



## *Erythrina variegata* (coral tree)

Fabaceae (legume family)

'atae (Tahiti); coral tree, Indian coral tree, tiger's-claw (English); *drala* (Fiji); *gatae* (Samoa, Horn Islands, 'Uvea, Cook Islands); *gate* (Niue); *natae*, *netae* (Marquesas); *ngatae* (Tonga); *paar*, *weeku* (Chuuk); *paar*, *raar* (Yap); *parepein* (Pohnpei); *wiliwili haole* (Hawai'i)

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### IN BRIEF

**Distribution** Found throughout the tropics in cultivation.

**Size** Typically 10–15 m (33–50 ft), with a spreading crown, except for the commonly used cultivar 'Tropic Coral', which has a narrow, columnar form.

**Habitat** Grows best in the tropical lowlands with moderate rainfall 1000–1500 mm (40–60 in).

**Vegetation** Found with a wide variety of cultivated plants in farming and landscaping.

**Soils** Prefers sandy loams but does well in a wide range of soil textures and pH; it is a nitrogen-fixing tree so it can tolerate poor soils.

**Growth rate** Fast growing in favorable conditions with observed growth rates greater than 1.5 m (5 ft) per year.

**Main agroforestry uses** 'Tropic Coral': windbreak, living fence, trellis support. Regular form: ornamental, overstory shade.

**Main products** Fodder, medicinal.

**Yields** Primarily used for the services it provides, as commercial products are minimal.

**Intercropping** Interplanted as a shade tree in coffee and cacao plantations and as a trellis plant with betel nut (*Piper betel*), black pepper, vanilla, and yam (*Dioscorea* spp.).

**Invasive potential** Not considered an aggressive invasive, although it can naturalize along streams.



PHOTO: C. ELEVITCH

The columnar form of coral tree known as 'Tropic Coral', is often used for hedges, windbreaks, and living fence posts.

## INTRODUCTION

The coral tree is cultivated throughout the tropics, particularly as an ornamental tree and as a shade and soil improvement tree (it fixes nitrogen) for other tree crops such as coffee and cacao. The large, spreading tree is tolerant of a wide range of soil textures and soil pH. It is also relatively tolerant of salty conditions, waterlogging, and seasonal drought. The most attractive type, var. *variegata*, is grown for its variegated leaves, as well as its seasonal showy red flowers. Another type that has ascending branches, cultivar ‘Tropic Coral’, is currently very popular as a boundary plant, living fence post, and windbreak. The tree is also often used as a shade tree planted among coffee or cacao trees (although *Erythrina subumbrans* is more commonly used for this purpose). The spiny stems can be a drawback in certain situations, and it cannot be planted too close to sidewalks, which will be lifted by its lateral root growth. In some places the tree is used for fuelwood and cattle fodder, especially when interplanted with other tree crops as a shade plant. It can easily be grown from either seed or cuttings. It has a low potential to be invasive, because the seeds are dispersed by dropping to the ground under the mother tree, but the tree can naturalize along stream courses below where it is planted.

## DISTRIBUTION

### Native range

Coral tree is indigenous to the Old World tropics, possibly originally from India to Malaysia, but is native or of ancient introduction westward to Zanzibar and eastward to eastern Polynesia (the Marquesas). It is typically found on sandy soil in littoral forest, and sometimes in coastal forest up to 250 m (800 ft) in elevation.

### Current distribution

The tree is found throughout the tropics, in cultivation.

## BOTANICAL DESCRIPTION

### Preferred scientific name and author

*Erythrina variegata* L.

### Family

Fabaceae (legume family)

### Subfamily

Papilionoideae

### Non-preferred scientific names

*Erythrina corallodendrum* var. *orientalis* L.

*Erythrina indica* Lam.

*Erythrina orientalis* (L.) Merrill

*Tetradapa javanorum* Osbeck

### Common names

#### Pacific islands

‘atae (Tahiti)

coral tree, Indian coral tree, tiger’s-claw (English)

*drala* (Fiji)

*gatae* (Samoa, Horne Islands, ‘Uvea, Cook Islands)

*gate* (Niue)

*natae, netae* (Marquesas)

*ngatae* (Tonga)

*paar, weeku* (Chuuk)

*paar, raar* (Yap)

*parepein* (Pohnpei)

*wiliwili haole* (Hawai‘i)

#### Other regions

*arbre au corail, arbre immortel* (French)

*dadap aykam* (Java, Indonesia)

*dadap blendung* (Sunda, Indonesia)

*galala itam* (Moluccas, Indonesia)

*chengkering* (Malaysia)

*andorogat* (Bikol, Philippines)

*bagbag* (Ilocos, Philippines)

*penglay-kathit* (Burma)

*rolouohs bay* (Cambodia)

*dok kbo, thong ban* (Laos)

*thong lang lai, thong phueak* (Thailand)

### Size

The tree grows up to 20 m (66 ft in height) in height, but 10–15 m (33–48 ft) is more typical, with a spreading crown (except in the cultivar ‘Tropic Coral’). The dense, oblong to rounded crown is low-branching with many ascending branches.

### Flowers

Inflorescence of many-flowered fascicles occurs in terminal or axillary racemes up to 20 cm (8 in) or more long. Calyx is top-shaped, deeply split along one side, 1–1.8 cm (0.4–0.7 in) long, on a pedicel 2–5 mm (0.1–0.2 in) long. Corolla is papilionaceous; standard is short-clawed, ovate to subelliptic, 3–4 cm (1.2–1.6 in) long, red–orange with longitudinal white lines; wings are about half as long as the standard, greenish to pale red; keel is as long as the wings, greenish to pale red. Ovary is superior, stamens 10, diadelphous, with 9 fused together at the base, enclosed within the



**Left: Coral tree inflorescence. Right: Seed pods can usually be found on trees nearly year-round.** PHOTO: C. ELEVITCH

keel. Flowering is reported from July to November in the Southern Hemisphere and 6 months later in the Northern Hemisphere.

### Leaves

Leaves are trifoliolate, alternate; rachis is mostly 10–20 cm (4–8 in) long; blades are ovate to rhomboid, 8–18 cm (3.2–7.2 in) long; lateral ones are smaller than the terminal one, petiolules 6–13 mm long, with vegetative parts finely pubescent. They are deciduous just before and during the flowering season, except for ‘Tropic Coral’, which has been reported by some authors to not drop its leaves, while other sources have noted its deciduous habit. *E. variegata* retains its leaves better than other *Erythrina* species in Hawai‘i. Low temperatures, powdery mildew, and/or drought combined with very windy conditions will accelerate leaf drop and retard the development of new leaves.

### Fruit

Fruit a compressed, narrowly oblong pod 10–14 cm (4–5.6 in) long, sterile in the basal portion, and not constricted between the 5–10 dark brown seeds. The fruits are ripe from October to November in the Southern Hemisphere and March to April in the Northern Hemisphere, but they often remain on the tree for several months longer.

### Seeds

Seeds are kidney-shaped, dark purple to red, and 1–1.5 cm (0.4–0.6 in) in length. These simply fall to the ground and may be washed away (they have been seawater-dispersed over their native range). There are 1450–5000 seeds/kg (660–2270 seeds/lb).

### Similar species

The genus includes 110 species, many of which are cultivated as ornamentals. The only other related species common in the Pacific islands are *Erythrina crista-galli*, *E. fusca*, and *E. subumbrans*. Another species, *E. sandwicensis*, is endemic to Hawai‘i and is uncommon in cultivation. These can be distinguished from *E. variegata* and each other as follows:

*E. crista-galli*—Easily distinguished from the other three by its flowering much of the year. Its leaves are leathery, dark green, and elliptic (widest toward the middle), and the flowers are rich, dark red.

*E. fusca*—This tree, unlike the others, occurs naturally in swampy areas. The leaves are oblong to oval in shape, like *E. crista-galli*, but the flowers are seasonal and dull purple-red.

*E. subumbrans*—The most distinguishable characteristic of this species is its seed pod, which is constricted at the base (the seeds are formed only in the upper part of the pod), unlike the other four species noted here, and the flowers are greenish to pale red.

*E. variegata*—This is the most commonly cultivated member of the genus. Its young stems and other parts are finely hairy, its leaves are mostly ovate (widest toward the base) and sometimes variegated with yellow (var. *variegata*). Its crimson to orange flowers are 5–8 cm (2–3.2 in) long, and its pod is 5–10 seeded.

*E. sandwicensis*—This is similar to *E. variegata* but has smaller flowers that are 3.5–4 cm (1.4–1.6 in) long and fewer seeds, one to three per pod. *E. sandwicensis* trunks and main branches have a characteristic orange hue, while *E. variegata* trunks and branches are whitish gray.



## GENETICS

### Variability of species

Variable because of its large range, and some varieties have been selected for propagation.

### Known varieties

**var. *variegata*** (possibly the same as cv. ‘Parcellii’)—This one is easily recognized by its yellow and green variegated leaves and is favored as an ornamental throughout the Pacific.

**var. *orientalis*** (L.) Merr.—This is the “wild type.”

**var. *alba*** (with white flowers)—This looks like the wild type, but has white flowers.

**cv. ‘Tropic Coral’**—This is the cultivar used as fence posts and windbreaks because of its unique growth form (columnar, with branches all erect). ‘Tropic Coral’ probably originated under cultivation in New Caledonia, as a sport or mutant of the more typical open-branched form of *Erythrina variegata*. In cultivation it has spread to other tropical and warm-temperate areas, including Australia and southern Florida. This cultivar is not known to occur naturally anywhere in the wild.

### Culturally important related species in the genus

The genus comprises 110 species, and many of these are cultivated for their showy flowers and/or variegated variation. Perhaps the most attractive of the species is *Erythrina variegata* var. *variegata*, with its variegated leaves. The other species of the genus most commonly cultivated are *Erythrina crista-galli* and *Erythrina fusca*.

### Genetic resources where collections exist

Seed collections are stored in Costa Rica (the Centre for Tropical Agricultural Research and Training [CATIE]), and the seeds or the plants are often obtainable at local nurseries.

## ASSOCIATED PLANT SPECIES

Its native habitat is littoral forest and coastal forest. In the former, it is associated with trees such as fish-poison tree (*Barringtonia asiatica*), tropical almond (*Terminalia catappa*), and many other littoral species. It also occurs inland in coastal forest, where it is mixed with numerous native lowland forest species.

### Commonly associated in modern times

It is commonly associated with ornamental plants, and



**Top:** The variegated variety, var. *variegata*, is a favored ornamental in many parts of the Pacific. **Bottom:** *Erythrina crista-galli* is a popular ornamental, but is used little in agriculture. PHOTO: C. ELEVITCH

where it is a windbreak, often with crop plants such as vegetables, sugarcane, coffee, macadamia nuts, and many others.

## ENVIRONMENTAL PREFERENCES AND TOLERANCES

### Climate

The tree is found in the humid tropics and subtropics and can tolerate a wide variety of climates within this zone. It does particularly well in monsoonal climates that have a wet summer and a dry winter, and it requires little water during the winter dry season, because it drops its leaves at that time. The rainfall in its natural environment ranges from 800 mm (32 in) to 1500 mm (60 in). It is usually found in the lowlands from near sea level to 250 m (800 ft), but it can be planted up to 1500 m (5000 ft) elevation.



The bark of coral tree is mostly smooth, with a small number of short thorns. PHOTO: C. ELEVITCH

### Elevation range

lower: near sea level

upper: 250 m (800 ft) or more in nature, but can be grown at up to 1500 m (5000 ft) near the equator

### Mean annual rainfall

lower: 800 mm (32 in), should be at least 1000 mm (40 in) for optimum growth

upper: 1500 mm (60 in) in native range, tolerates up to 3800 mm (150 in)

### Rainfall pattern

In its native habitat the climate is monsoonal with a rainy summer and a dry winter of 5–6 months, but it can be cul-

tivated in practically any rainfall pattern. The tree performs better in moderate than in heavy rainfall areas.

### Dry season duration (consecutive months with <40 mm [1.6 in] rainfall)

5–6 months of dry season in its native range

### Mean annual temperature

20–32°C (66–90°F)

### Mean maximum temperature of hottest month

28–35°C (82–95°F)

### Mean minimum temperature of coldest month

16–24°C (61–75°F)

### Minimum temperature tolerated

0°C (it is intolerant of freezing)

### Soils

It can be grown in a wide range of soil types. Although it prefers sandy loams, it will do well in clay and loam soils. It also is tolerant of a wide range of soil pH, ranging from 4.5 to 8.0. It can do well in nutrient-poor soil, as it fixes nitrogen.

### Soil texture

Tolerates light to heavy texture soils (sands, sandy loams, loams, and sandy clay loams, sandy clays, clay loams, and clays).

### Soil drainage

Grows in soils with free or impeded drainage and even tolerates seasonally waterlogged soils.

### Soil acidity

pH 4.5–8.0

### Special soil tolerances

It can grow in moderately saline and infertile soils.

### Tolerances

#### Drought

It is drought tolerant, as it is native to monsoonal areas that have several months of dry season. It needs almost no water when it is leafless in the winter.





**Left: Coral tree (cultivar ‘Tropic Coral’) and banana, both tolerant of salt spray, growing as a hedge along the coast of ‘Upolu, Samoa. Right: Coral tree can be pollarded (pruned back severely to the branch in order to promote dense regrowth) on an annual basis. PHOTOS: C. ELEVITCH**

#### **Full sun**

It prefers full sun.

#### **Shade**

It does not tolerate shade very well.

#### **Fire**

It is somewhat fire resistant.

#### **Frost**

It is intolerant of frost, which limits its natural distribution to the tropics.

#### **Waterlogging**

It is resistant to periodic waterlogging for up to 2 weeks, but it prefers well drained sandy loams.

#### **Salt spray**

It is moderately tolerant of salt spray, as it is a littoral tree.

#### **Wind**

It does well in windy situations and is often used as a windbreak.

#### **Abilities**

##### **Fix nitrogen**

It fixes nitrogen and thus can grow in and enrich areas of nutrient-poor soil.

##### **Regenerate rapidly**

It can regenerate rapidly, and saplings have been known to grow up to 3 m (10 ft) in height in a year.

##### **Coppice**

Coral tree responds well to pruning. Regrowth appears to be significantly faster when at least 15% of the foliage is left after cutting.

## Pollard

The trees are regularly pollarded where they are used as shade trees and in landscaping.

## GROWTH AND DEVELOPMENT

The tree is grown from cuttings or seed. Sapling growth is rapid, and a 1-year-old sapling can reach 3 m (10 ft) in height. Growth continues to be rapid during its young years. Trees as young as 3 or 4 years old can start flowering.

### Growth rate

It typically reaches 3 m (10 ft) in height in a year, and 15–20 m (50–66 ft) in 20 to 25 years. On favorable sites, the stem can reach a diameter at breast height (dbh) of 50–60 cm (20–24 in) in 15 to 20 years.

### Flowering and fruiting

Flowering and fruiting are seasonal. Flowering occurs when the tree is leafless in the summer, and fruiting soon follows. Its flowering time was used as a seasonal indicator in some places (e.g., in Samoa its flowering indicated that whales would soon be running in the adjacent ocean).

### Yields

It is not usually used for fodder in the Pacific, but yields of 15–50 kg (33–110 lb) of fodder per tree per year have been recorded.

### Rooting habit

It forms extensive vertical roots, but these may spread horizontally from the base of the trunk to make large surface roots, making the tree unsuitable for planting next to sidewalks.

### Reaction to competition

The tree does not tolerate shade well, and the seedlings grow poorly in the shade of competition. For optimum growth, new plantings should be kept weed-free. Mature trees are tolerant of a grass cover, but it should be mowed to reduce competition.

## PROPAGATION

Propagation is by two common methods, cuttings and seeds. Large branch cuttings can easily be planted to form new trees, as described below. Cuttings are the only way to propagate clonal varieties, as seeds are not true to type.

## Propagation from cuttings

(after Wilkinson and Elevitch 2003a)

### Cutting collection

This tree is most commonly propagated vegetatively for live fences, windbreaks, and establishment in areas where livestock is present (which could eat shoots from small seedlings). Large-size branch cuttings are used, usually 2–3 m (6.6–10 ft) in length and 5–10 cm (2–4 in) in diameter. Smaller cuttings may be used, a minimum of 30 cm (1 ft) in length and a diameter of 4–5 cm (1.8–2 in). However, larger cuttings at least 1.5 m (5 ft) long will establish more quickly, survive better against competition from weeds, and be less susceptible to damage or destruction from grazing animals. It is best to retain the terminal bud of branch cuttings to ensure fast new top growth. However, in many cases growers cut one long branch into several cuttings, and therefore this is not always feasible.

Cuttings can be taken any time of year, although the ideal time is when the new growth is appearing, usually at the onset of the rainy season. Growers traditionally favor taking cuttings with the waning moon and planting them in the ground with the waxing moon.

### Storage of cuttings

Cuttings are stood upright in shady, dry, and cool conditions for a minimum of 24 hours and a maximum of 2 weeks. This standing time allows the cuttings to dry slightly and helps prevent rotting and fungal problems.

### Outplanting

Whether planted directly in the field or in nursery containers, the cuttings should be grown in sunny conditions. After planting, soil moisture should be maintained, although overwatering can easily cause the buried part of the cutting to rot. For larger stakes 2–2.5 m (6.6–8.3 ft) tall, the lower portion of the cutting is buried 20–40 cm (8–16 in) deep. For smaller cuttings, generally about 20% of the cutting's length should be underground. Planters should make sure to plant cuttings correct side down! Some recommend dipping the top portion of the cutting in pruning wax to help keep moisture from rotting the wood. Another strategy for avoiding rot on the top portion of the cutting is to make sure the top is cut at an angle so that rainwater is shed. The planting holes may be sprinkled with VAM mycorrhizal fungi inoculant (an aid to establishment and growth in P-deficient soils) and rhizobia bacteria inoculant. The soil should be firmed around the base of the cutting. Incisions should be made in the bark of the part of the cutting that will be underground in order to improve rooting. It takes about a month for axillary shoots to appear.

## Media

Usually cuttings are started directly in the ground. However, if using containers, any standard well drained potting media may be used.

## Time to outplanting

Cuttings establish quickly, producing axillary shoots in 3–4 weeks, followed by rooting. Generally, 3–4 months in the nursery will yield a well rooted plant ready for outplanting.

## Success rate

Under optimal conditions of soil moisture, 90–100% of coral tree cuttings will survive. Very wet conditions in the early stages of establishment can lead to rot in the underground portion of the cutting.

## Propagation from seed

(after Wilkinson and Elevitch 2003b)

### Seed collection

The seeds can be collected after the pods mature, which is usually late winter. In Hawai'i, it flowers in January and February and sets seed in February–April. The fruits are pods about 15–30 cm (6–12 in) long. Seeds are mature when the pod dries and turns brown and the seeds become hard with a shiny seed coat. Mature pods can be collected from the tree or from the ground.

### Seed processing and storage

Seeds are easily cleaned by hand from dried pods. Seeds should be well dried in the sun. Prior to storage, seeds should be frozen for a minimum of 48 hours to kill any insect larvae harbored inside. Germination is commonly 90% or greater for recently harvested seed. Seeds maintain viability for several years when stored in an airtight container with desiccant in a cool location or in the refrigerator.

### Pre-planting seed treatments

For best germination, scarification of the hard seed coat is recommended. Mechanical scarification (nicking with a large nail clippers) works very well; be sure not to damage the germ or the inner part of the seed. Soak the scarified seeds overnight in room-temperature water. If any seeds do not imbibe water, they may be nicked and soaked again. Hot-water scarification is an alternative to mechanical scarification and is appropriate for large seed lots. Seeds are soaked in hot water (80°C [176°F]) for 10 minutes and then in tepid water overnight.

## Growing area

Seedlings should be grown in full sun in an uncovered growing area. Humidity and overwatering can lead to fungal diseases, so a hot and dry growing environment is ideal.

## Germination

Scarified seeds will begin germinating in 5–10 days. Scarified seeds may be planted in containers or direct-seeded. Cover seeds shallowly with potting mix (about 0.6 cm [0.25 in] deep), followed by a thin mulch layer such as coarse poultry grit or sand. Water the seeds with a fine-headed sprayer. Keep moist but not overwatered. Overwatering can easily lead to damping off. After 1–2 weeks of growth, seedlings should be inoculated with rhizobia bacteria selected for this species.

## Media

Any standard potting soil is suitable. As with other nitrogen-fixing plants, the medium should have low available N, which encourages active nodulation for nitrogen fixation, assuming rhizobia bacteria are present.

## Time to outplanting

Well watered seedlings are normally ready for planting 10–16 weeks after germination. The size expected for outplanting is 30 cm (1 ft) tall, with a based diameter of 6 mm (0.25 in).

## Other comments on propagation

Coral tree is not true to seed. Projects desiring the columnar variety 'Tropic Coral' (mainly for windbreaks and live fence posts) should propagate the tree from cuttings, not seed, to ensure the column-shaped form. Projects desiring thorny trees or more branching form (commonly desired for shade) should propagate vegetatively from trees with the desired form or from their seeds.

## DISADVANTAGES

The tree is ideally planted by itself as a specimen or in rows; it needs to be kept away from sidewalks and lawn areas because large lateral roots can lift sidewalks and interfere with mowing. It is leafless during part of the year and so tends to produce a lot of leaf litter. The flowers, although spectacular, are seasonal and last on the tree only 1–2 months.

## Potential for invasiveness

It is not very invasive, because it has an ineffective dispersal mechanism for its seeds (they just fall from the tree).





A serious pest identified in Hawai'i in 2005, the erythrina gall wasp causes severe defoliation and eventual death of trees. The presence of this pest effectively halts the planting of coral tree in Hawai'i until the problem is resolved. Left: New leaves with stems swollen by gall formation. PHOTO: C. ELEVITCH Right: Completely defoliated hedge, Mānoa, Hawai'i. PHOTO: D. EVANS

However, it can naturalize along streams where there are trees planted upstream.

### Diseases and pests

The species is a host to the fruit-piercing moth *Othreis fullonia*, a serious pest in the Pacific islands. The tree itself is not particularly susceptible to diseases, but borers may infest weakened trees and some species of caterpillars can damage foliage. In Hawai'i, the leaves are susceptible to attack by powdery mildew (*Oidium* sp.), especially during the winter rainy season.

In 2005, a serious new pest was identified in Hawai'i, the erythrina gall wasp (*Quadrastichus erythrinae*) (Heu et. al 2006). This pest has also been reported in American Samoa and Guam, as well as parts of Southeast Asia. The wasp larvae develop inside the young leaf petioles and stems, and cause galls to form. Severe infestations have been reported throughout Hawai'i. These infestations can cause complete defoliation and death of trees. Treatments with certain pesticides have been effective at reducing infestations, although such treatments are impractical for most people. Until this problem is resolved, planting of coral tree in Hawai'i is not recommended.

### Host to crop pests/pathogens

The species is a host to the fruit-piercing moth *Othreis fullonia*, a serious pest in the Pacific islands.

### Other disadvantages

The wood is not very suitable for much other than light (and temporary) construction and for making light boxes.

## AGROFORESTRY/ENVIRONMENTAL PRACTICES

### Mulch/organic matter

Although not as prolific as some other nitrogen-fixing



Coral tree is deciduous in many environments. The loss of foliage could be a disadvantage if shade or wind protection is required during the dry season. PHOTO: C. ELEVITCH



trees such as *Gliricidia sepium*, coral tree is often pruned annually when used for crop shade or living fence posts. The prunings make excellent mulch for crops.

### Crop shade/overstory

The tree is sometimes used as a shade for coffee and cacao. For this purpose they are planted with a spacing of 8 x 10 m (27 x 33 ft). The trees are pollarded once a year to a height of 2–3 m (6.6–10 ft) to produce a spreading crown.

### Alley cropping

Because of its relatively moderate growth rate after pruning, coral tree is usually not the best choice for a fast-growing nitrogen-fixing tree for organic matter production in alley cropping.

### Homegardens

The tree is very well suited for homegardens as an ornamental.

### Improved fallows

Since they fix nitrogen they are potentially useful trees for enriching the soil, as well as being a shade tree.

### Living fences

Coral tree is excellent for living fences, as it can easily be grown from large cuttings. The type most suitable for this is ‘Tropic Coral’, which has a columnar shape and is evergreen. Farmers commonly establish fence posts from 3-year-old upright branches about 15 cm (6 in) in diameter and 2.5 m (8 ft) long. These are normally stacked in the shade in an upright position and left to cure for a week before planting.

### Fence posts

The wood is not good for this, because it is not particularly resistant to rot. But if a living fence post is desired, it is excellent for this purpose.

### Boundary markers

It is commonly used for a boundary marker as a living fence.

### Windbreaks

Commonly used as a windbreak, particularly the columnar variety (‘Tropic Coral’) and for soil and water conservation. The trees have a strong, vertical root system that does not seem to compete too severely with adjacent crops. Wind-



**Top: This densely planted row of ‘Tropic Coral’ is used to support hog wire, making a very strong enclosure for pigs. Bottom: A boundary hedge without attached fencing.** PHOTOS: C. ELEVITCH

breaks are normally established from large cuttings planted in lines at a spacing of about 1 m (3.3 ft).

### Silvopasture

Living fence posts can be used as support for fencing suitable for containing cattle or horses. The periodic pruning of these fence posts yields excellent fodder. Trees are also grown inside paddocks to provide some shade, wind pro-

tection, and as a potential source of off-season fodder.

### Animal fodder

The foliage makes an excellent feed for most livestock, as the leaves normally contain 16–18% crude protein. A tree of average size, pruned three or four times a year, produces from 15 to 50 kg (33–110 lb) of green fodder annually depending on growing conditions. Trees maintained in coffee plantations benefit from associated cultivation practices and can produce up to 100 kg (220 lb) of fodder from one annual harvest. The leaves have no known toxicity to cattle.

### Woodlot

The wood is not very suitable for use as timber, as it is soft, light, and not durable, but it can be used for fuelwood, especially when gathered in areas where it is used as a shade tree among other tree crops.

### Native animal/bird food

Nectar-feeding birds are attracted to the copious nectar produced during the short flowering season.

### Host plant trellising

Farmers in India use it to support climbing plants such as betel nut (*Piper betel*), black pepper (*Piper nigrum*), vanilla (*Vanilla planifolia*), and yam (*Dioscorea* spp.). Trees established to support vines are usually planted at a spacing of 2 x 2 m (6.6 x 6.6 ft) to 2 x 3 m (6.6 x 8 ft). Vines are planted 3–4 months after establishment of the tree seedlings or during the following rainy season. During the hottest months, foliage from the closely spaced trees shades the vines, and in the winter, the leaves fall to allow them to more receive more direct sunlight.

### Coastal protection

The tree can be used in coastal areas, as it improves the soil and is native to littoral habitats.

### Ornamental

It makes an attractive ornamental tree because of its large, showy red, seasonal flowers.

## USES AND PRODUCTS

The coral tree is important for several reasons, but its distribution may be natural (seawater drift) rather than being carried through the islands as a useful tree. Although the light wood is of little use as timber, it was and still is commonly used to make the outrigger on traditional canoes and for floats on fishing nets. The flowering was used

## SAMOAN LORE

When the coral tree fruits are ripe, it is an indicator that whales are running and yams are in season in Samoa.

as a seasonal indicator on some islands (e.g., Samoa). The bark and leaves have been widely used to make traditional medicines, although there seems to be little commonality of usage in the Pacific islands. The nectar is an important seasonal food source for lorries, honeyeaters, and flying foxes. Nowadays the tree is mainly used as an ornamental, especially the variety with variegated leaves (var. *variegata*), and as a living fence post, especially ‘Tropic Coral’.

### Medicinal

In Pohnpei the leaves are reportedly used to make a drink to cure curses, and the smoke from smoldering leaves, bark, or roots is inhaled for the same purpose. In Yap the leaves and bark are reportedly used as a potion to treat stomachache. In Tonga the bark is mixed with others and used to treat stomachache. In Samoa the leaves are occasionally used to treat eye ailments, and the bark is applied to swellings. In India, China, and Southeast Asia, the bark and leaves are used in many traditional medicines, including one said to destroy pathogenic parasites and relieve joint pain; the juice from the leaves is mixed with honey and ingested to treat tapeworm, roundworm, and threadworm in India; women take this juice to stimulate lactation and menstruation; it is commonly mixed with castor oil to treat dysentery; a warm poultice of the leaves is applied externally to relieve rheumatic joints; and the bark is used as a laxative, diuretic, and expectorant.



Coral trees in flower attract many nectar-feeding birds. PHOTO: C. ELEVTCH



### Leaf vegetable

Boiled leaves can be eaten as a potherb.

### Beautiful/fragrant flowers

These are sometimes used as decoration in vases, or in leis, but are seasonal.

### Timber

The wood is not very suitable for use as timber since it requires careful seasoning, preferably kiln drying. It does not split on nailing, but holds nails poorly.

### Fuelwood

It is a useful fuelwood tree. An average shade tree in a coffee plantation can yield 25–40 kg (55–88 lb) of wood from annual pollarding.

### Craft wood/tools

The wood is used to construct outriggers and fishnet floats, packing boxes, picture frames, and toys, but other timbers are much for suitable for this purpose.

### Canoe/boat/raft making

The light wood is favored for making outrigger floats.

### Body ornamentation/garlands

Seeds and flowers may be used for making leis, but the seeds are prone to beetle infestation on the tree and the flowers are highly seasonal.

## URBAN AND COMMUNITY FORESTRY

Coral tree is an easy-to-grow, medium size tree with attractive foliage and flowers. It is well suited for coastal environments, where many people live, and can grow at elevations up to 1500 m (5000 ft) near the equator. It can be pruned to size and shape for many landscaping applications.

### Size in an urban environment

The tree typically grows to 10–15 m (33–50 ft) in height, with a crown diameter of about half the height of the tree, except for the columnar cultivar ‘Tropic Coral’, which has a narrow crown diameter of 2–3 m (6.6–10 ft). However, in urban environments trees can be pruned periodically to maintain a desirable size and form.



**Top: ‘Tropic Coral’ makes a very good component in a hedge, visual barrier, or windbreak, and can be repeatedly pruned to maintain its size. Upolu, Samoa. Bottom: Hedge in commercial landscaping. Kaloko, island of Hawai‘i, before arrival of the erythrina gall wasp. PHOTOS: C. ELEVITCH**

### Rate of growth in a landscape

As a nitrogen-fixing tree, it can grow rapidly, especially in cultivated landscapes with ample moisture. A tree can grow to 10 m (33 ft) in height in 8 years. After pruning, regrowth is also rapid, up to 3 m (10 ft) within the first year.

## Root system

In younger trees, most roots are in the upper 30 cm (12 in) of soil. Older trees have deeper root systems. The extensive surface rooting may interfere to a limited degree with pavement, sidewalks, and other surface objects.

## Products commonly used in a Pacific island household

Many parts of the tree have various uses, such as medicine, fodder, utility wood, and lei making, but the tree is probably best known as a shade, hedge, and living-fence tree.

## Light requirements

Coral tree grows best in full sun. Seedlings as well as larger trees perform poorly if heavily shaded.

## Water/soil requirements

It grows in a wide range of soil types. Because it is a nitrogen fixer, it tolerates infertile soils better than many landscaping plants.

## Life span

Coral tree can live to be about 100 years old.

## Varieties favored for use in homegardens or public areas

The yellow and green variegated var. *variegata* is a popular ornamental in the Pacific. 'Tropic Coral' has a narrow, columnar form and is also favored as an ornamental. Its compact canopy makes it suitable for tight landscapes and for narrow hedges and living fences. 'Tropic Coral' has only tiny prickles on the stems, which makes it easier to work with in a homegarden.

## Seasonality of leaf flush, flowering, fruiting

Flowering takes place once a year (July–November in the Southern Hemisphere, and January–May in the Northern Hemisphere). Trees are deciduous just prior to and during flowering (except possibly for 'Tropic Coral', which may hold its leaves).

## Exceptional ornamental values

The bright red, showy flowers last for several weeks. Flowering is particularly attractive because it occurs during a deciduous period when the grayish bark and framework of the tree are visible. The flowers have no scent.

## Use as living fence, hedge or visual/noise barrier

When pruned to encourage leafy regrowth from the lower

trunk, trees make an excellent hedge, particularly 'Tropic Coral'. This cultivar is also used very successfully as a living fence post on which to mount wire fencing. Thornier types may be used for a hedge or living fence where the added deterrent is desired.

## Birds/wildlife

The flowers produce copious nectar and attract many small nectar-feeding birds that hop around and poke at the flowers.

## Maintenance requirements

Small seedlings can usually hold their own with weed competition, but vines and tall grasses should be controlled for the first 2–3 years. Once established, the tree requires little maintenance. Fertilizer is rarely required, except in very infertile soils. Irrigation is also often unnecessary, as the tree handles drought well.

To control the size and form, pruning is required. Regrowth is rapid after pruning, so landscape hedges are typically



Recently rooted cuttings used for trellis to support bitter melon, vanilla, and beans. PHOTO: S. SKIPPER

trimmed once or twice per year, depending on how much regrowth is visually acceptable. The prunings make excellent nutrient-rich mulch for other plants in the landscape, or are valuable fodder for most livestock.

The tree can also be pollarded to control the height and canopy diameter. In pollarding, a framework of several stems is formed at a desired height by pruning the tree during its early development. These stems are then pruned back heavily every 1–3 years, depending on the rate of regrowth.

### Special considerations regarding leaf, branch, and fruit drop

Generally, regrowth after pruning is more susceptible to breakage in high winds than are branches on a tree that has never been pruned. Once pruned, regular follow-up pruning will reduce the risk of storm damage.

When using prunings for mulch, branches of any size may set root in wet environments. To avoid new plants emerging from mulch, newly rooted plants can be periodically pulled up using a hoe or other hand tool. Another option is to compost the prunings before using them as mulch.

### Nuisance issues

None.

### Hazards

Some trees are thornier than others. Thornier trees can present a hazard, especially in public places where people could be injured by stepping bare-footed on small fallen branches or even bumping up against the trunk of the tree. The seeds are poisonous if eaten without cooking.

### Common pest problems

Powdery mildew (*Oidium* sp.), Chinese rose beetle (*Adoretus sinicus*), mealybugs (*Phenacoccus* spp.), and mites (*Tetranychus cinnabarinus* and *Polyphagotarsonemus latus*) are common pests that effect coral tree in the landscape. These are passing pest problems, however, and rarely require any treatment.

## COMMERCIAL PRODUCTS

Coral tree is valued for its use as livestock fodder, windbreak, live fence, crop shade, organic matter production, ornamental uses, and uses in traditional handicrafts and medicines. The tree has little commercial use, although it is used commercially for paper pulp production in India.

## INTERPLANTING/FARM APPLICATIONS

Some interplanting systems include:

### Example system 1

#### Location

Throughout the Pacific, and other tropical regions.

#### Description

The tree is used for shade and soil enrichment in crops such as cacao or coffee. This is a new practice, as these crops were not traditionally cultivated in plantations (and are not native to the Pacific). In the Pacific, *Erythrina subumbrans* is probably more commonly used for this purpose.

#### Crop/tree interactions

It produces soil nitrogen from the roots, and a green mulch from the falling leaves. The tree can also be planted along the edges of the plantation as a living fence post and as a windbreak.

#### Spacing

When planted among other tree crops for shade, a spacing of 8 x 10 m (27 x 33 ft) is common. The trees can be planted very close together when making a living fence or hedge.

### Example system 2

#### Location

India

#### Description

Farmers in India use it to support climbing plants such as betel nut (*Piper betle*), black pepper, vanilla, and yam (*Dioscorea* spp.). Vines are planted 3–4 months after establishment of the tree seedlings or during the following rainy season. During the hottest months, foliage from the closely spaced trees shades the vines, and in the winter, the leaves fall to allow more direct sunlight.

#### Crop/tree interactions

In this case, the young trees are used as trellises and for shade.

#### Spacing

The trees used to support vines are usually planted at a spacing of 2 x 2 m (6.6 x 6.6 ft) to 2 x 3 m (6.6 x 8 ft).



## PUBLIC ASSISTANCE AND AGROFORESTRY EXTENSION

Extension offices for agroforestry and forestry in the Pacific: <http://www.traditionaltree.org/extension.html>

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## *Erythrina variegata* (coral tree)

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