BRIEF NOTE

A Significant Seed Bank for *Spergularia marina* (Caryophyllaceae)[1]

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ABSTRACT. The seed bank of *Spergularia marina* averaged 471,135 seeds m^{-2} in an Ohio salt marsh, representing the largest seed pool reported in the literature for a flowering plant community. Seed banks perform an important role in maintaining populations of annual halophytes, such as *S. marina,* in salt marshes, because of the local extinction of plant populations in these unpredictable and highly stressful saline environments.

OHIO J. SCI. 88 (5): 200–202, 1988

INTRODUCTION

Spergularia marina (L.) Griseb. is an annual halophyte that was first reported to occur in a wet saline marsh at Rittman, Ohio in 1978 (Riehl and Ungar 1980). Since the first report of *S. marina* in one small area of the salt marsh containing fewer than 100 plants in a 600-cm^2 area, the species has spread widely over the marsh so that local populations in 1987 contained as many as 120,000 plants m^{-2}.

Seed banks may play a very important role in maintaining plant species at sites in which the environment is unpredictable. Moisture and salinity stress caused by reduced precipitation at any time during the growing season can eliminate an entire local population. A review of the seed bank literature indicates that some plant

[1]Manuscript received 14 July 1988 and in revised form 4 October 1988 (#88-15).

communities maintain very large seed banks: annual grassland = 300,000 seeds m^{-2} (Young et al. 1980); sedge meadow = 377,041 seeds m^{-2} (McGraw 1987); and freshwater marsh = 255,000 seeds m^{-2} (Van der Valk and Davis 1979).

Coastal salt marsh communities have been reported to have seed banks ranging from a low of 380 seeds m^{-2} (Hopkins and Parker 1984) to a high of 140,000 seeds m^{-2} (Jerling 1984). Previous surveys of inland salt marsh habitats indicate that seed banks may range from 850 seeds m^{-2} (Smith and Kadlec 1983) to 128,031 seeds m^{-2} (Philipupillai and Ungar 1984).

Josselyn and Perez (1981) reported that seed densities in a California coastal salt marsh reached 83,050 seeds m^{-2}, with *S. marina* comprising 92% of the total. Because of the high densities of *S. marina* in local populations at the Rittman, Ohio salt marsh, it was hypothesized that a large seed bank might be produced by this species. The purpose of my investigation was to determine the number of seeds stored in the seed bank of communities dominated by *S. marina* at the Rittman, Ohio salt marsh.

METHODS

To determine the extent of the seed bank, soils were collected from a wet saline marsh at the site of the Morton Salt Company at Rittman, Wayne County, Ohio (longitude 81°47′30″, latitude 40°57′30″). Twenty-five soil cores (5.5 cm diam. × 5.0 cm deep) were collected with a bulb planter at different times during the 1987 and 1988 growing seasons from a plant community dominated by *Spergularia marina*. Other plant species associated with *S. marina* at this site were *Hordeum jubatum, Salicornia europaea,* and *Atriplex triangularis*.

Soil collections were put in plastic cups and returned to the laboratory. Cups were transferred to a germinator set at 5°C night/15°C day for the first 10 weeks and 5°C night/25°C day for the second 10-week period. A 12-h photoperiod was maintained in the germinator; soil cores were subirrigated with tap water for the 20-week germination period; and germination was monitored. Weekly counts were made of emerging seedlings; from these data estimates of the abundance of seeds were made.

RESULTS AND DISCUSSION

Results of the present study suggest that this plant community contains the largest seed bank ever reported for a flowering plant community. The mean number of seeds in the February, 1987 samples (N = 25) was 379,268 m^{-2} (SE = ±33,235, range = 62,312 − 640,838 m^{-2}). The relative densities of seeds in the soil were: *S. marina,* 99.2%; *Salicornia europaea,* 0.1%; and *Atriplex triangularis,* 0.7%. The seed bank was reduced to 38,506 seeds m^{-2} in June, because of seed germination in early spring. The February, 1988 samples (N = 25) contained a mean of 471,135 seeds m^{-2} (SE = ±45,801, range = 170,525 − 1,189,466 m^{-2}), reflecting considerable seed production in the 1987 growing season. Table 1 contains a comparison of the size of *S. marina* seed banks with reports of high seed bank counts from other plant communities.

Seed banks play a significant role in maintaining plant populations in a habitat. Storage of seeds in the soil is most significant in unpredictable or changing environments, because the only way of maintaining a population in these stressful habitats is in the form of dormant seeds until environmental conditions become more favorable for subsequent germination, growth, and reproduction of a particular plant species. In the case of annuals such as *S. marina,* the occurrence of a persistent seed bank assures that the population can be maintained in an area for more than one year. Annuals have only one chance to reproduce, and if an environmental stress such as drought or salinity results in a population becoming locally extinct, the seed bank will provide the source for recruitment of the species in subsequent years.

ACKNOWLEDGMENTS. This research was supported by Research Grant No. 807 from the Ohio University Research Committee.

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TABLE 1

Comparison of seed banks from various plant communities in the United States.

Plant community	Location	Mean no. of seeds m^{-2}	Reference
Annual grassland	California	300,000	Young et al. 1981
Arctic tundra	Alaska	3,367	McGraw 1980
Coniferous forest	Oregon	3,447	Strickler and Edgerton 1976
Deciduous forest	North Carolina	1,181	Oosting and Humphreys 1940
Desert	Nevada	57,177	Nelson and Chew 1977
Floodplain forest	South Carolina	4,159	Schneider and Sharitz 1986
Freshwater tidal marsh	New Jersey	32,430	Leck and Graveline 1979
Prairie	Missouri	6,470	Rabinowitz 1981
Prairie marsh	Iowa	255,000	van der Valk and Davis 1979
Salt marsh-coastal	California	83,050	Josselyn and Perez 1981
Salt marsh-inland	Ohio	471,135	This study
Sedge meadow	West Virginia	377,041	McGraw 1987

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