

# Collection of *Helianthus debilis* ssp. *vestitus* (Coastal Dune Sunflower) from the Barrier Islands off the Florida Gulf Coast

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## Abstract

Genetic resources are the biological basis of global food security. Collection and the preservation of wild relatives of important crop species such as sunflower provide the basic foundation to promote and sustain the crop. Acquisition through exploration is the initial step in the germplasm conservation process. There are 53 species of wild *Helianthus* (39 perennial and 14 annual) native to North America. *Helianthus debilis* ssp. *vestitus* (coastal dune sunflower) is a rare annual species found on the barrier islands off the Gulf Coast of Florida, and occasionally on the west central coastal mainland. Coastal dune sunflower is an annual diploid species found in open and disturbed sandy soil of coastal dunes and along sandy beach lines. It has been frequently recognized as salt tolerant due to inhabiting saline areas near the coast, and thus is a candidate for improving cultivated sunflower. Since there were only a few *H. debilis* ssp. *vestitus* accessions in the USDA-ARS wild crop relatives genebank collection, there was a need to collect additional accessions of this rare subspecies. An exploration covering 700 miles on the barrier islands off the Florida Gulf Coast in late October-early November 2015 led to the collection of eight coastal dune sunflower accessions. All populations were collected throughout the restricted distributional range of the species. Population size, habitat, soil type, seed set, the presence of diseases and insects, and other wild sunflower species located near the collection sites were recorded for each population. This germplasm will be important in the future as a genetic resource to combat emerging pests, and environmental challenges helping to maintain sunflower as a viable global crop and to preserve it for future generations.

## Introduction

Collection and preservation of wild crop relatives of important crops such as sunflower provides the basic foundation to promote and sustain the crop. Genetic resources are the biological basis of global food security. Acquisition through exploration is the initial step in the germplasm conservation process. There are 53 species of wild *Helianthus* (39 perennial and 14 annual) native to North America (Heiser et al., 1969; Schilling, 2006). The narrow genetic base of cultivated sunflower has been broadened by the infusion of genes from the wild crop relatives, which have provided a continuous source of agronomic and economic traits for cultivated sunflower (Seiler and Rieseberg, 1997; Seiler and Marek, 2011; Kane et al., 2013; Seiler et al., 2017).

*Helianthus debilis* ssp. *vestitus* (coastal dune sunflower) is a diploid annual species endemic to active sandy beaches of the barrier islands of the Gulf coast of Florida. These islands have a very dynamic plant community since they are subject to occasional, at times devastating hurricanes that completely scour the landscape. The annual nature of the subspecies provides some assurance of surviving and revegetation, but often has to compete with invasive species that come along with the revegetation process. It has been recognized as a potential source of salt tolerant based on its habitat (Chandler and Jan, 1984; Seiler et al., 2017).

Unfortunately, only three populations of coastal dune sunflower had been collected and only a two were available in the USDA-Agricultural Research Service, National Plant Genetic System wild sunflower crop wild relatives collection for research purposes. The objective of the study was to undertake an exploration to the barrier islands off the Florida Gulf Coast in late October-early November to collect populations of coastal dune sunflower from its limited distributional range in Florida.

## Materials and Methods

The sunflower exploration to collect *Helianthus debilis* ssp. *vestitus* took place from late October-early November, 2015. The exploration covered 700 (land and nautical) miles exploring the barrier islands off the Gulf Coast of Florida. Seed heads were collected from 20 to 200 plants within each population and bulked into a single sample. Herbarium specimens were deposited in the USDA-ARS wild *Helianthus* herbarium at Fargo, ND. The achene samples were deposited at the USDA-ARS North Central Regional Plant Introduction Station, Ames, Iowa, where they are maintained and distributed.

All populations were collected from the restricted distributional range of the species in Florida with permits from the various Governmental Agencies (Figure 1). Prior locations and generalized distribution maps were used to locate populations. Population size (number and extent), habitat, soil type, seed set per head, and the presence of diseases, insects, and other wild sunflower species were recorded for each population.

## Results and Discussion

The exploration was successful in collecting eight representative populations of coastal dune sunflower from its distributional range in Florida (Table 1). The exploration was successful in collecting eight representative populations of coastal dune sunflower from its distributional range in Florida (Table 1). In general coastal dune sunflower is low growing plant occurring in small scattered populations on sandy beaches and dunes. Figure 2 shows a typical habit of coastal dune sunflower on Honeymoon Island, while Figure 3 show a more open shoreline beach dune habitat in Caladesi Island State Park. Figures 4-6 show some similar habitats closer to the sandy shore in a more mixed vegetation on Egmont Key Island State park, while Figure 5 shows a very large population.

**Figure 1.** Distribution of *Helianthus debilis* ssp. *vestitus* (coastal dune sunflower) in Florida.



**Table 1.** *Helianthus debilis* ssp. *vestitus* identification number, elevation, location, habitat, and population size collected in late October-early November, 2015.

Identification Number	Elevation (m)	Location	Habitat	Population Size
DEB-VES-2850	6.8	Pinellas Co., Honeymoon Island, Pelican Cove Trail	Sandy beach dune, near mangroves tree along edge of water	20
DEB-VES-2851	2	Pinellas Co., North beach, Caladesi Island State Park	Sandy secondary beach in front of the shore and the trees	200
DEB-VES-2852	17	Hillsborough Co., Egmont Key Island State Park, north and south side of pier	Sandy beach, in front of Pilot's Compound, north and south side of Pier	30
DEB-VES-2853	1.4	Hillsborough Co., Egmont Key Island State Park	Sandy beach along west shore of island among an old palm grove	100
DEB-VES-2825	5	Hillsborough Co., Egmont Key Island State Park, south of the public dock	Sandy-grassy dunes, northeast end of Park, both sides of dock	20
DEB-VES-2826	19	Charlotte Co., Gasparilla Island State Park Light House	Sandy secondary beach dunes, southwest of light house and boardwalk area	200
DEB-VES-2828	20	Pinellas Co., Fort De Soto State Park, Bay Pier	Sandy beach, both sides of pier	100
DEB-VES-2829	18	Pinellas Co., Pinellas Byway, east side of highway to Fort De Soto State Park	Sandy road side ditch, open area	40

among an old palm grove. Figure 7 show a population on a steeper sandy slope in the Gasparilla Island State Park. Figure 8 and 9 show a rather healthy wider spread population in De Soto State Park State on both side of the Bay Pier.



**Figure 2.** *Helianthus debilis* ssp. *vestitus* (DEB-VES-2850) in Pinellas Co., small scattered population along sandy secondary beach along edge of palm and mangrove trees, along Pelican Grove Trail, Honeymoon Island.



**Figure 3.** *Helianthus debilis* ssp. *vestitus* (DEB-VES-2851), Pinellas Co., Caladesi Island State Park, large scattered populations with low growing plants on the north secondary sandy beach intermixed with sea oats.



**Figure 4.** *Helianthus debilis* ssp. *vestitus* (DEB-VES-2852) Hillsborough Co., Egmont Key Island State Park, sandy beach in front of Pilots Compound, north and south side of Pier.



**Figure 5.** *Helianthus debilis* ssp. *vestitus* (DEB-VES-2853) Hillsborough Co., Egmont Key Island State Park, sandy beach along west shore of island among an old palm grove.



**Figure 6.** *Helianthus debilis* ssp. *vestitus* (DEB-VES-2825) Hillsborough Co., Egmont Key Island State Park, sandy beach at the north end of island, opposite lighthouse.



**Figure 7.** *Helianthus debilis* ssp. *vestitus* (DEB-VES-2826) season(s), Charlotte Co., Gasparilla Island State Park, sandy secondary beach dune southwest of the boardwalk and lighthouse.



**Figure 8.** *Helianthus debilis* ssp. *vestitus* (DEB-VES-2828) Pinellas Co., Fort De Soto State Park, sandy beach on both sides of the Bay Pier.



**Figure 9.** *Helianthus debilis* ssp. *vestitus* (DEB-VES-2829) Pinellas Co., Byway road to Fort De Soto State Park, sandy roadside ditch, open area.

## Conclusion

The addition of eight populations of *Helianthus debilis* ssp. *vestitus*, coastal dune sunflower, to the sunflower crop wild relatives germplasm collection represents the first germplasm collected in almost 30 years. The added populations are important as a genetic resource to combat emerging pests and environmental challenges, helping to maintain sunflower as a viable and competitive global crop and to preserve it for the future generations.

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