EFFECTS OF HUNTING ON SEED DISPERSAL AND RECRUITMENT IN A NON-TIMBER FOREST PRODUCT

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INTRODUCTION

The sustainability of seed harvest from natural populations has recently been questioned, as recruitment failure in the Brazil nut *Bertholletia excelsa* (Lecythidaceae) was found to increase with the intensity of seed harvest (Peres *et al*. 2003). However, areas where seeds are collected tend to also have more intense hunting. Like *Bertholletia*, *Carapa procera* DC (Meliaceae) seeds is a highly-prized non-timber forest product (crabwood oil) of Guianan and Amazonian rainforests. Like Bertholletia, *Carapa* in terra firma forest depends on scatter-hoarding rodents for seed dispersal and seedling recruitment. We studied how hunting affected seed dispersal in *Carapa*.

NTFP : CARAPA OIL

THE FRUITS AND SEEDS

Carapa is a lower canopy tree that occurs in Suriname, French Guiana and the Northern Brazilian Amazon. *Carapa* trees produce up to several hundreds of large (c. 10 cm in diameter), dry, five-valved fruits that each contain up to 20 seeds (average 11), which weigh 21 g P.A.J., unpubl. data).

Only the seeds that acouchies and agoutis remove from below parent trees and scatter-hoard in swallow, single-seeded caches in the soil surface may establish seedlings. However, in areas where seeds are collected for oil, these rodents tend to be heavily hunted as well. We tested three hypotheses: (Hyp. 1) populations with hunting have lower rates of seed dispersal than do populations without; (Hyp. 2) the rate of seed dispersal decreases with increasing crop size in populations with hunting, whereas it increases or is constant in populations without; and (Hyp. 3) populations with hunting have higher rates of seed predation by insects than do populations without

THE SEED- DISPERSERS

Myoprocta acouchy © P. A. Jansen

Dasyprocta leporina © Tom Ruttink

METHOD

We compared seed fate between four *Carapa* populations in French Guiana and Suriname, two with poaching and two without, in three years (2002, 2003 & 2004) of contrasting fruit abundance. We measured seed production and seed fate at individual trees in 2002-2004, always in late May-early-to-mid June, i.e. the end of the fruiting season. The number of fruits produced was estimated as one fifth of the total number of husks. The number of seeds produced was estimated by counting the depressions left by seeds (0 -4 per husk). We scored seeds as:1) intact and freshly fallen, 2) infested by moths, predated by 3) peccaries, 4) rodents, and (5) germinated.

Hypsipila infested-seeds

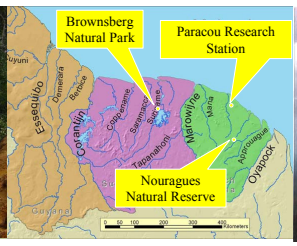
THE SEED-PREDATORS

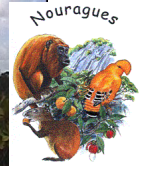
Fruits and seeds left below parent trees, in contrast, are subject to heavy infestation by *Hypsipila* moths and predation by peccaries (*Pecari tajacu* and *Tayassu pecari*) prohibiting seedling establishment.

Tayassu pecari © P.-M. Forget

Pecari tajacu © P.-M. Forget

STUDY SITES





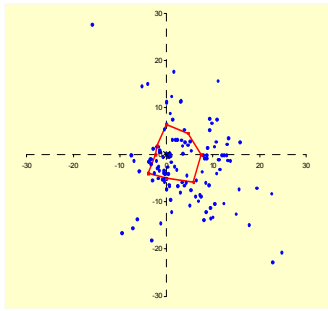
THE SEEDLINGS

RESULTS

Populations with poaching had lower rates of seed removal, ie dispersal, than populations without, but the contrast was less strong than expected. While seed removal increased with crop size in non-hunted populations, it decreased with increasing crop size in hunted ones. The trends, however, were less strong than expected. Among the seeds that were not dispersed, the proportion of the seeds that were predated was unexpectedly lower in hunted areas than in non-hunted areas.

	hunting					no hunting			
	Brownsberg gold mines		Paracou			Nouragues		Brownsberg plateau	
	2003	2004	2003	2004	*total*	2002	2003	2004	*total*
n	10	18	46	20	*94*	41	28	23	*92*
crop size (mean)	440	366	98	365	*243*	311	125	428	*284*
seed abundance	Low*	high	low	high		high	low	high	
dispersed (%)	67	76	79	62	*70*	81	89	94	*87*
not dispersed (%) (see *a*)	33	24	21	38	*30*	19	11	6	*13*
(a) Status non-dispersed seeds (%)									
intact	33	39	20	44	*37*	20	7	33	*21*
germinated (see b)	52	35	89	52	*53*	21	14	53	*26*
predated (see c)	35	39	33	14	*27*	65	85	36	*62*
(b) Germination status (%)									
germinating	61	63	54	81	*68*	72	60	58	*67*
seedling (non-buried seed)	15	16	36	15	*20*	8	15	12	*10*
seedling (w/o seed)	17	12	4	2	*7*	11	17	26	*17*
seedling (buried seed)	7	8	6	2	*5*	9	8	4	*7*
(c) Predation type (%)									
moths	87	93	51	90	*84*	38	30	65	*40*
rodents	3	4	7	6	*5*	9	10	6	*9*
peccaries	9	3	41	5	*12*	53	60	30	*52*

When lacking removal, ie dispersal, seeds are either infested or established as seedlings below the parent crown with poor chance of survival throughout 1 year.



Hereabove, a case example of effective seedling recruitment at a tree (DBH = 51cm) that produced c. 1389 seeds and established 131 dispersed,, seedlings with buried cotyledons, ie from cached seeds (Nouragues, 21 May 2002)

CONCLUSION

Consistently lower numbers of seeds removed, ie dispersed by rodents, may translate to lower levels of seedling recruitment. Our results therefore suggest that the subsistence hunting that usually accompanies seed harvesting may indeed contribute to recruitment failure, though modestly. Seed harvest from natural populations may become more sustainable if accompanied by adequate protection of seed dispersers.

LITERATURE

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