

FLORA AND FAUNA GUARANTEE - SCIENTIFIC ADVISORY COMMITTEE
FINAL RECOMMENDATION ON A NOMINATION FOR LISTING

Input of toxic substances into Victorian rivers and streams due to human activities.
(Potentially Threatening Process)

Date of receipt of the nomination: 29 July 1992
Date of preliminary recommendation: 22 December 1992
Date of final recommendation: 25 May 1992

File No.: 92/4207

Validity:

The nomination is for a valid item and the prescribed information was provided.
In the opinion of the SAC the process is adequately defined and described.

The nominated process is the deliberate and/or accidental input of toxic substances into Victorian rivers and streams. Such substances include heavy metals, biocides and other organic and inorganic substances. Heavy metals (e.g. mercury, nickel, zinc, lead, copper, gold, cadmium) may be released into streams through urban runoff, mining and sewerage effluent and industrial discharges. Biocides (e.g. insecticides, herbicides, fungicides) which are used widely throughout Victoria to kill unwanted organisms and pose a threat to non-target species of flora and fauna. Biocides may enter the aquatic environment in a variety of ways including accidental or deliberate application to streams, drift from aerial spray, runoff from forestry and agricultural operations, contamination from industrial sources and contaminated leaf fall. Toxic substances may also be released into the freshwater environment through accidental spills and saline discharges from irrigation runoff, mine dewatering and evaporating basins. Other toxic substances which may enter the freshwater environment include inorganic poisons (e.g. Chloride, Chlorine, Nitrite, Ozone, Sulphides) and non-pesticide organic poisons (e.g. Cyanide, Phenols).

The process has the potential to affect species survival and reproductive rates as well as causing population fragmentation which may affect evolutionary development. Those species which are categorised as threatened, are listed under the *Flora and Fauna Guarantee Act 1988*, or which have very localised distributions, are particularly at risk.

The process has occurred and is continuing to occur in Victorian rivers and streams.

The range of flora or fauna affected or potentially affected was adequately stated in the nomination.

Significance of the threat which the potentially threatening process poses or has the potential to pose was adequately stated in the nomination.

Eligibility for listing as a potentially threatening process under the Flora and Fauna Guarantee

The nominated item satisfies at least one criterion of the set of criteria prepared and maintained under Section 11 of the *Flora and Fauna Guarantee Act 1988*, and stated in Schedule 1 of the *Flora and Fauna Guarantee Regulations 1990*.

Evidence that criteria are satisfied:

Criterion 5.1 *The potentially threatening process, in the absence of appropriate management, poses or has the potential to pose a significant threat to the survival of a range of flora or fauna.*

Evidence:

In Victoria, aquatic flora and fauna are subject to a wide range of toxic pollutants including heavy metals (e.g. mercury, nickel, chromium, zinc, cadmium, lead), biocides (e.g. insecticides, herbicides, fungicides), other organic and inorganic substances which may occur from industrial effluents, saline discharges and accidental spills. Few studies have been undertaken to compare population densities before and after contamination of waterways by toxic substances. There are however numerous cases of contamination causing short term declines in numbers of particular aquatic fauna species (Muirhead-Thompson 1987, Kingsbury & Kreutweiser 1980, Davies and Cook, in press). While there are few documented examples of significant impacts of toxic substances on the overall survival of species, there is a clear potential for this to occur. For example, 49 dead Murray Cod (*Maccullochella peelii*) were recorded following the release of the aquatic weedicide Acrolein into the Goulburn River (Hosking pers. comm.). Freshwater fish species and invertebrate species which are particularly at risk include threatened species, those listed under the *Flora and Fauna Guarantee Act 1988* and those with very localised distributions (e.g. Trout Cod



Maccullochella macquariensis, Brown Galaxias *Galaxias olidus* var. *fuscus*, Ewen's Pygmy Perch *Nannoperca variegata*, Freshwater Herring *Potamalosa richmondia*, Australian Grayling *Prototroctes maraena*, Murray Cod *Maccullochella peelii*, Macquarie Perch *Macquaria australasica*, Agassiz's Chanda Perch *Ambassis agassizii*, Yarra Pygmy Perch *Edelia obscura*, Tasmanian Mudfish *Galaxias cleaveri*, Dwarf Galaxias *Galaxiella pusilla*, Australian Bass *Macquaria novemaculeata*, Orbost Crayfish *Euastacus diversus*, Warragul Burrowing Crayfish *Engaeus sternalis*, Mallacoota Burrowing Crayfish *Engaeus mallacoota*, Narracan Burrowing Crayfish *Engaeus phyllocercus*, stoneflies *Riekoperla isosceles*, *R. intermedia*, *R. darlingtoni*, *Thaumatoperla flaveola*, Freshwater amphipod *Austrogammarus australis*, caddisfly *Archaeophylax canarus*, planarian *Spathula tryssa*, Baw Baw Frog *Philoria frosti*, Giant Burrowing Frog *Heleioporus australiacus*, Southern Barred Frog *Mixophyes balbus*, Giant Bullfrog *Limnodynastes interioris*, Spotted Tree Frog *Litoria spenceri*, Alpine Water Skink *Sphenomorphus kosciuskoti*). Contamination of particular headwaters could result in local extinctions of species which may be unable to recolonise such areas.

There are examples of toxic contamination which have occurred in Victorian streams where threatened species (e.g. Broad-finned Galaxias *Galaxias brevipinnis*, Spotted Galaxias *G. truttaceus*, Pouched Lamprey *Geotria australis*) and species which are listed under the *Flora and Fauna Guarantee Act 1988* occur (e.g. Yarra Pygmy Perch *Edelia obscura*, Australian Grayling *Prototroctes maraena*, Murray Cod *Maccullochella peelii*, Macquarie Perch *Macquaria australasica*, Brown Galaxias *Galaxias olidus* var. *fuscus*) (Nuttall 1982, Ealey *et al.* 1983, Rich 1986, Tiller 1990). Some studies have indicated that persistent heavy metal contamination may cause reductions in species richness and abundance (Weatherly *et al.* 1967) and that chronic contamination can have deleterious effects on reproductive capabilities and can alter behavioural and metabolic states (Hellawell 1986).

Background Information

- The effects of toxic substances on species survival depends on a range of factors including the substance involved, its toxicity and concentration, the duration of the contamination event, its persistence in the environment and the species involved. Species may exhibit acute contamination (severe short term effects often resulting in rapid death of individuals) or chronic contamination (resulting in deleterious effects over time).
- "Application factors" are used by management authorities as a guide to predict the concentrations of toxicants which can be considered "safe" or of "minimal risk" for the protection of aquatic organisms. This factor is used in conjunction with acute lethality data for other related toxicants to predict safe concentrations in those substances for particular species (EPA 1983). These factors however apparently have little empirical support.

Advertisement for public comment

In accordance with the requirements of Section 14 of the *Flora and Fauna Guarantee Act 1988*, the preliminary recommendation was advertised for public comment for a period of at least 30 days.

The preliminary recommendation was advertised in:

"The Age" - on 7 April 1993

"The Weekly Times" - on 7 April 1993

Government Gazette - on 8 April 1993

Submissions closed on 10 May 1993.

Further evidence provided:

No public comments were received by the Scientific Advisory Committee.

No evidence was provided to warrant a review of the Scientific Advisory Committee's preliminary recommendation that the potentially threatening process is eligible for listing.

Documentation

The published information and research data provided to the SAC have been assessed. To the best of their knowledge, the SAC believes that the data presented are not the subject of scientific dispute and the inferences drawn are reasonable and well supported.

Final Recommendation of the Scientific Advisory Committee

The Scientific Advisory Committee concludes that on the evidence available the nominated item is eligible for listing in accordance with Section 11 of the Act because primary criterion 5.1 is satisfied.

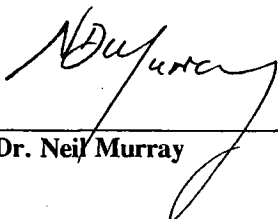
The Scientific Advisory Committee recommends that the nominated item be supported for listing on Schedule 3 of the *Flora and Fauna Guarantee Act 1988*.

Selected references:

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- Nuttall, P. M. (1982) *A biological assessment of water quality in Dandenong Creek and its major tributaries, Victoria*. Dandenong Valley Authority Technical Report No. 23.
- Rich, C. J. (1986) *A morphological and electrophoretic examination of geographical variation in the ornate mountain galaxiid, *Galaxias olidus* Gunther*. Honours thesis, Department of Zoology, University of Melbourne.
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- Weatherley, A. H., Beevers, J. R. & Lake, P. S. (1967) *The ecology of a zinc polluted river*. *In*: Australian inland waters and their fauna: Eleven studies. Australian National University Press, Canberra.

Endorsement by the Convenor of the Scientific Advisory Committee

Date



Dr. Neil Murray

20 July 1993