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).

Ken Langeland
University of Florida Center for Aquatic and Invasive Plants
7922 NW 71st Street, Gainesville, FL 32653
kal@gnv.ifas.ufl.edu

Introduction
Florida’s native sword fern, also know 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 distributer 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 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 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).

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>
<thead>
<tr>
<th></th>
<th>N. cordifolia (Tuberous sword fern)</th>
<th>N. exaltata (Native sword fern)</th>
<th>N. multiflora (Asian sword fern)</th>
<th>N. biserrata (Giant sword fern)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frond</td>
<td>To 1.0 m tall.</td>
<td>To 1.5 m tall.</td>
<td>To 1.5 m tall.</td>
<td>To 2.5 m tall.</td>
</tr>
<tr>
<td>Petiole</td>
<td>Dense, spreading, pale brown scales.</td>
<td>Sparse to moderate pale to reddish-brown scales of single color or slightly darkened at attachment, with expanded base bearing small marginal hairs.</td>
<td>Covered with appraised, dark brown scales with pale margins.</td>
<td>Sparse to moderate reddish to light brown hair-like scales.</td>
</tr>
<tr>
<td>Rachis</td>
<td>Pale hair-like scales on upper surface with distinctive bases much darker than the scales.</td>
<td>Moderately spaced hairlike scales that have expanded bases bearing small, marginal hairs.</td>
<td>Clothed with linear two-colored, very hairy scales, giving hairy appearance to rachis.</td>
<td>Moderately spaced scales of one color.</td>
</tr>
<tr>
<td>Pinnae (medial)</td>
<td>To 4.8 cm long, .9 cm wide, typically attached&lt;1cm apart.</td>
<td>To 7.4 cm long, 1.8 cm wide attached .7 to 2.1 cm apart.</td>
<td>To 12.3 cm long, 1.8 cm wide, attached to 2.4 cm apart.</td>
<td>To 23 cm long, 2 cm wide attached to 3.5 cm apart.</td>
</tr>
<tr>
<td></td>
<td>Bases often overlapping the rachis.</td>
<td>Bases usually not overlapping the rachis.</td>
<td>Margins singly or doubly toothed. Scaly and pubescent below with pale brown hairs.</td>
<td>Margins finely double toothed. Densely pubescent below. Apices long pointed.</td>
</tr>
<tr>
<td></td>
<td>Mostly straight but sometimes</td>
<td>Slightly curving to decidedly sickle-shaped near apex acute to attenuate tips.</td>
<td>Central vein with dense short, erect hairs on upper surface.</td>
<td>Central vein with dense erect hairs, short matted hairs, or rarely glabrous on upper surface.</td>
</tr>
<tr>
<td></td>
<td>slightly curved with blunt tips.</td>
<td>Basal lobe on the upward facing edge overlapping the rachis above and the lower portion of the next pinnae. Glabrous</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Basal lobe on the upper facing edge overlapping the rachis above and the lower portion of the next pinnae. Glabrous</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(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 \((\textit{Nephrolepis falcata})\), 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 \((\textit{Nephrolepis hirsutula})\), also sold in the nursery trade, is not known to have escaped cultivation and likewise will not be discussed. Avery’s sword fern \((\textit{Nephrolepis x averyi})\) is a natural hybrid of \(\textit{N. biserrata} \times \textit{N. exaltata}\).

**Identification**

Use the narrative below, the dichotomous key (adapted from Nauman 1981), or Table 1, which compares characteristics of the four species of \(\textit{Nephrolepis}\), to distinguish them. A glossary is provided 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 \((\textit{Nephrolepis} \textit{spp.})\), available on http://eids.ifas.ufl.edu. The interested reader will also find the following publications useful:


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 attach-
ment that is distinctively darker than
the rest of the scale also will distinguish
tuberous sword fern from the other
three species. Another good characteris-
tic 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
to 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 dif-
ticult 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 ingre-
dient glyphosate. A foliar application
of a product that contains 41.0% glypho-
sate diluted to 1.5% v/v of product
provides control. Follow-up applica-
tions are necessary. Several products
are available from garden and agri-
cultural 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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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- horse-
shoe- 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,
apprased 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 tomen-
tose (rarely glabrous), with short, dense trichomes . . . . . . . . N. biserrata

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