

# A Case of Mistaken Identity

## Native and Exotic “Boston Ferns” and “Sword Ferns” (*Nephrolepis* spp.)



Figure 1. Florida's native sword fern, also known as wild Boston fern, is a dominant feature of south Florida hammocks and a popular native landscape plant (*Nephrolepis exaltata*). Shown here in DuPuis Preserve (Palm Beach/Martin County).

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### Introduction

Florida's native sword fern, also known as wild Boston fern, (*Nephrolepis exaltata*) (Figure 1) and giant sword fern (*Nephrolepis biserrata*) (Figure 2), were highly admired by early botanists, naturalists, and horticulturists (Small 1918a, 1918b, Simpson 1920, Foster 1984). Charles Torrey Simpson (1920) wrote: “But the real glory of the hammock is the two species of *Nephrolepis*, one being the well known “Boston” fern.” According to Foster (1984) “—they [*N. exaltata*] could be seen in homes and public buildings almost everywhere. They were the most

desired plants of growers and yearly sales soared in the hundred thousands.” In 1894, a cultivar of *N. exaltata* was discovered in a shipment from a Philadelphia grower to a Boston distributor and named *N. exaltata* cv. ‘Bostoniensis’, hence the commonly used name Boston fern (Foster 1984). Other derivatives of *N. exaltata* cv. ‘Bostoniensis’, ranging from 1-5-pinnate, and with such descriptive names as *N. exaltata* cv. ‘Florida [Fluffy] Ruffles’ were developed and are still known from Florida (FNA Editorial Staff 1993). The

Figure 2. Fronds of Florida's native giant sword fern (*Nephrolepis biserrata*) are often 2 m long. Shown here in Fern Forest, Pompano Beach (Broward County).



native sword fern and giant sword fern are still highly recommended for use as indoor and landscape plants (Broschat and Meerow 1991, Haehle and Brookwell 1999), but non-native, similar appearing species of *Nephrolepis* now are also sold and confused with our native species.

Tuberous sword fern (*Nephrolepis cordifolia*) (Figure 3), not native to Florida, was found growing on a roadside in Sumter County, Florida in 1933 (Ward 2000) and in cultivation in Floral City, Florida in 1938 (Ward 2000). It is now found naturalized in pine rocklands, flatwoods, marsh



Figure 3. Tuberous sword fern (*Nephrolepis cordifolia*) can be confused with the native sword fern and is commonly available for sale in retail nurseries.

edges, and hammocks of conservation areas of south Florida and as far north as Georgia (Langeland and Burks 1998). It was included on the Florida Exotic Pest Council's (FLEPPC) "1995 List of Florida's Most Invasive Species" in Category I, which means that it is invading and disrupting native plant communities in Florida. Tuberous sword fern is sold in the nursery and landscape trade, which may contribute to its further spread into native plant communities. However, the Florida Nurserymen and Growers Association (FNGA) and FLEPPC, in a 1999 joint decision, encouraged phase-out of tuberous sword fern from the growing and landscape market (Aylsworth 1999). Asian sword fern (*Nephrolepis multiflora*) (Figure 4), also not native

to Florida, was found growing and "driving out all other plants" on Sanibel Island, Lee County, Florida in 1954 (Ward 2000) and in Boca Chica, Monroe County, Florida in 1965 (Ward 2000). It was included on the Florida Exotic Pest Council's (FLEPPC) "1993 List of Florida's Most Invasive Species" in Category II and moved to Category I in 1999.



Native sword fern and giant sword fern are similar in appearance to the non-native invasive tuberous sword fern and Asian sword fern. Tuberous sword fern is sold under various names

**Table 1**

	<b>N. cordifolia</b> (Tuberous sword fern)	<b>N. exaltata</b> (Native sword fern)	<b>N. multiflora</b> (Asian sword fern)	<b>N. biserrata</b> (Giant sword fern)
<b>Tubers</b>	<b>Sometimes present.</b>	Never present.	Never present.	Never present.
<b>Frond</b>	To 1.0 m tall.	To 1.5 m tall.	To 1.5 m tall.	To 2.5 m tall.
<b>Petiole</b>	Dense, spreading, pale brown scales.	Sparse to moderate pale to reddish-brown scales of single color or slightly darkened at attachment, with expanded base bearing small marginal hairs.	Covered with appraised, dark brown scales with pale margins.	Sparse to moderate reddish to light brown hair-like scales.
<b>Rachis</b>	Pale hair-like scales on upper surface with <b>distinctive bases much darker than the scales.</b>	Moderately spaced hairlike scales that have expanded bases bearing small, marginal hairs.	<b>Clothed with linear two-colored, very hairy scales, giving hairy appearance to rachis.</b>	Moderately spaced scales of one color.
<b>Pinnae (medial)</b>	To 4.8 cm long, .9 cm wide, typically attached <1cm apart. <b>Bases often overlapping the rachis. Mostly straight but sometimes slightly curved with blunt tips.</b> Basal lobe on the upper facing edge overlapping the rachis above and the lower portion of the next pinnae. Glabrous	To 7.4 cm long, 1.8 cm wide attached .7 to 2.1 cm apart. Bases usually not overlapping the rachis. <b>Slightly curving to decidedly sickle-shaped near apex</b> acute to attenuate tips. Basal lobe on the upward facing edge sometimes overlapping the rachis. Sparsely to moderately scaly near midvein and base with pale brown scales	To 12.3 cm long, 1.8 cm wide, attached to 2.4 cm apart. Margins singly or doubly toothed. Scaly and pubescent below with pale brown hairs. <b>Central vein with dense short, erect hairs on upper surface.</b>	To 23 cm long, 2 cm wide attached to 3.5 cm apart. Margins finely double toothed. Densely pubescent below. Apices long pointed. <b>Central vein with dense erect hairs, short matted hairs, or rarely glabrous on upper surface.</b>
<b>Indusia</b>	<b>Kidney- to crescent-shaped to rounded-triangular.</b>	Kidney- to horseshoe-shaped.	Circular to horseshoe-shaped indusia.	Circular to horseshoe-shaped.

(e.g. Boston fern, hardy fern, large fern, erect sword fern) and names are often interchanged among the different species. Tuberous sword fern is most often confused with and sold in some stores as the native sword fern. The purpose of this article is to help consumers, distributors, growers, and land managers to distinguish between these species. Fishtail sword fern (*Nephrolepis falcata*), is non-native to Florida and escaped from cultivation (Wunderlin and Hansen 2000) but is not considered invasive. It is easily distinguished from the other species by its 1- to 3-dichotomously forked pinnae and will not be discussed further. Petticoat fern (*Nephrolepis hirsutula*), also sold in the nursery trade, is not known to have escaped cultivation and likewise will not be discussed. Avery's sword fern (*Nephrolepis x averyi*) is a natural hybrid of *N. biserrata* x *N. exaltata*.

## Identification

Use the narrative below, the dichotomous key (adapted from Nauman 1981), or Table 1, which compares characteristics of the four species of *Nephrolepis*, to distinguish them. A glossary is provided

## Glossary

Appressed	Lying flat or close against.
Attenuate	Gradually narrowed to a long point at the apex.
Acute	Sharply angled, the sides of the angle essentially straight.
Fron	A large divided leaf.
Glabrous	Without hairs.
Indusia	An outgrowth of tissue that covers the spore producing structures in ferns.
Medial pinnae	Referring to those pinnae of the central portion of the frond.
Pubescent	Hairy.
Pinnae	Primary division of a compound leaf or frond of a fern.
Rachis	The central prolongation of the frond stalk.
Scale	An outgrowth of the epidermis having cell dimensions in two planes.
Tomentose	Densely covered with short matted hairs.
Trichomes	A hairlike outgrowth of the epidermis.
Tuber	A thickened, solid portion of an underground stem.

to help understand terminology used in the key and table. Photographs for key characters can be seen in "Natural Area Weeds: Distinguishing Native and Non-Native Boston Ferns and Sword Ferns (*Nephrolepis* spp.), available on <http://eids.ifas.ufl.edu>. The interested reader will also find the following publications useful:

- Coile, N. C. 1996. *Which Boston Fern Is It?* The Exotic *Nephrolepis cordifolia* (L) Presl, or the Native *Nephrolepis exaltata* (L.) Schott. Botany Circular No. 32. Florida Department of

Agriculture and Consumer Services, Gainesville, Florida. 3 pp.

- Nelson, G. 2000. *The Ferns of Florida*. Pineapple Press, Sarasota, Florida. 208 pp.

- Wunderlin, R. P. and B. F. Hansen. 2000. *Flora of Florida*, Volume 1, Pteridophytes and Gymnosperms. University Press of Florida, Gainesville. 365 pp.

Tuberous sword fern, as the name implies, sometimes produces tubers and it is the only one of the four species that is capable of producing them. Therefore, if tubers are present on

the plants, this alone is a positive identification for this species. The presence of scales on the upper side of the rachis that have a point of attachment that is distinctively darker than the rest of the scale also will distinguish tuberous sword fern from the other three species. Another good characteristic to distinguish tuberous sword fern is that the pinnae (medial) are close together, the lobes overlapping the next closest pinnae, and the pinnae (medial) bases overlap and hide the rachis underneath. Tuberous sword fern is the smallest of the four species, having shorter fronds and pinnae. The fronds of tuberous sword fern are more erect than those of the native sword fern, the latter usually having long and weeping fronds. The pinnae of tuberous sword fern are usually straight and blunt compared to those of native sword fern, which are mostly sword shaped (falcate) and gradually narrowing to a point at the apex. Finally, if indusia are present, those of tuberous sword fern are more kidney- to crescent-shaped or triangular-rounded than those of native sword fern, which are more kidney- to horseshoe-shaped.

Asian sword fern and giant sword fern can be distinguished from tuberous sword fern by the presence of short stiff hairs that occur on the central vein of the pinnae of Asian and giant sword fern. These can be observed best by bending the pinnae and looking at the curve created while holding it up to light. The most distinguishing characteristic for Asian sword fern is a dense covering of dark brown, appressed scales with pale margins on mature petioles. In contrast: 1)The petiole scales of tuberous sword fern are dense, spreading, and pale brown; 2)those of native sword fern are sparse to moderate, reddish-brown, of a single color or slightly darkened at the point of attachment, and have expanded bases with small marginal hairs; and 3)those of giant sword fern are sparse to moderate, reddish to light brown and hair-like. Other features that will help distinguish the species are: 1)The hairy appearance of the rachis of Asian sword fern, owing to abundant two-colored, hairy scales, and 2)the fronds and pinnae of giant sword fern, which are much longer than of the other species.

## Control of Tuberous Sword Fern

Hand pulling can be used to remove some of the fern plants but the plants will break off, leaving plant parts in the ground from which regrowth will occur. Because some plants are difficult to up-root and the rachis can cut the skin, wear heavy gloves. Do not dispose of these or other invasive plant species where they cause new infestations.

Plants can be killed with herbicide products that contain the active ingredient glyphosate. A foliar application of a product that contains 41.0% glyphosate diluted to 1.5% v/v of product provides control. Follow-up applications are necessary. Several products are available from garden and agricultural supply stores. Products that contain glyphosate will kill desirable plants that it contacts so follow all instructions on the herbicide label and apply carefully.

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Mesozoic Landscaping, Inc. Richard's nursery has my personal certification as invasive *Nephrolepis* species-free.

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1. Tubers present ..... *N. cordifolia*
1. Tubers absent
  2. Central vein on upper surface of medial pinnae glabrous (sometimes with a few scales); indusium kidney- horseshoe- or crescent-shaped, ca. 1.2 mm or more wide.
    3. Pinnae sword-shaped with acute to attenuate tips; plants never bearing tubers; rachis scales appearing as one color or obscurely two-colored ..... *N. exaltata*
    3. Pinnae mostly straight or slightly sword-shaped with blunt tips; plants often bearing tubers; rachis scales pale with a distinctly dark point of attachment ..... *N. cordifolia*
  2. Central vein on upper surface of medial pinnae sparsely to densely covered with short erect hairs (often also with scales); indusium circular, ca. 1.0mm wide.
    4. Petioles (mature) covered with dark brown, appraised scales with pale margins ..... *N. multiflora*
    4. Petioles not covered with dark brown, appraised scales, but often with a few loose, reddish to light brown scales or scales absent, central vein on upper surface of medial pinnae densely pubescent to tomentose (rarely glabrous), with short, dense trichomes ... *N. biserrata*