

Three very important Casuarina species

Following on from the well received first note about the Casuarinaceae this weeks contribution to your wellbeing while following advice/ directions to stay at home, is about three very important species in many countries, although not in Australia.

The comments made in the introduction to the last note apply here namely that I have not included references as it is a quickly written piece for the times. I might add that neither have I used photographs as they are easily obtained by the reader on the net using your favourite search engine. Something you are encouraged to do if you are fed up with being *covido tenetur domum*.

The *Casuarinaceae*, you will recall is divided into four genera. one of which is *Casuarina*. Two of the most important plantation species in the genus are *C. equisetifolia* and *C. junghuhniana* both deserve our attention as they contribute significantly to many people's wellbeing in the Pacific and beyond. A third species *C. oligodon* will also be mentioned as it is very important to people in the Highlands of PNG.

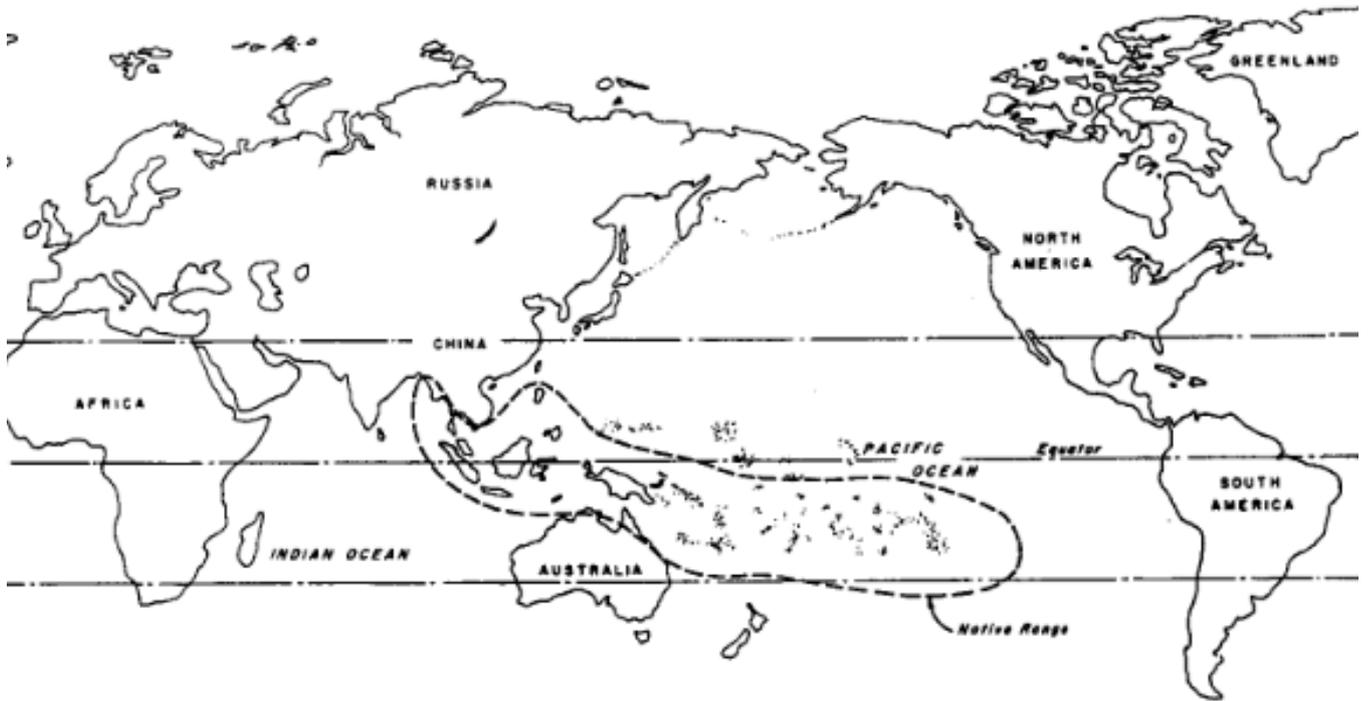
C. equisetifolia L. Johnson is divided into two subspecies *equisetifolia* and *incana*. The taxonomic distinction is supported by genetic studies. Subsp. *incana* occurs in Australia in a coastal belt from northern NSW to south of Townsville while subsp. *equisetifolia* grows from south of Townsville across the top to Darwin. Subsp. *equisetifolia* is also widely distributed through the Pacific from Australia to the Philippines and has been widely planted elsewhere.

C. equisetifolia

The species name is from the Latin *equinus* relating to horse and *folium* a leaf. Indicating a similarity with horse mane or tail of the foliage. The subsp. *incana* is Latin for hoary or white with reference to the hairy new shoots. There are many common names due to the wide distribution of the species. In Australia it is known as coast sheoak - which may well change to coast oak for obvious reasons.

Subsp. *equisetifolia* is a large tree up to 35m in height while subsp. *incana* is typically a large shrub on exposed seashores or of better form in more sheltered places where it can reach a height of 10m.

The species grows in hot humid climates with high rainfall and a pronounced dry season. Naturally, it is confined to a narrow coastal strip and only rarely extending inland. The soil consists of well drained



Geographic range of *C. equisetifolia*

sand and gravel with a wide range of pH from 5.0-9.5. Sites are often inundated by the sea for short periods and buffeted by salt spray. Adapting to these conditions means that the species can be grown in sand dunes, mine spoils and infertile pumice. Clearly a very tolerant species within its broad climatic parameters.

Following the early international conferences foresters from many countries started to utilise the species as useful introductions. Today it is grown in over 90 countries.

In China it is used for dune stabilisation and shelterbelts. in Tonga to protect crops from salt spray and for firewood in India.

However in some places this adaptability has made it a weed of considerable extent for example in Florida.

The wood is hard and heavy 1000kg/m³. but is difficult to use for fine work such as furniture. It blunts saws and seasons with difficulty so it is used in the round for poles, piles, and posts. It is used for paper pulp and like all of the *Casuarinaceae* it makes excellent fire wood and charcoal. The calorific value is 20.9MJ/kg which is on the higher end for

all species. Firewood and charcoal are important products in many countries with limited financial resources.

There are important non-wood uses of the species. Most often for environmental purposes such as erosion control, dune stabilisation and shelterbelts. There are thousands of kilometres in China, India, and Vietnam planted to hold back the encroaching sand or sea.

There are many traditional medical uses of the bark, twigs, and roots.

The success of the species is due at least in part to its association with *Frankia* which provides a source of nitrogen to the plant; a characteristic of the *Casuarina* outlined in the previous note.

The large geographical spread of the species gives rise to considerable genetic variation. To better understand the relationship between genotype and environment a great deal of work has been carried out with the aim to investigate genetic variation between provenances and local landraces. In international provenance trials trees from S.E Asia and landraces from Asia were generally faster growing than those from Australasia and the Pacific Islands.

C. junghuhniana

C. junghuhniana L. Johnson refers to Friedrich Franz Willeim Junghuhn (1809-1864) He was a German-Dutch botanist and geologist who worked extensively in Java. The common name for the species is Mountain Ru.

The species is indigenous to East Java, Bali to Timor and has been widely planted in other countries.

The tree can grow up to 25m in height in monsoonal moist tropical areas with a rainfall range of 700-1500mm. Naturally it grows above 1500m although it will grow to sea level.

Mountain Ru can grow on a wide range of soils from recent volcanics to clays. It tolerates pH from 2.8-8. Once established it is tolerant of drought and periods of water-logging as well as fire after the first few years.

It grows quite quickly and can be harvested after 5 years for poles and firewood. An MAI between 10 and 15 cubic metres /ha is usually obtained in plantations which is not particularly high.

It, like *C. equisetifolia* has *Frankia* containing nodules on the roots which are often in large masses. When introduced into new areas the 1-1.8million seeds/kg are inoculated with *Frankia* before sowing. Seedlings grow rapidly in the nursery reaching 300mm in 3 months. Compared to *Pinus radiata* which grows to a similar height in about 9 months

The reddish-brown wood is very hard but is prone to splitting and is not particularly durable. It can be used for pulp and makes good firewood or charcoal. It has a very high calorific value of over 34Mj/kg.

Clearly this pioneer tolerant adaptable useful species is of wide interest in countries with suitable climate and a need for wood product.

C. junghuhniana introduced into India in 1996 is gaining in importance as an agroforestry species because it has shown better growth and drought resistance. Pure species and hybrid with *C. equisetifolia* are now widely planted in India for pulpwood and pole production. It is expected that up to 70-80% of all casuarina planting in India will consist of these two species. To this end 30% of the presentations at the latest international casuarina conference in Thailand last year dealt with *C. junghuhniana* and its hybrid with *C. equisetifolia*.

C. oligodon

The name is derived from Greek *oligo* few and *don* (*dontus*) teeth and refers to the small number of very small leaves on the branchlet. It is one of three species naturally occurring in Papua New Guinea. The others are *C. grandis* and *C. equisetifolia*. The species has two subspecies identified by L. Johnson in 1982 subsp. *oligodon* and subsp. *abbreviata* which has shorter leaf teeth, smaller cones and more crowded whorls of male flowers. Subsp. *oligodon* is only found on New Guinea while subsp. *abbreviata* grows in a slightly wider area. *C. oligodon* grows in the Eastern Highlands of PNG where it is an important source of firewood, poles, windbreaks and for erosion control on the steep cultivated slopes . It is also used to protect coffee and food crops.

It is tall tree up to 30m with a dbh of 600mm. Trees grow up to 2,500m above sea level on sandy soils along watercourses where the rainfall and humidity is high. It is not tolerant of poor or high salt soils. It does not generally sucker.

As with all *Casuarinas* its ability to fix atmospheric nitrogen means that it is able to replenish soil resources of this important element when used as part of the rotation system of leaving depleted gardens to fallow for many years. Increasing population of the Highlands is reducing the time of fallow from about 20 years to now 7 to 10 years. Studies have shown that up to 70% of N in the trees is derived from the atmosphere. Typically up to 36kg/ha per year in long fallow as the tree matures. Importantly much of the N is stored in the above ground biomass making it essential that it be retained on site and incorporated into the soil.

The calorific value of the wood is about 20MJ/kg which makes it an excellent fire wood. It tends to be more brittle than other species which somewhat limits its use for plantations in other places.

These three species demonstrate how important the genus is to many people in the Pacific region and increasingly more widely such as in India.

Chris Borough summed it up in the following short paragraph

Don't forget *Casuarina oligodon* from the Highlands of PNG. Hugely important for both fuelwood and fence material but most critically to plant after gardening as it enriches N in soil and wipes out bugs such as Nematodes.

Without *C. oligodon* (Diwai Yar) it is doubtful if the vibrant PNG Highlands population could exist.

As with many other highly adaptable species there is a down side in that *C. equisetifolia* and *C. junghuhniana* can become invasive weeds and care is required in this regard.

Following the last note Max Bourke sent me the following information

C. equisetifolia among others has become very weedy in the USA. It is a declared noxious weed and I remember going to a National Park (named after Walt Disney, near Orlando in Florida) where it had really taken over.

Interestingly "we" also exported Kookaburras to the USA who thrive in said "Australian pine forests" as they are known.

Little known weird fact for you: in the early Tarzan movies, with Johnny Weismuller as the hero, you will often hear "kookaburra calls" in the soundtracks because the movies were shot in the Florida everglades!

Australia's aid programs since the WW2 through CSIRO and ACIAR have helped millions obtain a better existence through a scientific approach to species such as the three briefly described here.

Again I would like to thank John Turnbull, Stephen Midgley, Khongsak Pinyosarek and Chris Borough for their help but of course all errors are mine not theirs.

I hope you use the net to look more closely at some of the names here and look for the Tarzan films with the kookaburras.

Steve Thomas

10th April 2020