

A hybrid of *Acrostichum* from Andaman and Nicobar Islands, India

Background

Acrostichum L., the mangrove fern, comprises *A. aureum* L., *A. speciosum* Willd. and *A. danaeifolium* Langsd. & Fish (Tomlinson, 1986). Among the three species, *A. speciosum* is restricted to the Indo-West Pacific (IWP) region, *A. danaeifolium* to the Atlantic East Pacific (AEP) region and *A. aureum* is widely distributed in both regions (Adam and Tomlinson, 1979; Tomlinson 1986). In the field, the two IWP species are distinguished based on leaflet shape and texture. The leaflets of *A. speciosum* are papery and narrow gradually to a pointed tip, while those of *A. aureum* are leathery and have a broadly rounded tip.

In India, *A. aureum* is most common and *A. speciosum* is only known to occur in the Andaman and Nicobar Islands (ANI) and Orissa (Kathiresan, 2008). In ANI, *A. speciosum* is rare and occurs only in Shoal bay creek along with *A. aureum*. During our recent floristic survey in the mangroves of ANI, we recorded some individuals with intermediate morphological characters between *A. aureum* and *A. speciosum* from Shoal bay creek. These individuals have leaflets that are leathery (like *A. aureum*) and with pointed tips (like *A. speciosum*). Recently, Zhang *et al.* (2013) observed similar hybrid individuals of *Acrostichum* in China and affirmed their hybrid status based on molecular analysis. They are morphologically consistent with our present observations and we have not found any individuals of this kind in other areas of ANI where only *A. aureum* occurs. So this taxon is recognised as a distinct hybrid entity.

The hybrid status of individuals in ANI is supported by intermediate morphological characters (i.e. leaf length, leaflet length and width, stalk length, stipe length and fertile leaflet length) and distribution limited to those areas where *A. speciosum* and *A. aureum* co-exist. The *Acrostichum* hybrid resembles *A. aureum* by its leathery leaflets and plant height; resembles *A. speciosum* by its pointed leaflets. The following are field keys for identification:

1. a) Leaflets narrowly acuminate at apex 2
 b) Leaflets leathery, obtuse to obcordate and shortly mucronate at apex *A. aureum*
2. a) Leaflets leathery, leaf size more than 1 m, leaflet stalk > 1 cm, stipe up to 1 m *Acrostichum* hybrid
 b) Leaflets papery, leaf size not more than 1 m, leaflet stalk < 1 cm, stipe < 50 cm *A. speciosum*

Five specimens each of *A. aureum*, *A. speciosum* and the hybrid were collected from different individuals and identified based on morphological descriptions by Giesen *et al.* (2006), Debnath (2004) and Dagar *et al.* (1991). Voucher specimens were deposited at the Botanical Survey of India, Regional Centre at Port Blair. The detailed diagnostic characters of *Acrostichum* in ANI are described in Table. 1.

Acrostichum aureum L.

Terrestrial fern up to 3 m tall (Fig. 1). Rhizome: erect, scales dark brown to black; Leaf: unipinnate, 1–2.5 m L, up to 20 leaflets; Stipe: straw-coloured, > 0.5 cm in diameter, up to 1 m L; Leaflet: green, coriaceous, linear to oblong, apex obtuse to obcordate and shortly mucronate, base cuneate or rounded and irregular, margin entire, venation reticulate, 10–30 cm L, 2–5 cm W; Leaflet stalk: 1–3 cm L; Costae: strongly raised abaxially and grooved adaxially; Fertile leaflet: distal and smaller, 10–20 cm L, 2–3.5 cm W, rusty-brown coloured, later turning dark brown, underside covered with large sporangia, tip obtuse.

Acrostichum speciosum Willd.

Terrestrial fern up to 1.5 m in height (Fig. 2). Rhizome: erect; scales dark brown to black; Leaf: unipinnate, not more than 1 m L, 10–16 leaflets; Stipe: straw-coloured, < 0.5 cm in diameter, 30–40 cm L; Leaflet: green, papery, lanceolate with narrowly pointed tip and cuneate base, margin entire, venation reticulate, 10–20 cm L, 1.5–2.5 cm W; Leaflet stalk: < 1 cm; Costae: strongly raised abaxially and grooved adaxially; Fertile leaflet: distal, dark brown, covered with sporangia underside, 5–10 cm L, 1–1.5 cm W, tip pointed.

Acrostichum hybrid

Terrestrial fern > 1.5 m tall (Fig. 3). Rhizome: erect; scales dark brown to black, broadly lanceolate; Leaf: unipinnate, > 1 m L, 10–20 leaflets; Stipe: straw-coloured, > 0.5 cm in diameter, up to 1 m L; Leaflet: green, coriaceous, lanceolate with pointed tip, base cuneate or rounded and irregular, margin entire, venation reticulate, 10–30 cm L, 2–5 cm W; Leaflet stalk: 1–2 cm L; Costae: strongly raised abaxially and grooved adaxially; Fertile leaflet: covered with sporangia underside, rusty brown, 10–20 cm L, 2–3.5 cm W, tip pointed.

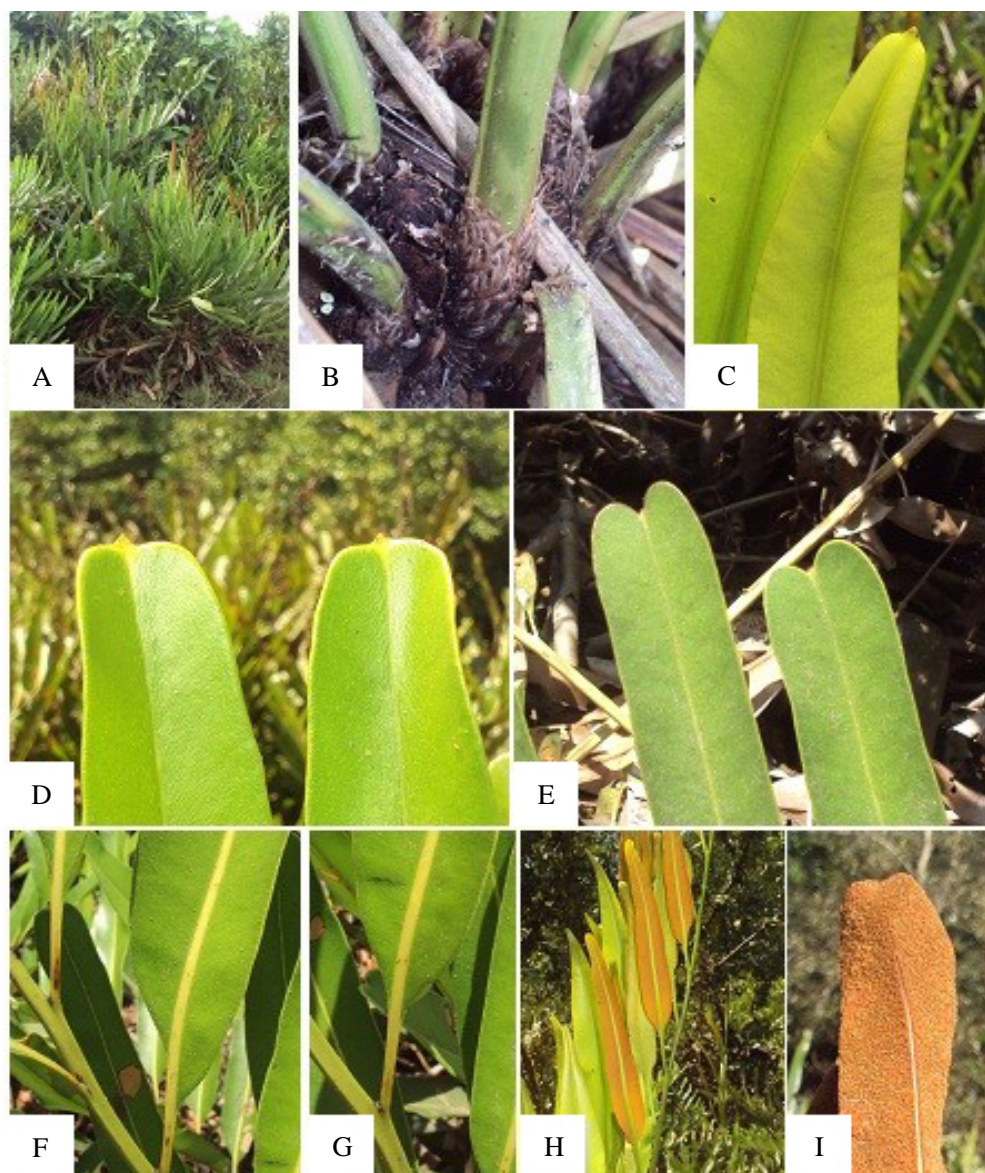


Fig. 1 *Acrostichum aureum*. (A) habitat, (B) rhizome and stipe base with scales, (C) young sterile leaflets with pointed leaf tip, (D) blunt ends of mature sterile leaflets with mucronate, (E) obcordate leaf tip, (F) irregular base of leaflets, (G) long stalk, (H) young fertile leaflets with acute tip, (I) mature fertile leaflet with blunt end and sporangia underside.

Table 1 Diagnostic characters of *Acrostichum* in Andaman and Nicobar islands.

Character	<i>A. aureum</i>	<i>A. speciosum</i>	<i>A. hybrid</i>
Plant height	3 m	< 1.5 m	> 1.5 m
Leaf length	1–2.5 m	up to 1 m	> 1 m
Leaflet shape	broadly lanceolate	lanceolate	broadly lanceolate
Leaflet base	cuneate or rounded & irregular	cuneate	cuneate or rounded & irregular
Leaflet tip	obtuse or obcordate & mucronate	acuminate	acuminate
Leaflet texture	leathery	papery	leathery
Leaflet stalk (L)	1–3 cm	< 1 cm	1–2 cm
Fertile leaflet (L)	> 10 cm	< 10 cm	> 10 cm
Fertile leaflet tip	obtuse	acuminate	acuminate
Fertile leaflet stalk (L)	1–3 cm	0.3–0.8 cm	1–2 cm
Stipe (L)	up to 1 m	< 50 cm	> 50 cm

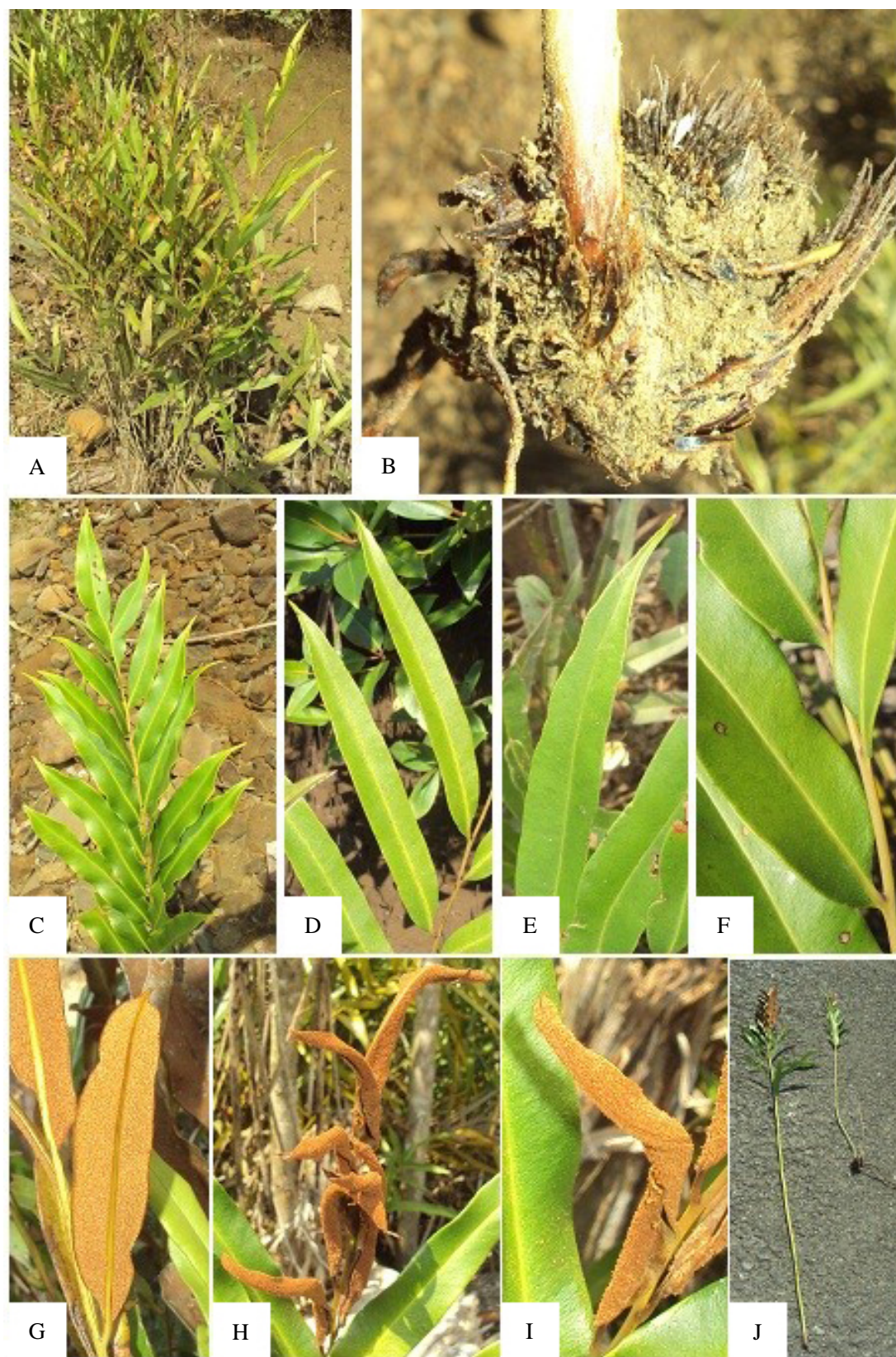


Fig. 2 *Acrostichum speciosum*. (A) habitat, (B) rhizome and stipe base covered with scales, (C) sterile leaflets, (D & E) narrowly pointed tip of sterile leaflet, (F) small stalk and irregular base leaflets, (G) fertile leaflet with pointed tip, (H & I) mature fertile leaflet with sporangia underside, (J) comparison between stipe length of *Acrostichum* hybrid (left) and *A. speciosum* (right).

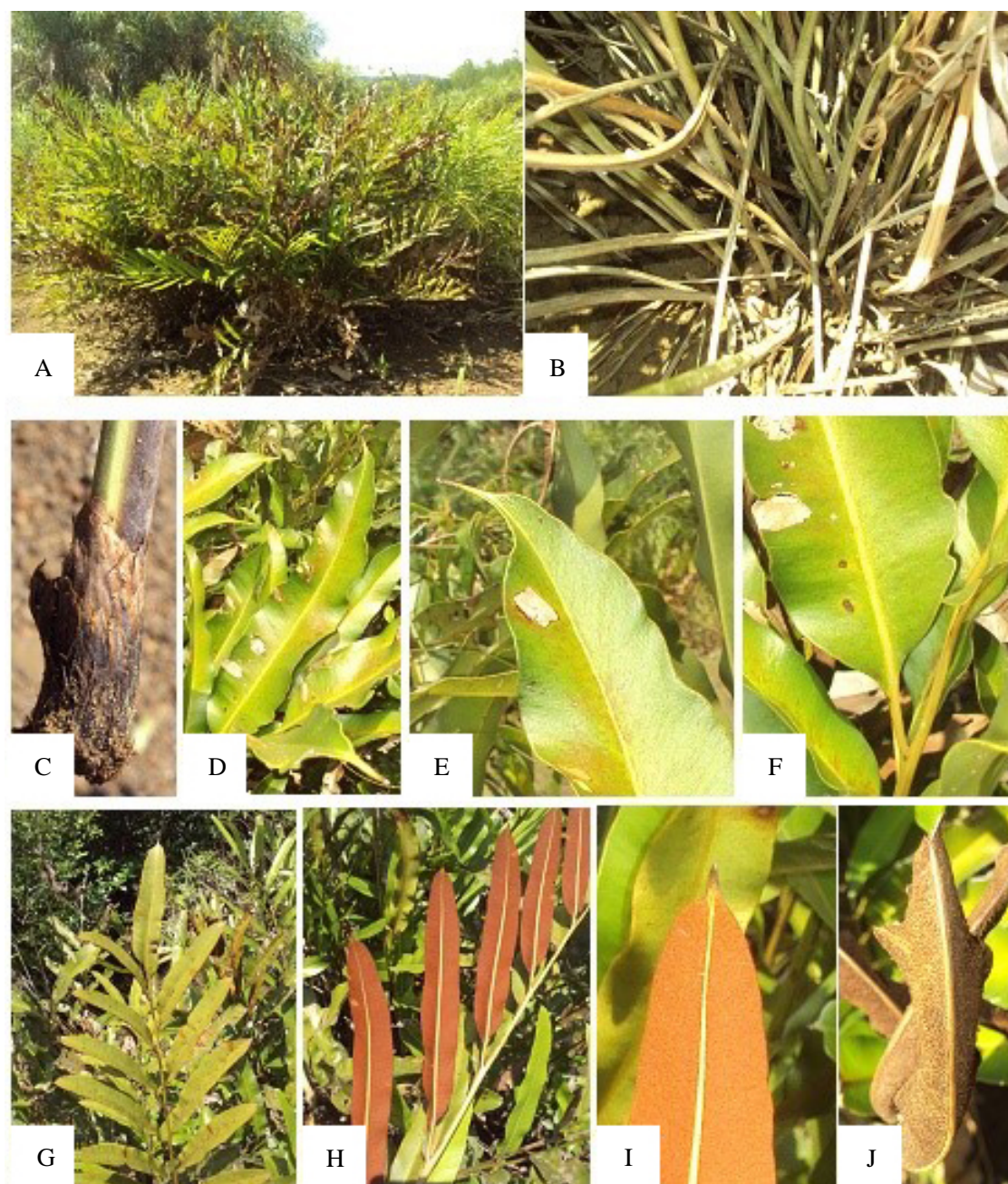


Fig. 3 *Acrostichum* hybrid. (A) habitat, (B) stipe, (C) stipe base covered with scales, (D & E) mature fertile leaflet with narrowly pointed tip, (F) leaflet base and long stalk, (G) Fertile fronds, (H) fertile leaflets with long stalk and underside covered with sporangia, (I) pointed tip of fertile leaflet, (J) mature fertile leaflets.

Discussion

Though *Acrostichum* ferns are differentiated based on leaflet tip, *A. aureum* shows plasticity in shape of leaflet tip particularly young sterile and fertile leaflets exhibit pointed tips like *A. speciosum*. Similarly, *A. speciosum* can be confused with *Stenochlaena palustris* because both exhibit narrowly pointed leaf tips. However, *A. speciosum* differs from *S. palustris* by its erect nature, leaflet with entire margin and reticulate venation. Whereas, *S. palustris* is climbing fern, leaflet margin is serrated and venation is parallel. In the field, the *Acrostichum* hybrid can be differentiated from *A. aureum* by its pointed tip of both sterile and fertile leaflets; from *A. speciosum* by its long stalk, long stipe and leathery leaves. Rhizomes are underground in both *A. speciosum* and the *Acrostichum* hybrid whereas in *A. aureum*, they are erect and aboveground.

Generally, both *A. aureum* and *A. speciosum* occur at the landward side of mangroves. However, they differ with respect to light and salinity. *A. aureum* is often encountered upstream of estuaries where fresh water influence is strong (Tomlinson, 1986; Taylor, 1986; Sun *et al.*, 2002). It is light demanding and often found in disturbed mangrove areas (Aksornkoae *et al.*, 1992; Medina *et al.*, 1990). In contrast, *A. speciosum* is usually found in the mangrove under-storey, just landward of the high intertidal zone. These areas are frequently inundated by tides and are usually shady (Tomlinson, 1986; Turner *et al.*, 1999). However, in Shoal bay creek *A. aureum* and *A. speciosum* co-exist at landward edges along with their putative hybrid. This facilitates contact of spores resulting in hybridization. Further molecular and ecological studies are needed to assess the parentage and the effect of hybridization on mangrove ecosystem.

References

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