



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

Input of petroleum and related products into Victorian marine and estuarine environments.

(Potentially Threatening Process)

Date of receipt of the nomination: 11 November 1993
Date of preliminary recommendation: 24 February 1994
Date of final recommendation: 5 May 1994

File No.: 94/0632

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 petroleum and related products into marine and estuarine environments. This includes crude (unprocessed) and refined oil, both of which incorporate petroleum hydrocarbons. Hydrocarbons may be aliphatic or aromatic. Aliphatic hydrocarbons, although not highly toxic, can result in significant effects such as smothering. Aromatic hydrocarbons are particularly toxic and may persist for long periods in anaerobic sediments, being released gradually or episodically into the environment.

The main sources of marine oil pollution are land based via rivers and streams (41%), spills from ships (35%), natural seepage (10%) and pollution from offshore operation and refining (4.3%) (HORSEC 1978). Land based pollution originates from oil heating systems, atmospheric fallout, operation of vehicles, petroleum refineries and other land based industries. Chronic oil pollution may continue at relatively low levels over time, while acute pollution is characterised by the input of large quantities of contaminants lasting for shorter periods.

The process has the potential to affect the survival of taxa by modifying behaviour, physiology, reproductive success or life cycles (Bayne *et al.* 1982, Chapman *et al.* 1988, Johnston 1976). It may result in numerous structural changes ranging from gross abnormalities to subtle subcellular defects affecting behaviour and senses (Hawkes 1977, Kay 1978). When exposed to oil, cell membranes in plants can be damaged by the penetration of hydrocarbon molecules which leads to the leakage of cell contents. In addition, the process has the potential to cause high mortalities of flora and fauna through the physical effects of direct coating and poisoning.

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, flora and fauna dependent on marine and estuarine environments are potentially subject to pollution from petroleum and related products. The fauna includes numerous seabirds and waders which rely on this environment for feeding. Birds may be affected by oil pollution by the fouling of feathers which can result in the loss of insulation and buoyancy and lead to an increase in metabolic rate. Death can occur through heat loss, drowning or exhaustion (Kay 1978, Hunt 1987). Oil can be ingested through preening which may result in pathological changes to the adrenal glands, liver, intestines, pancreas and kidney. It can also result in changes to shell thickness, chick physiology, and impairment of respiratory and renal functions. Blockage of external nostrils can result in death through suffocation (Michael 1977, Kay 1978).

Detrimental effects of oil pollution on aquatic mammals such as whales include damage to respiratory systems through inhalation of petroleum vapours, as well as the possible reduction or destruction of food supplies (Kay 1978).

Many species of fish rely on the marine and estuarine environment for feeding and breeding, either for their entire life cycle or part of it. Petroleum may enter fish either directly through the skin or gills, or by direct ingestion of tar. Oil pollution can cause physiological changes such as inflammation of the gills, changes to the storage and secretion of products, alterations to heart beat, coughing rate and respiration, as well as death (Hawkes 1977). There appears to be a direct correlation between hydrocarbon stress and the increase in the incidence of fish diseases (Cupuzzo 1987). Ingestion of sub-lethal doses by fish may decrease the number of eggs laid and their hatching success as well as increase the chance of developing abnormalities (Howarth & Marono, unpub.). Johnston (1976) noted that eggs and young larvae are the most susceptible stages of the life cycle of fish. Fish larvae often drift near the water's surface, where much of the oil is located during a spill.

Sublethal concentrations of hydrocarbons can disrupt the foraging behaviour of gastropods, decrease suspension feeding by bivalves, reduce the rate of production of faeces in oysters and reduce clearance rates of particles in mussels (Bayne *et al.* 1982). Benthic invertebrate populations can be severely depressed in abundance and diversity in the vicinity of oil rigs (Mackin 1971).

Salt marsh and mangrove communities may be particularly vulnerable to oil pollution because the substrates in which they grow have a high organic content and can bind hydrocarbons for long periods of time (Burns 1978). Studies in the United States found that damage to salt marsh plants was caused by oil being in contact with leaves and shoots which prevented the transfer of oxygen around the plant tissues and resulted in oxygen depletion around the roots (Cowell 1976).

Those species which are particularly at risk include threatened species, those listed under the *Flora and Fauna Guarantee Act* 1988, those with very localised distributions, and those which are dependent on the marine and estuarine environment for at least part of their life cycle (eg. Freshwater Herring *Potamalosa richmondia*, Australian Grayling *Prototroctes maraena*, Tasmanian Mudfish *Galaxias cleaveri*, Australian Bass *Macquaria novemaculeata*, Cox's Gudgeon *Gobiomorphus coxii*, Broad-finned Galaxias *Galaxias brevipinnis*, Spotted Galaxias *Galaxias truttaceus*, Pouched Lamprey *Geotria australis*, Striped Gudgeon *Gobiomorphus australis*, Tasmanian Whitebait *Lovettia sealii*, Dwarf Flat-headed Gudgeon *Philypnodon* sp. nov., marine opisthobranch *Platydorid* *galbana*, marine opisthobranch *Rhodope* genus, Little Tern *Sterna albifrons*, Fairy Tern *Sterna nereis*, Hooded Plover *Charadrius rubricollis*, Orange-bellied Parrot *Neophema chrysogaster*, Eastern Curlew *Numenius madagascariensis*, Pacific Gull *Larus pacificus*, White-bellied Sea-eagle *Haliaeetus leucogaster*, Australasian Gannet *Morus serrator*, Fairy Prion *Pachyptila turtur*, White-faced Storm-Petrel *Pelagodroma marina*, Common Diving-Petrel *Pelecanoides urinatrix*, Black-faced Shag *Leucocarbo fuscescens*, Caspian Tern *Hydroprogne caspia*, Southern Right Whale *Eubalaena australis*, Humpback Whale *Megaptera novaeangliae*, Australian Fur-seal *Arctocephalus pusillus*)

Sub-criterion 5.1.2 *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 community.*

Evidence:

The San Remo Marine Community, a community listed under the *Flora and Fauna Guarantee Act* 1988, occurs at only one site in Victoria. Pollution by petroleum and related products, either by a spill or gradual seepage, could represent a significant threat to the community and its component taxa.

Pollution may destabilise communities if the most sensitive species are lost and replaced by opportunistic species.

Background Information

- In 1990, oil was spilt from a tanker near Apollo Bay. The slick of approximately 50 tonnes stretched over 10 nautical miles. It was estimated that between 1127 and 3380 penguins were killed by the spill, which represents between 1.2 and 3.6% of the total Victorian population (Dann 1991).
- Of the fifty known spills that occurred in Victoria between February 1975 and January 1978, the majority were results of human error or equipment failure. Over half occurred during bilge operations, the remainder during ballast discharge, deck washing or transfer operations (HORSCEC 1978).

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 a period of at least 30 days.

The preliminary recommendation was advertised in:

"The Age" - on 30 March 1994

"The Weekly Times" - on 30 March 1994

Government Gazette - on 31 March 1994

Submissions closed on 4 May 1994.

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 SAC also concluded that sub-criterion 5.1.2 has been satisfied and that no evidence exists to suggest that primary criterion 5.1 cannot be satisfied as a consequence of sub-criterion 5.1.2 being 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:

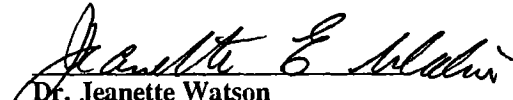
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Endorsement by the Convenor of the Scientific Advisory Committee

Date

28 July 1994


Dr. Jeanette Watson
Acting Convenor