POLLINATOR COMMUNITIES IN SALTMARSHES AND DYKES: COMPARING HABITAT VALUE IN AGROECOSYSTEMS

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BACKGROUND

Insect pollinators such as bees, wasps, hoverflies, and beetles provide an essential ecosystem service by pollinating flowering plant species (henceforth referred to as flowering plant species) in agricultural and natural ecosystems. Globally, flowering plant species' dependence on animal pollinators for successful reproduction is estimated at 78% in temperate and 94% in tropical ecosystems. Without these pollinators, most of the world's flora would be at risk. Additionally, pollinators have enormous agricultural value as their pollination services globally are worth an estimated $315-773 billion (CAD) annually, or 9.5% of the world's agricultural economic output in 2005. The total volume of global food production dependent on pollinators is estimated at 35%. In Canada alone, the value of pollination services of honeybees (*Apis mellifera*) for directly harvested agriculture (e.g. blueberry, squash, apple crops) has an estimated worth of $2.57 billion (CAD) annually, and when production of hybrid canola seed (and products derived from canola) is included this value increases to between $4.0 to $5.5 billion. Wild bees account for the majority of pollinator species in Nova Scotia. Wild bees, such as bumblebees, primarily pollinate crops such as blueberries, squash, tomatoes, and eggplants. Wild bee species require nesting and food resources (flowers that produce nectar and pollen) outside of crop fields to complete their life cycles. Both salt marshes and artificial structures such as dykes may provide valuable habitats for wild bees adjacent to farm fields/croplands.

RESEARCH

The relative amount of pollination services associated with different types of habitat bordering farms in coastal environments is poorly understood. This study compared insect pollinators found in saltmarshes and dykes, two habitats in coastal dykelands proximal to cropland. It was hypothesized that dykes would have a greater abundance and diversity of pollinators than saltmarshes due to greater showy floral abundance and diversity and the availability of nesting habitat. Additionally, surveying pollinators in either habitat has not been done in the Bay of Fundy dykelands. This research aimed to understand differences in these habitats for supporting pollinators and to inform their relative value for pollination services to nearby crops. This work will help us understand potential ecosystem service trade-offs between salt marsh and dykes, which will help stakeholders make informed agroecological land management decisions.

This study is the first to examine pollinator assemblages on salt marshes and dykes in the Bay of Fundy dykelands. This study is also a novel comparison of floral resources (abundance and diversity of flowers) found on tidal salt marshes and dykes. Pollinators that visit croplands rely on adjacent ecosystems to provide essential resources such as pollen, nectar, and nesting habitat.

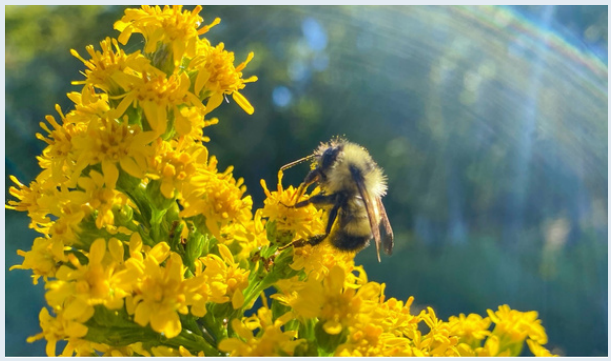

Fig 1. Bombus (likely vagans) visiting Solidago sempervirens on a saltmarsh site.

RESULT

This research aimed to understand differences in these habitats for supporting pollinators to inform their relative value for pollination services to nearby crops.

The average pollinator abundance (total number of insects determined to be pollinators) and the average number of pollinator species (richness) were similar between the two habitats, with dykes having slightly higher counts than salt marsh. Floral abundance and taxon richness (the number of flowering species) were significantly higher in dyke habitats. These results contradict other studies that indicate a tight relationship between floral and pollinator abundance. One explanation is an underestimation of floral resources in saltmarshes: salt marshes are dominated by grasses that do not provide nectar for visiting pollinators, but researchers found bumblebees (*Bombus*) and leaf-cutter bees (*Megachilidae*)visiting flowers of prairie cordgrass (*Spartina pectinata*) in saltmarshes as part of their fieldwork. While ground-nesting wild bees do nest on dyke tops

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within the study area, they have not been observed nesting in salt marshes, likely because of regular tidal flooding.

The results of this study indicate that both salt marshes and the tops and sides of dykes are used by pollinators. The abundance and diversity of pollinators caught on salt marshes were higher than expected. Bees were the most abundant pollinators in both habitats, with wasps second-most. This study supports previous work showing that wild bees are typically the most dominant pollinator in a landscape. However, it is essential to consider other non-bee insects that provide pollination services, such as butterflies. Sweat bees (*Lassioglossum spp.*) were the most abundant of the bee taxa and bumblebees (*Bombus spp*). They are the second most abundant in both habitats. No patterns of community differences (measured as Bray Curtis dissimilarity) were seen consistently between these two habitats, likely due to two factors a) that pollinators observed in this study are probably moving between these two systems, and b) several taxa were only encountered on specific sites leading to considerable community difference among sites within a habitat type. Additionally, no solid temporal trends in abundance or dissimilarity were seen, supporting that these pollinators are accessing these habitats simultaneously during this study.

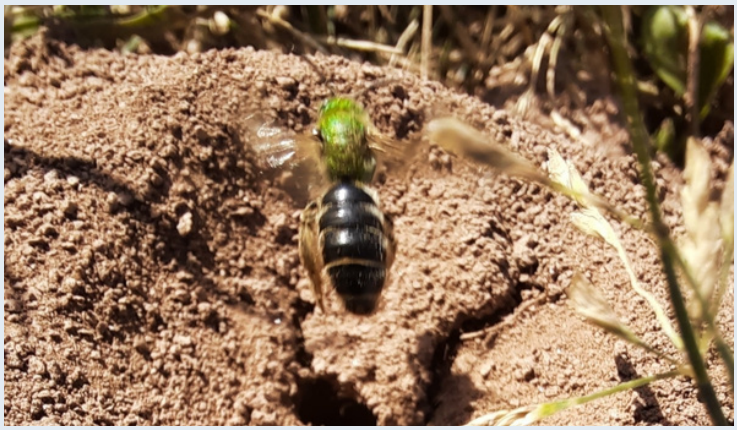

Fig 2. Wild native ground-nesting bee emerging from dyke top nest (Bishop Beckwith Dyke)

APPLICATION

Dyke realignment/breach to restore salt marsh may result in a temporary negative impact on pollinators. Disturbance of the dyke is likely to disrupt ground-nesting pollinators, affecting populations if progeny if nests are destroyed. Sowing of showy floral species could be used on dykes after realignment to support wild pollinators. Additionally, nesting habitats could be facilitated on dykes to help facilitate pollinators. The effect of mowing dyke tops and sides on insect pollinators is unclear. On the one hand, loose soil on dyke tops is frequently colonized by ground-nesting pollinators. However, mowing also temporarily removes flowering plant food sources. Conservation of these wild pollinators is essential in the face of their (trending) global decline, crop yield, and profitability and supports local/global food security. Stakeholders may use this study to weigh the region's cost-benefits of dyke realignment and salt marsh restoration.

Further research is needed to understand how pollinators use salt marshes and dykes (i.e. potentially visiting wind-pollinated species and availability of nesting habitat) to conserve these wild pollinators and maximize their ecological and economic benefits. Additional research is ongoing within ResNet to document the links between the pollinators found on dykes and in salt marshes with those actively pollinating nearby crops.

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