** The seed shadow of oak (*Quercus liaotungensis* Koidz.) was investigated in a broad-leaved deciduous forest in Dongling Mountain in 1997. The seed rain patterns under oak tree crown for three out of four oak trees fit quadratic distribution, with high coefficients of determination. For each of the four trees selected in tills study the seed rain size estimated from the viable acorns collected from the traps deployed under the crown was low, ranging from 26 to 259. For each of the four oak trees, the average density of the seed rain under oak tree crown ranged from 0.76 to 7.26 seeds/m<sup>2</sup>. The average seed rain density estimated from the acorns in the traps deployed randomly in the field was 1.57 seeds/m<sup>2</sup>. After all viable acorns fell, the acorn ground density estimated from the acorns in the quadrats was 0.13 seeds/m<sup>2</sup>, but no viable acorns were found on the ground under the tree crown of the four oak trees, although the area under die crown was over 5 folds than the area of the combined quadrats. These results indicated that a large number of acorns was removed or predated by vertebrates once the acorns fell on the ground and acorns predation was more intensive in the sites directly under the parent trees than the sites away from the parent trees; this supports the distance-dependent hypothesis. Of the total acorns of all four oak trees, the viable acorns only accounted for 18.1%, and 17.8% for acorns infected by insect larvae, 12.1% for immature acorns, 3.6% for decayed acorns, and the acorns predated by rodent directly in the crown was the highest, accounting for 48.4%. The proportion of acorns predated by animals including vertebrates and invertebrates amounts up to 78.3%, indicating that acorn predation by animals is a limiting factor affecting acorn survival before seed dispersal. The sustained time of viable acorn fall ranged from September 8 to October 3 for the four oak trees, with the peak between 16th and 26th September, The number of acorns was not significantly different among the four directions around the trunk base.

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#### Record 97 of 129

**Author(s):** Alcantara, JM; Rey, PJ; Sanchez-Lafuente, AM; Valera, F

**Title:** Early effects of rodent post-dispersal seed predation on the outcome of the plant-seed disperser interaction

**Source:** OIKOS, 88 (2): 362-370 FEB 2000

**Abstract:** We analysed two potential effects of post-dispersal seed predation on recruitment of the wild olive tree (*Olea europaea* var. *sylvestris*), a Mediterranean bird-dispersed tree: (a) the limitation of abundance and distribution of seedlings after dispersal, and (b) the selection of certain seed characteristics of the recruited plants. An observational approach was used to compare seed rain among microhabitats, and how it was affected by seed predation. The relation of microhabitat, scrub density, and seed size with predation risk was explored by a field experiment. Seed density ranged from 0 seeds/m<sup>2</sup> in open places to 93.2 seeds/m<sup>2</sup> under *O. europaea*. The overall predation rate was low, as shown in the observational approach (35%). The mean percentage of predation in the experimental approach was 51%, ranging across microhabitats between 28% and 88%. It was higher in dense scrub patches (67%) than in sparse ones (33%), and lower for large seeds (42%) than for medium and small ones (57% and 55%, respectively). Finally, seed density near seed depots did not increase their probability of being detected by rodents or the predation rate. Although predation rates were low, wild olive seeds could be frequently found by rodents due to their spatial ubiquity and local abundance. Together with the efficient foraging strategy of predators (92% of experimental seed depots are found), this allowed a widespread post-dispersal predation, but it did not modify the relative distribution of seeds among microhabitats. Thus? in our study, the seed dispersal pattern of the wild olive tree was not reshaped by post-dispersal predation. because (1) rodents did not alter significantly its initial spatial distribution and (2) mice did not seem to limit the number of recruits. Finally, our results indicate that, as a consequence of seed size preferences of rodents, large seeds have a higher probability to survive post-dispersal predation. Thus, seed size may be a key trait to determine the identity of the future recruits in the wild olive tree, at least affecting the characteristics of the seeds that reach the soil seed bank.

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#### Record 98 of 129

**Author(s):** Wright, SJ; Zeballos, H; Dominguez, I; Gallardo, MM; Moreno, MC; Ibanez, R

**Title:** Poachers alter mammal abundance, seed dispersal, and seed predation in a neotropical forest

**Source:** CONSERVATION BIOLOGY, 14 (1): 227-239 FEB 2000

**Abstract:** We evaluated the hypothesis that poachers reduce the abundance of herbivorous mammals, and that this, in turn, alters seed dispersal, seed predation, and seedling recruitment for two palms (*Attalea butyracea* and *Astrocaryum standleyanum*) in central Panama. Using physical evidence left by poachers and interviews with forest guards, we quantified poaching intensity for eight forest sites. We quantified mammal abundance using transect counts and small-mammal traps. Abundance was inversely related to poaching intensity for 9 of 11 mammal species (significantly so for 5 species), confirming the first component of the hypothesis. The outcome of interactions among seeds, mammals, and beetles also varied with poaching intensity: Nonvolant mammals were the only seed-dispersal agents, and rodents and beetles were the only seed predators. We quantified seed fate by examining the stony, endocarps that encase the seeds of both palms. The large, durable endocarps were located easily on the forest floor and bear characteristic scars when a rodent or beetle eats the enclosed seed. The proportion of seeds dispersed away from beneath fruiting conspecifics was inversely related to poaching intensity, ranging from 0% to 10% at protected sites where mammals were abundant and from 3% to 40% at unprotected sites where poachers were most active. The proportion of dispersed seeds destroyed by beetles was directly related to poaching intensity, ranging from 85% to 99% at protected sites and from 30% to 50% at unprotected sites. The proportion of dispersed seeds destroyed by rodents was inversely related to poaching intensity, ranging from 85% to 99% at protected sites and from 4% to 50% at unprotected sites. Finally, seedling densities were directly related to poaching intensity. There was no single relationship between poaching intensity and the biotic interactions that determine seedling recruitment. The net effect of poaching on seedling recruitment can be determined only empirically. For these palms, seedling densities were directly related to poaching intensity.

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### Record 99 of 129

**Author(s):** Julien-Laferriere, D

**Title:** Fruit consumption, seed dispersal and seed fate in the vine *Strychnos erichsonii* in a French Guianan forest

**Source:** REVUE D'ÉCOLOGIE-LA TERRE ET LA VIE, 54 (4): 315-326 OCT-DEC 1999

**Abstract:** Fruit removal and seed dispersal of three individuals of the vine *Strychnos erichsonii* (Loganiaceae) were investigated in a mature forest of French Guiana, during the season of minimal flower and fruit production. Five visitor species, birds and diurnal or nocturnal arboreal mammals, were observed, while one terrestrial rodent was collected in traps baited with *S. erichsonii* seeds or fruit pulp. One diurnal and one nocturnal mammal dispersed seeds at long distance. Arboreal frugivores consumed fruits as soon as they became ripe and also ate unripe fruits. Fruit-traps revealed a higher fruit removal during the night for the two more productive vines ('instantaneous' productivity). More than two-thirds of the seeds checked along transects until 30 m for the parent plant were dead or infested, without obvious relationship with the seed localisation (under or beyond the crown). However, the proportion of intact vs dead/infested seeds beyond the crown was higher for the more productive plant ('overall' productivity), suggesting predator satiation. Seed density decreased sharply in the first meters from the parent plant, but remained noticeable until 15 m after the crown on some transects. Seedlings were very few and distributed independently of their position under or beyond the crown. A high seed mortality, a low number and a high turnover of seedlings under and in the vicinity of the parent plant suggest a crucial importance of long distance dispersal for the plant recruitment. Seed dispersal seems to be performed by a small number of varied species. Based on its regular fruiting period during the season of flower and fruit scarcity, and its large place in the diet of several frugivores mammals, *S. erichsonii* is probably an important resource for these species during the season of food scarcity.

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### Record 100 of 129

**Author(s):** Mitani, M

**Title:** Does fruiting phenology vary with fruit syndrome? An investigation on animal-dispersed tree species in an evergreen forest in south-western Cameroon

**Source:** ECOLOGICAL RESEARCH, 14 (4): 371-383 DEC 1999

**Abstract:** Fruit syndrome found in zoochorous plants is regarded as a result of hypothetical coevolution with a seed disperser/predator. Fruiting phenology was compared among two representative syndromes, such as bird-monkey syndrome (BM) and ruminant-rodent-elephant syndrome (RRE), plus the gravity dispersal species for comparison, in south-western Cameroon in order to examine which biotic or abiotic factors induced syndrome variation. The individual size of selected plants (> 1.6 m in height) was recorded in a 16.95-ha area for recruitment estimation and their fruiting behaviour was checked for 9 months from June 1985 to February 1986. The BM species, a suggested successful group, fruited in a less synchronous manner within species and had fruiting peaks just before and during the rainy season. The RRE species, a suggested failing group, showed greater variation within syndrome in fruiting timing, duration and synchronization. Results obtained supported no clear phenological response to corresponding vertebrates except for the case of *Sacoglottis gabonensis* in the RRE. The reason for concealing potential responses is probably a result of conflicting requirements for seed dispersal and offspring survival. Periodical fruiting of the BM is likely to reflect ecological constraint, such as water stress on seedlings, caused from syndrome-specific morphological limitation. In this case, the animals have indirect effects on fruiting phenology through selecting syndrome-specific fruit morphology. The greater variation of the RRE suggests a broad spectrum of dispersal tactics from faithful zoochory to alternatives, with a trade off between agent restriction and seed size and another trade off between parental investment and seed-predation risk.

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