

**Advice to the Minister for the Environment and Heritage from the Threatened Species Scientific Committee (TSSC) on Amendments to the List of Key Threatening Processes under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)**

**1. Name and description of the threatening process**

‘*Cinnamomum camphora*, Camphor Laurel most toxic chemotypes.’

Camphor Laurel is a large evergreen tree that was introduced into Australia following European settlement. The species is an invasive woody weed capable of replacing native trees along watercourses and on soil types which formerly supported rainforests. The infestation and spread of Camphor Laurel is aided by birds dispersing seed and its spread is particularly prevalent in disturbed landscapes.

The nomination focuses on the claimed toxic effects of certain forms of the species. It proposes that the most toxic forms of Camphor Laurel contain compounds in their fruit, seeds, leaves, roots and bark which have caused declines in native species throughout northern New South Wales and southeastern Queensland. The nomination highlights that Camphor Laurel trees can exist in up to nine different chemical forms. The nominator uses the description ‘most toxic chemotypes<sup>1</sup>’ to refer to those Camphor Laurel trees with the greatest levels of toxic compounds.

It is asserted that the hybridisation of various forms of Camphor Laurel has assisted in the proliferation of the more toxic chemotypes and that where the most toxic chemotypes of Camphor Laurel are present, loss of regional biodiversity is evident.

**2. How judged by TSSC in relation to the EPBC Act criteria**

Section 188(4) of the EPBC Act states:

*A threatening process is eligible to be treated as a key threatening process if:*

- a) it could cause a native species or an ecological community to become eligible for listing in any category, other than conservation dependent; or*
- b) it could cause a listed threatened species or a listed threatened ecological community to become eligible to be listed in another category representing a higher degree of endangerment; or*
- c) it adversely affects 2 or more listed threatened species (other than conservation dependent species) or 2 or more listed threatened ecological communities.*

Camphor Laurel is a native of eastern Asia which was probably introduced into Australia during early European settlement and was planted extensively along the east coast as an ornamental and shade tree in the early part of the 20<sup>th</sup> century. It was widely planted in the Richmond-Tweed region as a shade and windbreak species. It has since naturalised and spread extensively invading habitats across the far north of New South Wales and south east Queensland. In the latter part of the 19<sup>th</sup>

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<sup>1</sup> Chemotype - *Plants within a given botanical species whose chemical composition is somewhat different from averages, usually as a result of growing conditions such as soil type, climate, etc. Other chemotypes are more accurately termed genotypes (derived from the word gene) for their unusual chemical composition is inherited, irrespective of growing conditions.*

century Camphor Laurel was grown under cultivation in a wide variety of environments throughout the world either for its chemical constituents or for shade and ornamental purposes. Camphor Laurel has spread along eastern Australia from the Atherton Tablelands to Victoria, and also occurs as a garden ornamental elsewhere in Australia. Its greatest abundance occurs in northern New South Wales in the area bound by Lismore, Alstonville, Bangalow and Mullumbimby and further north near the Queensland border at Carool and Bilambil.

Camphor Laurel has long been recognised as a serious environmental weed species in Australia. Control programs advocate integrated removal and replacement with native trees. Camphor Laurel fruits abundantly in autumn and winter with seed being produced in large quantities that is suited to dispersal by birds. Camphor Laurel aggressively replaces native vegetation along waterways and on soil types which support rainforest and has established itself in high densities along many streams, particularly where the landscape has been disturbed through clearing for agricultural or urban development.

There are two main chemical varieties (or chemotypes) of Camphor Laurel known to occur in Australia ('camphor' and 'cineole'). The 'camphor' type is considered to be the most dominant chemotype in the northern rivers region of New South Wales. Some chemotypes of the tree are believed to contain significant amounts of safrole, a toxic and carcinogenic substance. However, any impact on native flora and fauna as a result of chemicals present in, and leached from, its leaf, fruit and bark is unspecified.

Survey work in the Richmond-Tweed region during the late 1970's identified, from bark characteristics, a high proportion of the 'camphor' form and a very low proportion of the 'cineole' form. It was estimated that the more toxic chemotype was very rare at this time and is unlikely to have obtained extensive spread in the 20 years since.

**A. Could the threatening process cause a native species or an ecological community to become eligible for listing as Extinct, Extinct in the Wild, Critically Endangered, Endangered or Vulnerable?**

It is claimed that the nominated threatening process will cause a number of native species to become threatened. Those species cited include: rainforest pigeons, the koala and other native mammals, aquatic invertebrates and fish, and native laurels.

A number of fruit-eating pigeon species occur in the rainforests of northern New South Wales. It has been recognised that these species declined in abundance after forest clearing causing the loss of seasonally important food sources and that their future survival in New South Wales may depend, at least in the short term, on the retention of rainforest remnants and exotic fruiting plants. At lower elevations, where the abundance of native fruits has been reduced by clearing of rainforest, the Camphor Laurel may in fact be the major winter food for Topknot and White-headed Pigeons.

Conservation of fruit-eating pigeons in north eastern New South Wales requires the retention of suitable habitat from the coast to the hinterland and from north to south. Remnants and degraded or exotic vegetation, such as the Camphor Laurel, not only increase the mobility of fruit pigeons but they also provide a seasonal food source. Exotic plants such as Camphor Laurel have become an important part of the diets of rainforest pigeons in New South Wales and patches of Camphor Laurel are sometimes retained by land managers, until substantial links of native vegetation have been re-

established.

Rainforest pigeons do not appear to be currently declining in abundance in New South Wales. Most species are now observed more frequently at specific locations and in greater numbers than in the 1970s. In particular, recent surveys indicate that there has been no recent observable decline in either the Wompoo Fruit Dove, Brown Cuckoo Dove or Emerald Dove.

Mass bird deaths, as a result of Camphor Laurel poisoning, have yet to be established beyond reasonable doubt. It is considered that some bird deaths may in fact be caused by other processes (e.g. one autopsy undertaken indicated that death claimed to be resulting from consumption of Camphor Laurel fruit was caused by poisoning from a pesticide product).

In relation to koalas in the Lismore area, while koalas have been sighted in Camphor Laurel trees in the Lismore area, research has indicated that the level of use is not significant and there is currently no research available indicating whether or not koalas were eating Camphor Laurel leaves. A survey undertaken of faecal pellet analysis in the area found constituents in the following proportions: 98% eucalypt species, 2% turpentine and corymbia species. Camphor Laurel was not determined to be a significant feed tree for koalas, its most preferred fodder species being *Eucalyptus tereticornis*. While it is likely that Camphor Laurel trees are used for shade and resting purposes it has not been verified that the koala feed on this species.

In addition, the impact of the more toxic chemotypes of Camphor Laurel on aquatic fauna and ecosystems is unsupported. There appears to be no evidence or documentation of the toxic properties of Camphor Laurel, the affects (likely or known) on aquatic organisms and in particular on tadpoles. A series of tests to assess the aquatic toxicity of Camphor Laurel leaves (incubated in water) was undertaken in New South Wales. While this assessment was designed to provide an estimate of the toxicity of Camphor Laurel in comparison to forest red gum leaves and did not make predictions about the ecological effects of Camphor Laurel *per se*, it did find that native Forest Red Gum leaf leachates were significantly more toxic than the Camphor Laurel leaf leachates. It appears that native aquatic species are already well adapted to a certain degree of toxicity in their habitats and the impact of Camphor Laurel leachates may not be significant.

No evidence could be found substantiating the claim that rainforest pigeons, tadpoles, the koala and other native mammals, aquatic invertebrates, fish, and native laurels were threatened by '*Cinnamomum camphora*, Camphor Laurel most toxic chemotypes'.

The effects of the nominated process are not clearly defined or documented and there are few quantitative data substantiating any claim that '*Cinnamomum camphora*, Camphor Laurel most toxic chemotypes' is eligible for listing as a Key Threatening Process under this criterion. The threatening process '*Cinnamomum camphora*, Camphor Laurel most toxic chemotypes' **is not eligible under this criterion** as there is insufficient evidence to suggest that this process is likely to cause a native species or an ecological community to become eligible for listing as Extinct, Extinct in the Wild, Critically Endangered, Endangered or Vulnerable. The information is considered **insufficient to determine whether the threatening process meets this criterion** at this time.

**B. Could the threatening process cause a native species or an ecological community to become eligible to be listed in another category representing a higher degree of endangerment?**

The nomination identifies Coxen's Fig-Parrot and Fleay's Barred Frog as two species affected by the nominated threatening process and makes reference to likely impacts on Eastern Freshwater Cod and *Hicksbeachia pinnatifolia* (Monkey Nut).

Camphor Laurel has not been recorded to be a threat to Coxen's Fig Parrot (*Cyclopsitta diophthalma coxeni*) in any known reviews of its conservation biology nor does the species' recovery team currently consider it to be a major threatening process to the species. While the New South Wales recovery plan for Coxen's Fig-Parrot identifies that Camphor Laurel is one of the weeds threatening lowland subtropical rainforests, there is no indication that the toxic effects of Camphor Laurel are currently considered to be a threat to the species itself— either in the past, currently or predicted into the future. Based on the evidence provided, the toxic effects of Camphor Laurel currently can not be supported as constituting an important or significant threat to this species.

In relation to Fleay's Barred Frog, there is no documented link between the most toxic chemotypes of Camphor Laurel and the decline of this species. Frog declines have occurred over a large area in total, and while Camphor Laurel is present in some of the catchments affected, it is absent from a great many number of relevant catchments, including those catchments worst affected by frog declines. There are currently no published scientific reports implicating Camphor Laurel toxins in the decline of Fleay's Barred Frog. The most likely cause of frog declines is considered to be a pathogen. A large body of scientific evidence led to the national listing of this pathogen "*Infection of amphibians with chytrid fungus resulting in chytridiomycosis*" as a Key Threatening Process in July 2002. It is possible that Camphor Laurels may have a local affect on frog populations, however there is no information available in the scientific literature to support either a local effect or wider impacts of the nominated threatening process at this time.

It is more likely that other causal factors have been instrumental in the decline of these two species.

No evidence could be found substantiating that any nationally listed species, including Coxen's Fig Parrot, Fleay's Barred Frog, Eastern Freshwater Cod or *Hicksbeachia pinnatifolia* would become more threatened by '*Cinnamomum camphora*, Camphor Laurel most toxic chemotypes'.

The effects of the nominated process are not clearly defined or documented and there are few quantitative data substantiating any claim that '*Cinnamomum camphora*, Camphor Laurel most toxic chemotypes' is eligible for listing as a Key Threatening Process under this criterion.

**Conclusion:** Based on the information provided and summarised above, the threatening process is **not eligible under this criterion** as the process is not likely to cause a native species or an ecological community to become eligible to be listed in another category representing a higher degree of endangerment. The information is considered **insufficient to determine whether the threatening process meets this criterion** at this time.

### **C. Does the threatening process adversely affect 2 or more listed threatened species (other than conservation dependent species) or 2 or more listed threatened ecological communities?**

The impact of the nominated threatening process on nationally listed species had been discussed under criterion B. Based on the evidence provided and summarised above there is no other evidence available supporting the assertion that any other listed threatened species or ecological community is adversely affected by the nominated process. The impact of the nominated threatening process is not sufficiently known at this time to warrant listing against this criterion. The nominated threatening

process is not known to adversely affect at least 2 listed threatened species and is therefore **not eligible under this criterion**.

**Conclusion:** The threatening process **is not eligible under this criterion** as the process is not likely to adversely affect two or more listed threatened species or two or more listed threatened ecological communities. There is insufficient evidence that any currently listed threatened species or ecological community is adversely affected by the toxic effects of Camphor Laurel.

**CONCLUSION - The threatening process does not meet s188(4)(a), s188(4)(b) and/or s188(4)(c) of the EPBC Act.**

There is insufficient evidence at this stage to support a possible threat to native wildlife. Further research establishing the extent and effects of the more toxic chemotypes of Camphor Laurel would be required to identify direct links between Camphor Laurel and threats to threatened species.

It is possible that certain chemical varieties of Camphor Laurel are toxic to fruit-eating species and aquatic environments where trees are present, however there is insufficient evidence to justify its listing at this time. There is a need for research that establishes the relationship between the most potent chemotypes of the species and the decline and distribution of threatened native species. Currently there is an absence of refereed and reported scientific data indicating a potential long-term effect on native animals by volatiles of Camphor Laurel.

While a wide range of anecdotes exist, the impact of the more toxic forms of Camphor Laurel has not been adequately established to justify listing the nominated process at this time. No published or scientifically rigorous evidence is available to link the toxic effects of Camphor Laurel with known impacts on biodiversity.

### **3. Recommendations**

TSSC recommends that the threatening process '*Cinnamomum camphora*, Camphor Laurel most toxic chemotypes' is not eligible for inclusion as a **key threatening process** in the list referred to in section 183 of the EPBC Act.

## **Publications used to assess the nomination**

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