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Facultative Self-pollination in Island Irises

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itats throughout northeastern North America. Our study of an isolated population on Kent

through a female phase. Kron *et al.* (1993) suggested that the final stage, in which the stigmas curl down and sometimes contact the anthers, could lead to autonomous self-pollination.

In the present study our aim was to determine the extent of self-compatibility and inbreeding depression in an isolated population of *Iris versicolor* occurring on an oceanic island. We also measured the amount of time that individual flowers spent in different phases to test whether pollination influenced subsequent floral behavior and to investigate the mechanisms behind autonomous self-pollination.

METHODS

Our study was conducted in June and July 1994 and 1995, at the Bowdoin Scientific Station, located on Kent Island, in the Bay of Fundy, New Brunswick, Canada (44°35'N, 66°46'W). The 80-ha island is isolated from the mainland of Maine and Nova Scotia by 20 km and from the island of Grand Manan, the nearest large body of land, by 9 km.

Iris versicolor is common in moist open areas on Kent Island and most of the larger islands

in the Grand Manan Archipelago. A native perennial, it reproduces both asexually, through vegetative or clonal growth, and sexually. Its large showy flowers are composed of three functional "pollination units" (Pande and Singh, 1979; Kron *et al.*, 1993). The central style is divided into three branches. On the underside of the distal end of each style branch is a stigma flap which opens, reflexes downward, and becomes receptive during the female phase. Tucked underneath each style branch is an anther extending up towards the base

designated as controls and were allowed to be visited by insects naturally (free pollination treatment). The other 20 flowers were bagged for the duration of the experiment (autonomous self-pollination treatment). We removed the bags once the flowers had obviously senesced and the stigmas were no longer receptive (within 10 days of opening, Kron *et al.*, 1993). Mature-sized fruits were collected at the end of July.

In the third experiment, a sample of 45 additional irises was established in an open field to investigate whether pollen deposited on the stigma influenced floral behavior, specifically the closing or reflexing downward (curling) of the stigma flap. All flowers were bagged in the bud stage. Fifteen flowers were hand-pollinated as soon as the stigma flap opened and

TABLE 1. Percentage of flowers that set fruit in different experiments. All values include standard error.

were 20 in Experiment 2, by the time of fruit set they were reduced because of damage by herbivores. (Fruit set was not monitored in Experiment 1.)

Experiment 2		
Free pollination—exposed sites	70.6	17
Free pollination—protected sites	61.1	18
Autonomous self-pollination—exposed sites	52.6	19
Autonomous self-pollination—protected sites	17.7	17
Experiment 3		
Hand-outcrossed	73.3	15
Autonomous self-pollination	40.0	15
Anthers removed, flowers bagged	6.7	15

difference in fruit set between bagged and freely pollinated flowers in exposed sites ($P = 0.45$), but freely pollinated flowers had higher fruit set than bagged flowers in protected sites (Table 1; $P = 0.02$).

were closed.

Overall, more than 70% of hand-outcrossed flowers set fruit, compared to 40% for autonomous self-pollinated flowers. Only one emasculated flower (7%) set fruit. The effect of treatment on fruit set was statistically significant (chi-square test: $P < 0.001$). However,

against petals of the same flower where pollen has settled, or by causing neighboring flowers to come into contact with each other.

One possible artifact introduced by our bagging experiments was the fact that once the anthers dehisced, pollen could not be removed by insects. Much of the pollen therefore remained in the anthers or fell on petals beneath the stigmas, where it may have been more

other words, the rate of autonomous self-pollination could be somewhat lower under natural conditions if insects remove pollen from flowers but are inefficient in depositing it on stigmas. We should also point out that we measured inbreeding depression only in terms of fruit set, capsule size, and seeds per capsule. To establish definitively that self-pollination

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