

COMUNICACIONES

Birds as short-range seed dispersers of *Zamia fairchildiana* in SW Costa Rica

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Resumen: Se ha discutido frecuentemente sobre los mecanismos de dispersión de semillas en *Zamia*, debido a la falta de datos. En el suroeste de Costa Rica, la dispersión a corta distancia la hacen varias especies de aves (*Saltator maximus*, *S. albicollis*, *Turdus grayi* y *Ramphocoelus passerinii*).

Key words: *Zamia*, dispersal, bird zoocory.

The dispersal of cycad seeds has been as debated as their pollination syndromes. In the case of the species of *Zamia* very little has been published (cf. Tang 1989), and it has been hypothesized that birds, bats, rodents, gravity and hydrochory may be involved.

Recently, a female plant of *Zamia fairchildiana* L. D. Gómez (WBG 63.136), transplanted as an adult in the Wilson Botanical Garden (Plot B-44), matured a cone that started to open in early January, 1993. For 15 days and from 06:00 - 15:00 hrs. I was able to observe the feeding behaviour of three species of birds that have all contributed to the scattering of ripe seed around the plant.

The birds pry open the widening cracks of the cone and tear away pieces of the bright red sarcotesta that covers the seed. Soon, the "scales" are broken away and the birds can freely continue to peck at the seeds and pluck them out.

The most frequent visitors were the Buff-Throated Saltator (*Saltator maximus*), which often lifts seeds, and may fly some distance away with them. The Streaked Saltator (*Saltator albicollis*), often seen in the company of the former, relishes the seed coats and displays a very aggressive behaviour when defen-

ding its food from Scarlet-Rumped Tanagers (*Ramphocoelus passerinii*) of both sexes. It also carries seeds away from the plants. The tanagers consume the sarcotestae in situ.

The average weight of the seeds is 5.286 g (N=534). The birds weight is 50 g for *S. maximus*, 40 g for *S. albicollis*, 76 g for *Turdus grayi*, and 31 g for *R. passerinii* (Stiles *et al.* 1989).

On two occasions, a Clay-Coloured Robin (*Turdus grayi*) was seen pecking at the same cone, taking the seeds and perching, approximately 200 cm from the food source. A similar observation on cones of *Zamia skinneri* Warsz., in the forests near Turrialba (P. de Vries pers. comm. 1976).

A search at the base of the plant (Plot B-44) revealed a number of seeds totally or partly destituted of their sarcotestae, but the number of seeds retrieved in a radius of 100 cm from the base of the trunk is lower than expected from the number of scales counted, even if apical scales often have fewer fertilised ovules than the usual four per megasporophyll.

Even allowing for a percentage of aborted and non-pollinated ovules, it is apparent that the birds are carrying many of the seeds away. The average cone of *Z. fairchildiana* contains

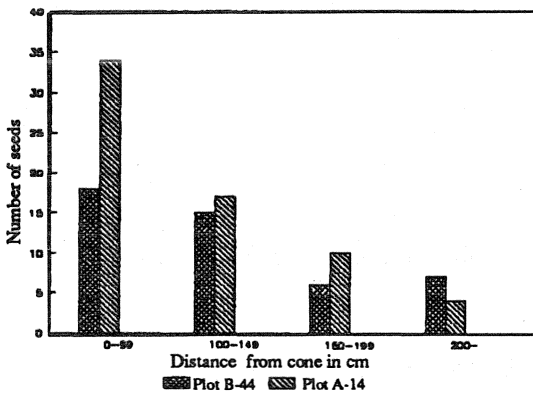


Fig. 1. *Zamia fairchildiana* et al. Short-range dispersal of seeds.

168.5 seeds ($N=32$). If the cone under observation was within that average, then 122.5 seeds are unaccounted for, as only 46 were found within a radius of 200 cm from the mother plant: 18 from less than 99 cm, 15 between 100-149 cm, 6 from within 150-199 cm, the remainder 7 from a distance greater than 200 cm.

Another plant (Plot A-14) that released its seeds about two months prior to plant in Plot B-44 yielded similar results: 34 in 0-99 cm, 16 between 100-149, 10 in the 150-199 cm range and 4 between 200-270 cm, for a total of 64 seeds all germinated and 104.5 seeds potentially carried away a longer distance.

Because the finches and tanagers are mostly birds of open, semi-open and forest edges, and this species of cycad is a dense forest plant, their value as dispersers of seeds is relative and perhaps only efficient in the periphery of natural populations. The ripe female cone offers an obviously fleshy and brightly coloured food source that contrasts with the drab olive brown of the scales that enhance their appeal by being in the centre of a radial arrangement of green fronds. How efficient that "Bull's eye" model is under natural forest conditions needs quantification.

Furthermore, the contribution of avian dispersors to the population dynamics and gene flow of these plants may be limited, since a large number of the seeds are dropped too close to their progenitors: 27.29% in Plot B-44 and 37.98 in Plot A-14, of the predicted average of 168.5 seeds in the "ideal" cone, as theoretically expected (Janzen 1970, Green 1983).

The tanagers may be considered the less significant contributors to gene flow, while the saltators and the robin scatter propagules throughout a greater area. Plants observed are on rather level ground and within 400 cm from male individuals, presumably the pollinators. In both cases, the seed shadows conform to a leptokurtic distribution (Fig. 1), as observed by Tang (1989) for *Zamia pumila* in Florida. Since *Z. fairchildiana* is often found growing on hillsides with slopes ranging from 10-20% gradients, gravity and ombrochory can not be dismissed as potential dispersion agents.

This constitutes the first report of confirmed avian activity of populational and genetical significance in the short range distribution of this species of a Costa Rican native cycad.

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