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Irene Ducrest Hesse
Louisiana State University

William H. Conner
Baruch Forest Science Institute

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Leaf Production of *Sabal minor* (Jacq.) Pers. in a Louisiana Forested Wetland

IRENE DUCREST HESSE AND WILLIAM H. CONNER

Leaf production of *Sabal minor* (Jacq.) Pers. (dwarf palmetto) was estimated at two sites in a forested wetland near Thibodaux, Louisiana during a 1-year period. One site was flooded throughout the study period, while the other was a drier bottomland hardwood ridge, higher in elevation by 40 cm. Palmetto leaves were tagged and measured for total length during May 1989 and May 1990 in two plots within each site. Information on plant trunk height, plants/m², leaves (fronds)/plant, and leaf biomass was also obtained. Significant differences were noted for all parameters tested between plants on the flooded site and those on the ridge site. Leaf production was highest in the ridge site (68 g/m²/yr) and lowest in the flooded site (48 g/m²/yr). Most leaves died during the 1-year study period. Upon turning brown, leaves became brittle and broke apart rapidly. This may represent an important source of organic matter to the system that past studies have not documented.

Sabal minor (Jacq.) Pers. (dwarf palmetto) is a member of the palm family (Arecaceae or Palmae) and grows in lowlands, swamps, river terraces, and floodplains from Texas to south Florida and to northeast North Carolina (Correll and Correll, 1975). In Louisiana, it is abundant on alluvial soils from the Pearl River to the Sabine River, extending up the Mississippi River floodplain into Arkansas. Brown (1945) described *S. minor* as a tree with a trunk ranging from 0 to 2.4 m tall. Its evergreen leaves are filamentous and suborbicircularly fan-shaped with 32–50 segments. Petioles grow to up to 91 cm in length. Flowers are small, whitish, and very numerous from May into July with flower stalks up to 3 m long. Trunk size is thought to be related to the height of the water table, degree and frequency of flooding, and possibly the amount of shade, with the largest trunks being found in areas subject to flooding and in the shade (Brown, 1945). A variety of wildlife use this plant for food, including several kinds of songbirds, squirrels, raccoons, and white-tailed deer (Martin et al., 1951; Halls, 1977). Human uses include thatching and weaving (Brown, 1945).

Although *Sabal minor* is a common understory plant species occurring throughout the southeast region of the United States, very little ecological information has been published for it. This study provides preliminary results concerning leaf production of *S. minor* in two habitat types in a Louisiana forested wetland.

METHODS

The study area (Fig. 1) is a freshwater forested wetland that lies on the backslope of the

abandoned Bayou Lafourche tributary approximately 10 km southwest of Thibodaux, Louisiana. Study sites include a permanently flooded low site and an infrequently flooded bottomland hardwood ridge that is approximately 300 m wide and 40 cm higher in elevation than the flooded site. *Acer rubrum* L. (red maple), *Salix nigra* Marsh. (black willow), and *Fraxinus pennsylvanica* Marsh. (green ash) dominate the overstory vegetation in the permanently flooded areas. Understory vegetation in the flooded site includes *Cephalanthus occidentalis* L. (buttonbush), *Acer rubrum* L. (red maple), *Fraxinus pennsylvanica* Marsh. (green ash), and *Sabal minor* (Jacq.) Pers. (dwarf palmetto). The drier bottomland hardwood ridge is populated mainly with *Quercus* spp. (oaks), *Ulmus americana* L. (American elm), *Celtis laevigata* Willd. (sugarberry), and *Liquidambar styraciflua* L. (sweetgum). Major understory species in this area are *S. minor*, *Ilex decidua* Walt. (deciduous holly), *Acer negundo* L. (boxelder), and *Quercus* spp. Soils are classified by the Soil Conservation Service as a Fausse-Sharkey association. These soils are very fine, montmorillonitic, nonacid, thermic Typic Fluvaents or Vertic Haplaquepts (Matthews, 1984). Average total annual precipitation in the area is 160 cm, but can be quite variable, ranging from 79 cm in 1962 to 223 cm in 1940 (data for Thibodaux station from Louisiana Office of State Climatology, Baton Rouge, LA).

Two 10 × 10-m plots were randomly located in each site in May 1989. Within each plot, all palmettos were numbered, individual leaves were tagged and measured for total length, and trunk heights were measured. Leaves were

Fig. 1. Map showing the location of the study area in relation to the town of Thibodaux, Louisiana. Bottomland hardwood ridge is 40 cm higher in elevation than the inundated area.

classified as green, brown-tipped (early stage of decline), dying (mostly brown), broken, or dead. Tagged leaves, along with new leaves, were again measured in May 1990. One well was installed in each plot to monitor water levels above or below the soil surface.

To determine leaf biomass, 112 palmetto leaves ranging in size from the smallest to the largest available were harvested from a number of plants growing adjacent to the plots. Total length from the point of attachment to the

tip was recorded for each leaf, and the leaves were dried to a constant weight at 65 C and weighed. Dry weight was plotted against leaf length (Fig. 2). A second-order polynomial regression equation, $y = 47.816 - 0.715x + 0.007x^2$, where x = leaf length in cm and y = biomass in g., gave the best estimate of leaf dry weight ($r^2 = 0.81$). Using this equation, leaf production was calculated as the sum of the increase in biomass of leaves tagged in 1989 plus the biomass of new leaves that emerged

Fig. 2. Relationship between palmetto leaf length and dry weight ($r^2 = 0.81$).

Fig. 3. Monthly water levels for the ridge and flooded palmetto study areas, May 1989–May 1990.

during the year. Trunk height, plant density, number of leaves per plant, standing biomass, and biomass change were tested for significant differences between sites ($P = 0.05$) using a nested completely random design in which the replicates were the plots within each area, and the samples were the individual palms (SAS Institute, Inc., 1989).

RESULTS

Average monthly water levels from May 1989 to May 1990 are shown in Figure 3 for the two sites. Water levels in the flooded site remained at least 9 cm above the forest floor surface, whereas water levels in the bottomland ridge site were below the soil surface most of the year, dropping to 90 cm below the surface in Oct. 1989. The water table was at the surface on the ridge in Dec. and there was 4 cm of surface water during Feb.

Significant differences between the flooded site and the ridge site were noted for all parameters tested (trunk height, plant density, number of leaves per plant, standing biomass, and biomass change). Trunk height was greater on the flooded site. There were twice as many palmetto plants growing on the ridge site as there were on the flooded site, but they were generally smaller and had fewer leaves (Table 1). As a result, standing leaf biomass was slightly lower in the ridge area, with 137 g/m² vs 165 g/m² in the flooded area. Leaf production, on the other hand, was highest in

the ridge area (68 g/m²/yr) and lowest in the flooded plots (48 g/m²/yr).

DISCUSSION

Leaves tagged in 1989 grew very little except for those that were newly emerged at the time of tagging. The leaf life span of *Sabal minor* has been previously undocumented, but appears to be little more than 1 year in these sites, with shorter lived specimens occurring on the drier ridge site. This is a relatively short leaf life span compared to similar species, such as *Serenoa repens* and *Sabal etonia*, with a range of about 2.4–3.0 years (Abrahamson, 1990). By May 1990, the majority of the newly emerging leaves in 1989 were on the decline, turning brown and dying. Therefore, the majority of the annual aboveground palmetto production appears to be due to the presence of leaves that emerged during the year. Once they died, leaves became very brittle and quickly broke up. This could represent a significant source of organic matter to the system besides that being added by tree litterfall. Average litterfall production in similar freshwater forested wetlands (Conner and Day, 1976; Cramer and Day, 1979; Conner et al., 1981) is 490 g/m²/yr. *Sabal minor* thus contributes another 10–14% to total production. More detailed studies need to be conducted with this species to determine its contribution to the overall production of alluvial forests.

Palmetto characteristics differed between the inundated and ridge sites within the study area. Palmettos on the ridge had significantly shorter trunks and a higher plant density/m² than those on the inundated site. Plants on the flooded site were much taller and more robust. This difference in morphology between plants occurring on the flooded sites and those growing in drier conditions agrees with Brown's (1945) observations of *Sabal minor*. Similarly, Abrahamson and Hartnett (1990) reported that *Serenoa repens* (saw palmetto) in Florida appears to be taller and more robust in wetter (though not permanently flooded) sites than

TABLE 1. Dwarf palmetto variables for two sites in a Louisiana forested wetland. Standard error is given in parentheses. All numbers within the same column are statistically different ($P = 0.05$).

Plot	Density (stems/plot)	Average trunk height (cm)	Average number of leaves per plant	Leaf biomass (g/m ²)	Leaf production* (g/m ² /yr)
Ridge	22 (4.0)	21 (2.0)	5 (0.2)	137 (0.7)	68 (0.3)
Flooded	10 (1.5)	48 (2.5)	7 (0.4)	165 (1.7)	48 (0.7)

* Production based on increase in leaf biomass from 1989 to 1990 plus new leaves.

on dry sites. The amount of shading in the two Louisiana study areas was not measured, but appeared to be similar since both areas had a closed canopy.

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- (IDH) COASTAL ECOLOGY INSTITUTE, LOUISIANA STATE UNIVERSITY, BATON ROUGE, LOUISIANA 70803; AND (JPH) BARUCH FOREST SCIENCE INSTITUTE, BOX 596, GEORGETOWN, SOUTH CAROLINA 29442. Date accepted: June 26, 1995.