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Gillian Key, Biological Sciences, Manchester Metropolitan University, Manchester M1 5GD, UK.
Edgar Muñoz Heredia, Charles Darwin Research Station, Isla Santa Cruz, Galápagos, Ecuador.

POLLINATION OF *SCALESIA BAURII* SSP. *HOPKINSII* (ASTERACEAE) ON PINTA ISLAND

By: Conley K. McMullen and Sandra J. Naranjo

Previous studies in the genus *Scalesia* have shown that *S. affinis* Hooker f., *S. helleri* Robinson, *S. pedunculata* Hooker f., and *S. aspera* Andersson can reproduce by autogamy (automatic self-pollination) (Rick 1966; McMullen 1987, 1990). In addition, the first three of these, as well as an unidentified species thought to be *S. retroflexa* Hemsley, are known to be pollinated by the endemic carpenter bee *Xylocopa darwini* Cockerell (Hymenoptera: Apidae) (Linsley et al. 1966; Rick 1966; Eliasson 1974; McMullen 1985). The flowers of *S. pedunculata* on Santa Cruz Island are also visited by the Galápagos fritillary butterfly *Agraulis vanillae galapagensis* Holland (Lepidoptera: Nymphalidae) (personal observation).

Pollination studies on an additional member of this genus, *Scalesia baurii* Robinson & Greenman ssp. *hopkinsii* (Robinson) Eliasson, were conducted on Pinta Island from 28 June - 20 July 1990 (Fig. 1). Pinta is one of the northern islands in the archipelago that the carpenter bee does not inhabit. Fifteen individuals, located between 15-67 m altitude on Pinta's southern slope, were selected for this study. One hundred inflorescences were bagged before their flowers had opened to determine if the plants could reproduce autogamously. One hundred open-pollinated inflorescences were marked as well, and then covered after being exposed for one week. All pollination bags were collected on the last day of the study and fruit counts were made. Flower observations were conducted to discover what insects made visits

Figure 1. Inflorescence and leaves of *Scalesia baurii* ssp. *hopkinsii* on Pinta Island.

to these plants and might act as pollinators. These visits were timed and recorded. The maximum stay listed for any one insect was 15 minutes. After this, the insect was either captured, or another observation was begun so as not to spend an excessive amount of time watching one individual.

Table 1 shows the results of the bagging studies. Flower counts were not made, so an actual percentage of fruit set cannot be given. Eliasson (1974) mentions that approximately 50 bisexual disc-flowers are typically found in an inflorescence, although as many as 100 or more may be present. Ray-flowers are also present, but these are sterile. In any case, both treatments produced numerous fruits. The mean number for bagged inflorescences was 45.2, while that for open-pollinated inflorescences was 38.2. The reason for the latter having a lower fruit set is probably because of their exposure to predators before being bagged. Finches were often seen at these plants, and one inflorescence was actually observed being eaten. Ten of the bags were not recovered after this study. One explanation for this might be that they were overlooked during the final collection. However, another possibility is that these bags were destroyed by the Galápagos hawk (*Buteo galapagoensis*). This hawk removed and tore apart pollination bags from other plant species that were being studied during the same period.

The primary insect visitors to these plants are noted in Table 2. A species of *Mythenteles* (Diptera: Bombyliidae) was most frequently observed, with 51 visits and a total of 28,494 seconds spent on inflorescences. These bee flies would often visit more than one flower per inflorescence, and appeared to be probing for nectar. In fact, one was observed trying to force its way down into a corolla tube. Pollen was clearly visible on its wings and thorax during this visit. Second in occurrence was *Lepidanthrax tinctus* Thomas

Table 1. Bagging experiment results, in number of fruits produced per inflorescence.

	MEAN	RANGE	SD	N
Bagged Inflorescences	45.20	0-76	18.06	99
Open-Pollinated Inflorescences	38.18	0-67	16.78	91

Table 2. Insect visitation times, in seconds, based on 24 hours of observation (6:00 A.M. - 6:00 P.M, 9 & 10 July 1990).

	TOTAL	MEAN	RANGE	SD	N
DIPTERA					
Mythenteles sp. (Bombyliidae)	28,494	558.71	30-900	349.26	51
Lepidanthrax tinctus (Bombyliidae)	1,061	32.15	2-139	31.63	33
LEPIDOPTERA					
Atteva hysginiella (Yponomeutidae)	1,664	208.00	12-405	155.68	8
Pyralid Moth (Pyralidae)	568	189.33	60-274	113.78	3

(Diptera: Bombyliidae) with 33 visits, and a total time of 1,061 seconds. A moth, *Atteva hysginiella* Wallengren (Lepidoptera: Yponomeutidae), was the third most common insect with eight visits. However, its total visitation time was 1,664 seconds. Thus, its mean stay (208 seconds) was approximately 6.5 times longer than that of *L. tinctus*. Both of these insects appeared to probe for nectar just as the species of *Mythenteles*. The least frequent visitor recorded during the observation studies was a pyralid moth (Lepidoptera: Pyralidae). This single individual visited inflorescences three times, for a total of 568 seconds. In addition, two untimed visits were made by a species of *Rhinacloa* (Hemiptera: Miridae).

Most of the insects made their visits throughout the day, although the pyralid moth did not appear until after 4:00 P.M. Only *Mythenteles* individuals were observed spending more than 15 minutes on an

inflorescence during the timed studies.

Insufficient nectar was produced by the flowers for micropipet collection. However, the fact that all of the insect visitors had mouthparts adapted for sucking rather than chewing suggests that a small nectar reward presumably is present.

These results indicate that *S. baurii* ssp. *hopkinsii* is capable of autogamous reproduction, just as the other members of this genus that have been studied. In addition, even though the carpenter bee is absent on Pinta, there are other visitors that may promote self- or cross-pollination. Insects spending longer periods of time on each inflorescence are probably more important for selfing, since this behavior results in fewer visits to other plants. If this scenario is correct, then *L. tinctus* may be more important in the cross-pollination of this plant than the other visitors listed in Table 2.

The breeding strategy of *S. baurii* ssp. *hopkinsii* appears reasonable for a plant inhabiting an oceanic island. Autogamy would promote initial establishment, while visits by available insects might lead to outcrossing. The flowers of this species are well suited to the small generalist insects found on Pinta Island. Wind pollination, which demands profuse pollen production, would be of little value, especially during the colonization period when only a few individuals presumably would be present (McMullen and Close 1993).

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Conley K. McMullen, Department of Biology and Chemistry, West Liberty State College, West Liberty, West Virginia, 26074, USA. Sandra J. Naranjo, Escuela de Biologia, Universidad Central del Ecuador, Quito, Ecuador.