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AUSTRALIAN SENATE INQUIRY

# INVASIVE SPECIES – WESTERN AUSTRALIA

Government of Western Australia Submission

September 2003

(Prepared by the Department of Agriculture and Department of Conservation and Land Management)

# CONTENTS

# EXECUTIVE SUMMARY

This paper describes, in the context of the Western Australian environment, the current and potential impact of invasive animal and plant species. There is an abundance of scientific material written on the impacts of invasive species. This paper provides some comment on these impacts but concentrates mainly on suggested improvements to the current management regimes. A number of issues are highlighted where current regulations and administrative arrangements are inadequate to effectively manage invasive species.

After habitat destruction and fragmentation, the establishment of invasive alien species is now recognized as the second most significant global threat posed to biodiversity (IUCN 2000). It is also predicted that invasive species will become the primary drivers of ecological disintegration in the future because of the increased spread of alien species due to the greater mobility of the human population, rapidly growing transport technology, expanding tourism and travel activities, and world-wide free trade (Cox 1999, Ruesink *et al.* 1995).

Invasive marine pests are a significant issue in terms of their threat to the marine environment.

It is important to note that while there have been many eradications of introduced mammals from islands, no eradication campaign against any widely established exotic vertebrate species has ever been successful on any continent, despite numerous large-scale attempts and the huge potential benefits of success (Bomford *et al.*, *in press*).

It appears to be the approach of the Department of the Environment and Heritage's (DEH) that the person who applies to amend the list of specimens approved for live import should also be the person responsible for preparing terms of reference and assessment reports, and for covering the costs of the assessment. The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) does not seem to specify this.

If the proponent is responsible for 'preparing draft terms of reference for a report into the potential impacts on the environment of the species being proposed for import', (EPBC Act) there is likely to be a conflict of interest in getting importation approval. This directly conflicts with the need for a balanced and rigorous assessment process.

Under the proposed invasive species amendment bill, the State and Territory agencies that have responsibility for managing exotic species within their jurisdictions, will not be represented on the Minister's Invasive Species Advisory Committee, or at least not in a capacity as State or Territory regulatory agencies. At best only individuals who may work for such agencies might be co-opted onto the Invasive Species Advisory Committee.

It would appear efficient to develop a system where consultation occurred with those bodies that will be expected to manage the risks posed by the import of new species to Australia, and which currently possess the bulk of the available expertise and operational capacity in this area.

Quarantine should again be viewed as an "insurance policy" and agencies should be prepared to contribute towards the prevention of future losses. This principle should be spelled out in the preamble to any associated legislation.

The States and Territories, through the Vertebrate Pests Committee (VPC), have accepted the model for use in determining the risk posed by exotic vertebrates and have recommended to Biosecurity Australia (BA) and DEH that it be used to assess the risks posed by vertebrates proposed for entry into Australia. Biosecurity Australia in Agriculture, Fisheries and Forestry Australia (AFFA) has independently assessed the model and accepted it. It is understood that DEH is in the process of conducting an independent assessment and that, in addition to assessing the model for its intended use for terrestrial vertebrates, DEH is also assessing the report to see if it can be adapted for assessing risks posed by other animal groups. In the meantime, it is unclear how assessments of applications made by the applicant are being assessed. It would appear efficient to use one agreed system to assess the risks posed by exotic vertebrates both entering the country and being managed within the country.

In 2001, without any prior consultation with the States, the National Exotic Bird Registration Scheme (NEBRS) was abandoned when the *Wildlife Protection (Regulation of Imports and Exports) Act 1982* was repealed and replaced with the *Environment Protection and Biodiversity Conservation Amendment (Wildlife Protection) Act 2001*.

In Western Australia more than 50 species of bird have been introduced and released into the wild (of which 14 are now established), while 32 species of mammals have been introduced into the State (of which 15 species are established with a further two species possibly established) (Long 1988). Eight species of exotic fish are established in the wild in Western Australia (P. Mawson pers. comm.). There have been 43 identified introductions of invertebrate species into Western Australia since 1990 (J. Botha pers. comm.). A further significant issue for Western Australia is preventing the introduction of species that have become established in the Eastern states and, because of their status within those states, might not be considered a priority for concern.

**Recommendations:**

- That a review of existing Commonwealth legislation be undertaken to address the specific items raised in section 1 (E) of this submission. The review should consider whether or not, rather than legislative change, management arrangements can be put in place covering the items raised.

- Commonwealth legislation to be amended to prevent sales of identified threats such as Northern Australian Quarantine Strategy (NAQS) potential invasive species.

- There is a need for national action on a standard requirement for the logging of fumigations undertaken both within Australia and overseas.

- There needs to be a national audit of all invasive species.

- Expand the charter of Biosecurity Australia to ensure screening is undertaken for species, including diseases, impacting not only on primary production but also the natural environment.

- The national listing process needs to be all encompassing and take on board the views of State agencies.

- There needs to be better interaction between Biosecurity Australia and DEH with an enhanced capacity within DEH to handle invasive species issues and the associated requirements of the EPBC Act.

- Amend the *Australian Postal Corporations Act 1989* to allow scanning of interstate mail by appropriate State authorities.

- Commonwealth should foster and formalize international cooperation aimed at kerbing the trade in organisms via the Internet.

- Need a national approach to remove disincentives in reporting suspect finds or requesting identifications.

- The States and Territories have constitutional responsibility for the management of the movement and keeping of exotic species within their borders. As such, any departments or bodies responsible for advising the Minister on which species should be allowed to enter the country should include representation from the States and Territories.

# TERMS OF REFERENCE

## *SENATE TERM OF REFERENCE – 1 (A)*

## *The nature and extent of the threat that invasive species pose to the Australian environment and economy.*

Invasive species pose a major threat to the Australian environment and economy. However invasive species are poorly understood by the general public and other key sections of the Australian community, with some industries and some areas of government still actively promoting invasive species. One example of this is buffel grass (*Cenchrus cillaris*). Some figures are available for the impact cost of invasive species to various industries, such as the cost of weeds to agriculture, but are not so readily available for environmental needs. Cost estimates are usually given as production losses and control costs for particular industries. Canyon *et al.* in Pimentel (2002) state that "Environmental costs are difficult to determine for most pests, because the true dimensions of their impact are often unknown".

After habitat destruction and fragmentation, the establishment of invasive alien species is now recognized as the second most significant global threat posed to natural biodiversity (IUCN 2000). It is also predicted that invasive species will become the primary drivers of ecological disintegration in the future because of the increased spread of alien species due to the greater mobility of the human population, rapidly growing transport technology, expanding tourism and travel activities, and world-wide free trade (Cox 1999, Ruesink *et al.* 1995). Invasive species also cause billions of dollars worth of damage to primary industries annually (see Long 2003 for a summary on mammals) in the countries in which they become established. In the European Union, the cost of lost production due to invasive species is likely to exceed tens of billions of Euros annually (GISP 2000). Therefore the planning of more effective strategies to deal with biotic invasions is a conservation priority on a global scale.

Australia has received more introduced species than almost any other continent in the world. 96 bird species; 32 of which are now established, 12 are probably established and 52 have failed or probably failed to establish (see Long 1981). 79 mammal species; 49 of which are now established, 6 are probably established and 24 species have failed or probably failed to establish (see Long 2003). One species of reptile, one species of amphibian (the cane toad), and at least nine species of fish have also been introduced into Australia, but their impact is generally, with a few exceptions, less of an issue at present. A large number of terrestrial and marine invertebrates have been introduced into Australia.

There are 250 known introduced marine organisms in Australia, of which 90 are known to be present in Western Australia. Of the 90 in Western Australia, The Centre for Research on Introduced Marine Pests (CRIMP) indicates that approximately 10 could pose significant threats to the marine environment in the

future. An example of an introduced marine organism known to be established in Western Australian waters is the European fan worm (*Sabellidae spallanzanii*) in Cockburn Sound, from where it has spread to Bunbury, Albany and Esperance ports.

The number of invasive animal species that have become established to such a degree that they now pose a threat to our natural biodiversity of primary production systems has been fewer than in other parts of the world at this stage. This is due to a combination of factors such as the geographic isolation of the country, the number of animals introduced for each species, the number of releases made, the suitability of the new habitat, the level of protection provided during the early years following the releases, the match between the climate in the species native range and those parts of the new range in Australia, and a number of ecological attributes associated with each species (fecundity, diet, movement behaviour etc.; see Bomford, *in press* and Duncan *et al.* 2001).

**Plants**

About 1,200 non-native plants have been recorded as naturalised for Western Australia (FloraBase - The Western Australian Flora). Some of these are isolated records and a very few have been eradicated. The majority are species that have become established in the environment and are reproducing. No doubt there are others that have not yet been identified.

Infestations may not be noticed for several years, particularly in isolated areas. Canary Island St John's wort (*Hypericum canariense*), for example, was found on a roadside northwest of Bremmer Bay in early 2002. However the number and large size of the plants indicated they had been there for several years. Ensuing publicity led to *H. canariense* being found at other sites including several gardens. *H. canariense* is native to the Canary Islands so is well suited to the Mediterranean climate of the southwest of Western Australia. It is cause for concern to researchers in California where it is invading native coyote bush (*Baccharis* sp.) and is so invasive it has also choked out vigorous weeds such as pink pampas grass (*Cortaderia jubata*) (The Nature Conservancy, Wade pers. comm.).

Groves and Panetta (2002) gave two general principles for weed eradication programs as;

- biologically and economically feasible: If the known distribution of the weed is less that 100 ha, if it occurs at three or fewer locations, if its location sites are accessible and if the weed is readily detectable; and
- if the weed has a period of seed viability in the soil greater than five years and/or continues to be traded by nurseries, then the longer will be the period required for eradication.

By the time many infestations are noticed, or by the time a plant is regarded as causing a problem, eradication is usually not feasible. The problem is obviously compounded if the plant is in cultivation and/or the nursery trade. Thus, there are very few cases of successful eradication, with the eradication of kochia (*Bassia scoparia*) from Western Australia being the one major exception (Dodd 1996, Dodd and Randall 2002).

**Animals**

In Western Australia more than 50 species of bird have been introduced and released into the wild (of which 14 are now established), while 32 species of mammals have been introduced into the State (of which 15 species are established with a further two species possibly established) (Long 1988). Eight species of exotic fish are also established in the wild in Western Australia (P. Mawson pers. comm.). There have been 43 identified introductions of invertebrate species into Western Australia since 1990 (J. Botha pers. comm.) (See appendix 1).

The introduction of species such as the feral cat, fox, feral pig and cane toad has had a significant and adverse impact on the natural biodiversity of Australia. Some of that impact was evident quite early after their introductions were made, while others such as the cane toad, are only now manifesting themselves to the full extent. The majority of those introductions and their impacts have been poorly researched until recently. The threat posed by some species is only now being fully acknowledged or recognized at the political and statutory level. Feral cats, foxes and feral pigs have had, or are in the process of having, National Threat Abatement Plans written to help facilitate a coordinated response to reducing the impact that these species have.

Funded quarantine actions such as surveillance and eradication have a focus on agricultural and to a lesser extent forestry invertebrate pests. Cost analyses focus on losses to these industries rather than that on the environment. The potential threat of invasive species to the native fauna is significant. In many instances introduced insect species have become pests of livestock and wildlife. Because a number of species are as yet not in Western Australia the scale of the problem regarding the introduction of invasive invertebrate species is best understood by looking at case studies from elsewhere (See Appendix 2).

In summary the costs associated with the eradication efforts for a number of invasive invertebrates in the USA are;

*Table 1: Examples of the costs of invasive invertebrate pest control in the USA.*

| Species | Environmental Cost | US $ Cost |
|---|---|---|
| Gypsy moth (*Lymantria dispar*) | Forests of eastern USA and Pacific Northwest | • 764 million (control 1981)<br>• 20 million (control 2002) |
| Balsam woolly adelgid (*Adelges piceae*) | Inflicts severe damage in balsam-fir natural forest ecosystems. Loss of two native bird species and the invasion by three other bird species | |
| Red imported fire ant (*Solenopsis invicta*) | Kills poultry chicks, lizards, snakes, and ground nesting birds. 34% decrease in swallow nesting success | • 300 million per year (damage – Texas).<br>• 200 million per year (control) |

| | | |
|---|---|---|
| Formosan termite (*Coptotermes formosanus*) | | • 1 billion per year (damage) |
| Asian longhorn beetle (*Anoplophora glabripennis*) | Loss of public and private trees | • $ 5 million to date (control) |

Green (2002) mentions that the yellow crazy ant (*Anoplolepis gracilipes*) was accidentally introduced to Christmas Island more than 70 years ago, but did not present any undue environmental concern until the mid 1990s. Around this time something (perhaps some environmental factor, or secondary introductory of a new genotype) triggered the formation of "supercolonies" by this highly invasive species. It is estimated that since 1995, crazy ants have killed 10-20 million red crabs, which is 20-25% of the entire population. This has been a catastrophic loss, and the deletion of red crabs from large tracts of forest on the island is immediately obvious. In the absence of crabs, seedlings are now germinating en masse in the forest understorey, forever altering the structure of the rainforest in those places. The up side to this horror story is that a toxic bait has been identified which is extremely effective at controlling crazy ants at very low doses. In 2002 it was estimated that "the crazy ant problem on Christmas Island should be under control by the end of 2002".

**Disease**

At least four significant environmental diseases have entered Australia in the past 20 years, and two of these have been recorded in Western Australia, and one of those is now endemic in wild animal populations. Chytrid fungus (*Batrachochytrium dendrobatidis*) is a fungus from a group of exotic fungi that are normally soil dwelling. This fungus appears to have switched hosts and is known to infect and kill amphibians on three continents. Research has shown that it first appeared in wild Australian frogs in the early 1980's and was recorded in Western Australia as early as 1985. It is now widespread in the southwest of the State and has also been recorded from inland areas of the wheatbelt and a single location in the Kimberley region. It has been recorded from common and threatened frog species in Western Australia and has been implicated in the dramatic declines and extinction of several species of frog in eastern Australia.

Boid Inclusion-Body Disease (or IBD) is believed to be a retrovirus like agent that is naturally occurring in a small number of South American python species. It does not cause any problems in the natural host but is highly infectious to other python species and has been found to be fatal to all species of Australian pythons that have come in contact with it. The first recorded cases of IBD in Australia are believed to have been derived from an exotic python seized by Customs and placed in the Melbourne Zoo pending the court case. Nearly the entire native python collection in the zoo was infected and died shortly after. There is no treatment or cure for this disease and its diagnosis is currently difficult. IBD has been reported in Western Australia once, where it infected and killed a number of captive native pythons. The disease has now been contained and no further cases have been reported for more than two years. There is currently an embargo on the importation of all pythons (native or exotic) into Western Australia.

The other two diseases entered Australia via an approved quarantine facility with the support of the Australian Quarantine and Inspection Service (AQIS) system. In the early 1990's the Commonwealth authorities (AQIS and Environment Australia /DEH) approved the import of ten species of exotic parrots. These were the first legal imports for more than 30 years. The birds were quarantined prior to leaving the country of origin (England) and again on arrival in Australia. The birds were screened for Avian Influenza, Newcastle Disease and several strains of salmonella. These diseases affect domestic poultry primarily, but no effort was made to screen for any other diseases because no other diseases affecting birds are on the notifiable diseases list maintained by AQIS.

Shortly after the birds were release from quarantine two new avian diseases were detected in two aviaries that held the recently imported birds; Macaw wasting disease which is known to infect Australian cockatoo species and Papilloma virus which affects a wide range of Australian parrot species. One aviary owner agreed never to breed, sell or dispose of the birds until they died of natural causes, but the other owner gave no such undertaking.

## *SENATE TERM OF REFERENCE – 1 (B)*

## *The estimated cost of different responses to the environmental issues associated with invasive species, including early eradication, containment, damage mitigation and inaction*

**Plants**

The cost of weed eradication can be extremely high with perhaps the best example coming from the USA. In 1956 the parasitic witchweed (*Striga asiatica*) was found in the Carolinas. Witchweed attacks several important grain crops, particularly corn, and so was targeted for eradication. The initial infestation of 200,000 ha was spread over 20,000 $km^2$ of farmland in the east of both North and South Carolina. By 1999, it been reduced to about 2,800 ha at a total cost in excess of US $250 million (Robert E. Eplee in: Wittenberg and Cock 2001). However, this is seen as a small cost compared to the US $25 billion per year of crops threatened by the weed. Another example from the USA is leafy spurge (*Euphorbia esula*) that researchers found to have an impact of US $87.3 million on the State of North Dakota (Wittenberg and Cock 2001).

In relation to invasive weed species, the Australian National Weeds Strategy measured the cost of weeds to agriculture in 1997 at $3.3 billion per annum; this would now be some $4 billion per annum. Western Australian graingrowers lose $75 million per annum on just one weed species, the herbicide resistant annual ryegrass *Lolium rigidum*. Another $4 million is spent per annum in an attempt to eradicate one other species, skeleton weed (*Chondrilla juncea*).

The plants listed (mimosa, serrated tussock, willows, lantana, blackberry and parkinsonia) are all Weeds of National Significance (WONS). Their impacts have been well documented in the national strategies developed for each species. The WONS were all introduced many years ago, before there was a robust quarantine

system in place and indeed when the idea of man conquering nature was entertained, acclimatisation societies were fashionable and biodiversity was a completely unknown concept. Now there is an understanding of the importance of biodiversity and the devastating impact that invasive species can have on both agriculture and the environment. Steps are in place to minimise the risk of legal introduction of invasive plants, notably through the use of a permitted list system for introductions.

*Table 2: Status and current management of selected invasive weeds (ref. item (1)(b)(ii) of the TOR's*

| **Species** | **WA status** | **Current management** |
|---|---|---|
| Mimosa (*Mimosa pigra*) | Not present in Western Australia, prohibited from entry, declared P1, P2 Whole of State. | Prevent entry and carry out surveillance. |
| Serrated tussock (*Nasella trichotoma*) | Not present in Western Australia, prohibited from entry. | Prevent entry and carry out surveillance. |
| Willows (*Salix* spp.) | Common and widespread in cultivation. | Monitor for weedy tendencies. |
| Lantana (*Lantana camara*) | Common and widespread in cultivation. | Monitor for weedy tendencies. Weed infestations have been controlled near Kununurra. |
| Blackberry (*Rubus fruticosus* agg.) | Common and widespread in the southwest of Western Australia, declared in parts of the State, targeted for biological control. | Controlled in public access areas on Government land and on private properties in regions where it is Declared. Biocontrol research project in place. |
| Parkinsonia (*Parkinsonia aculeata*) | Widespread in the Kimberley Region of WA and parts of the Pilbara Region. Declared in parts of the State. | Too widespread to control in Kimberley. Biological control research. Eradication treatment in Pilbara. |

It should be noted that there could be a considerable lag-phase from when a plant is introduced to when it becomes weedy. Bridal creeper (*Asparagus asparagoides*), for example, was introduced in the mid-1800's but did not become a serious weed until the 1970's. During this lag-phase, plants are known as sleeper weeds. A freak weather event or some other situation such as a flood or serious fire could lead to the sudden spread of weeds with previously limited distributions. Mimosa (*Mimosa pigra*) for example, was the subject of an eradication campaign by the Department of the Northern Territory in the late 1960's. The infestation was limited to scattered plants and the plan was to at least prevent seed-set but the Federal government cut funding for the program around 1970. Floods in the early-mid 1970's spread seeds across the Adelaide River floodplain that led to the devastating population that exists today. Similarly, the introduction of another invasive species, such as a suitable pollinator, could also lead to the sudden spread of weeds with previously limited distributions. For example, it is predicted that the introduction of bumblebees (*Bombus terrestris*) to mainland Australia could lead to greatly increased seed production, and thus spread, of many introduced invasive plants.

It has already been well documented that many of our most serious weeds were deliberately introduced as garden plants (Groves and Hosking, 1997, Randall, 2001 Roush et al. 1999). For example, Groves and Hosking established that almost two thirds of all new incursions between 1971 and 1995 were brought in as ornamentals (see Fig. 1). And despite Australia having a relatively high level of quarantine, several problematic plant species have been introduced in recent times.

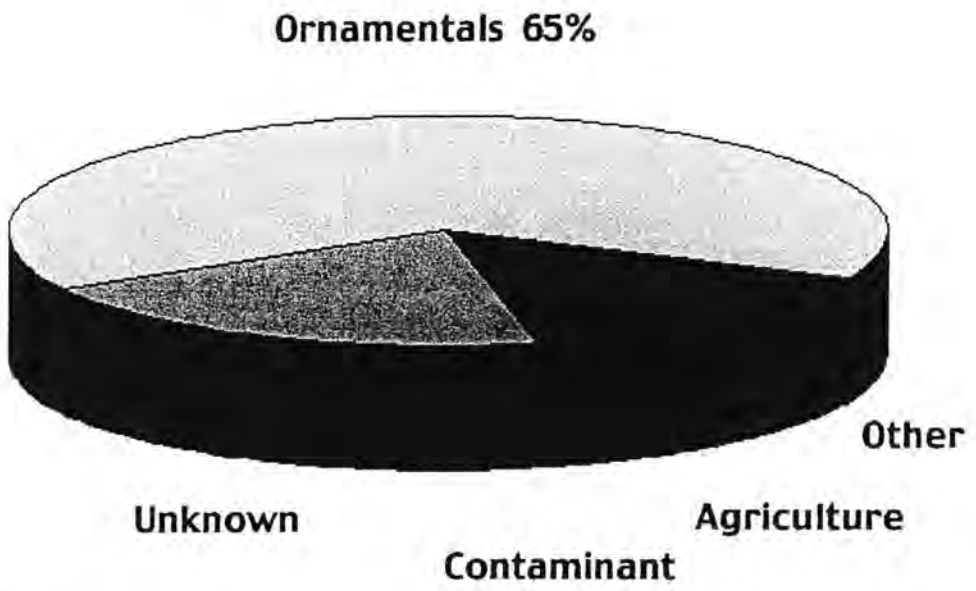


*Fig. 1. Adapted from Groves and Hosking (1997).*

**Animals**

For one potential invasive insect species, the banana skipper (*Erionota thrax*), it has been determined that in the absence of biological control agents it could cause production losses in Australia of up to $65.9 million per year. However, in the presence of biological control agents, these losses could be expected to shrink to approximately $3 million annually. More examples of the estimated impact of invasive insects can be found in Canyon *et al.*

Cost estimates in the event of incursions of exotic arthropods to Western Australia are currently limited to species that would have economic impacts on agriculture. In Table 3 estimated values regarding some species that could impact on plant industries are given.

*Table 3: Expected Net Present Value of annual industry benefits of exclusion of some pests exotic from Western Australia (extract from Cook, 2003).*

| **Scientific name** | **Common name** | **Benefits ($)** |
|---|---|---|
| *Ceutorhynchus assimilis* etc. | Cabbage weevil | 11,793,100 |
| *Diuraphis noxia* | Russian wheat aphid | 31,399,600 |
| *Liriomyza trifolii* & *L. huidobrensis* | Serpentine leafminers | 896,400 |

| | | |
|---|---|---|
| *Mayetiola destructor* | Hessian fly | 19,904,300 |
| *Sitona lineatus* | Pea leaf weevil | 33,284,100 |
| *Trogoderma granarium* | Khapra beetle | 114,231,700 |

It is currently considered that none of the above species would pose a direct threat to the environment and there may be a potential use for some other species in the biological control of weeds in Western Australia. The same holds true for the biological control (integrated pest management) of pest species on many crops in Western Australia. Substantial research efforts continue to be required on a case-by-case basis.

*Table 4: List of terrestrial vertebrates of known and particular concern in Western Australia.*

| **Common Name** | ***Scientific Name*** | **Status in the wild in Western Australia and Australia** |
|---|---|---|
| Cane Toad | *Bufo marinus* | Not present / increasing distribution |
| Blackbird | *Turdus merula* | Not present / widely established |
| Common Starling | *Sturnus vulgaris* | Not present / widely established |
| House Sparrow | *Passer domesticus* | Not present / widely established |
| Indian Myna | *Acridotheres tristis* | Not present / increasing distribution |
| Tree Sparrow | *Passer montanus* | Not present / increasing distribution |
| Rodents | *Rattus* spp., *Mus domesticus* | Widely established / widely established |
| Wild Dog | *Canis familiaris* | Widely established / widely established |
| Red Fox | *Vulpes vulpes* | Numbers reduced in some conservation areas / widely established |
| Feral Cat | *Felis catus* | Widely established / widely established |
| European wild rabbit | *Oryctolagus cuniculus* | Widely established / widely established |
| Feral Donkey | *Equus asinus* | Numbers reduced in parts of the Kimberley and Pilbara / widely established |
| Feral pig | *Sus scrofa* | Widely established / widely established |
| Feral Camel | *Camelus dromedarius* | Widely established / widely established |
| Feral Cattle | *Box taurus* | Widely established / widely established |
| Feral Goat | *Capra hircus* | Widely established / widely established in southern States |
| Fallow Deer | *Dama dama* | Restricted feral distribution / widely established |
| Red Deer | *Cervus elaphus* | Restricted feral distribution / widely established |
| Potential exotic pest species | | Present in captivity or in small wild populations |

There are also many other exotic species present in Australia that have not yet been adequately assessed for the risks they may pose to agriculture, the environment or human health. They include many animals kept as pets, or in zoos and wildlife parks and for research purposes. They may also include animals known to be in small wild populations.

Some of these species could in fact be so-called 'sleeper species', where a change in the environment can allow such species to increase in numbers and then be considered pests. For example, European hares (*Lepus europaeus*) are restricted to southeastern

Australian and occur there in low densities, but if conditions changed they could easily spread over a much larger area of the continent and become far more abundant than they currently are.

**Management of Invasive Species**

The estimated cost of different responses to the environmental issues associated with invasive vertebrate species has been presented as the actual costs expended by the Department of Agriculture and the Department of Conservation and Land Management.

It is important to note that while there have been many eradications of introduced mammals from islands, no eradication campaign against any widely established exotic vertebrate species has ever been successful on any continent, despite numerous large-scale attempts and the huge potential benefits of success (Bomford *et al.*, *in press*).

*Table 5: Established cost of difference responses to the environmental issues associated with invasive vertebrate species (Departments of Agriculture and Conservation and Land Management).*

| **Management Technique** | **Cost (2002/2003 $ values)** | **Details** |
|---|---|---|
| Threat identification and risk assessment | 115,000 | Weeds, bio-control agents, birds, mammals, reptiles and amphibians. |
| Prevention of entry | 450,000 | Starling prevention of entry and eradication. |
| | 499,000 | State barrier fence to exclude emus moving from pastoral to agricultural areas and damaging crops. |
| | 62,000 | Inspections at the State borders to prevent the entry of prohibited exotic vertebrates into the State. |
| Surveillance and early detection | 40,000 | Communications activities, targeted inspections of potential infestation areas, dealing with reports of invasive species and the ability to adequately respond to those reports. *Ad hoc* inspections also occur in the course of other activities. |
| Emergency response | 118,000 | Emergency response capability for dealing with incursions of weeds, vertebrates, invertebrates, and animal and plant diseases. |
| Containment | 40,000 | Containment of invasive vertebrates to small area to limit the damage the species can do. |
| | 90,000 | Containment of potential invasive species (exotic animals kept for production, research, display or leisure purposes) includes inspections of enclosures for the keeping of exotic animals, issue of permits, non-compliance issues, communications, and management. |
| Eradication | 450,000 | Starling prevention of entry and eradication. |
| | ~ 90,000 | Tree sparrow infestation. |
| | 200,000 | Black rat eradication on the Montebello Islands. |

| | | |
|---|---|---|
| | ~55,000 | Feral cat eradication on Faure, Rottnest, Hermite and Cocos Keeling Islands. |
| Management/ damage mitigation | 74,000 | Information provision/communications. |
| | 4,330,000 | Field mitigation activities (chiefly wild dogs, donkeys, rabbits, foxes) (including regulation of 1080 poison use, and manufacture of poison baits). |
| | 262,000 | Maintaining the operational standards of staff involved in field activities. |
| | 260,000 | Liaise with international, national and state bodies on animal pest policy; Contribute to national policy through Primary Industries Standing Committee and Natural Resource Management Standing Committee; Provide leadership to the national Vertebrate Pest Committee (VPC) and Pest Animal Control Co-operative Research Centre; Oversee regulatory standards implementation across Agency. |
| | 1,400,000 | The costs incurred by industry are very difficult to quantify. However, $1 400 000 of the money spent by the Department of Agriculture on damage mitigation is provided by pastoralists through a statutory rating system. |
| | 2,250,000 | Fox control on 3.5 million ha conservation estate primarily in the southwest of Western Australia. |
| | 15,000 | Strategic control of goats in high conservation areas within National Parks. |
| Research and development | 525,000 | Research to improve animal pest management. Provide and disseminate best practice information and advice on animal pest management strategies and techniques. |
| | 385,000 | Development of feral cat bait and control techniques. |
| **Total** | ~ 11,711,000 | |

Eradication of recently established species, found in low numbers has been achieved in Western Australia. Costs can escalate with increases in the number of animals present and their location.

*Table 6: Costs of eradication of some of recently introduced species in Western Australia (Department of Agriculture).*

| Common Name | Cost of actual eradication ($) | Number of animals present | Circumstances of infestation | Time to achieve eradication |
|---|---|---|---|---|
| House sparrow | ~ 30,000 (1994) | ~ 70 birds | Semi-rural area | 1 year |
| Tree sparrow | ~ 80,000 (2002) | ~ 60 birds | Residential area | 4 months |
| Tree sparrow | ~ 200 (2003) | 1 bird | Supermarket | 3 hours |
| Tree sparrow | ~ 2000 (2003) | 5 birds | Shipping berth | 8 weeks |

**Inaction**

The cost of inaction is very difficult to estimate. For the European starling in Western Australia, estimates of the likely negative impacts have been used as indicators of the benefits of current surveillance and eradication activities. McElwee (2000) estimated the present value of the expected impact of starlings on horticulture in Western Australia to be about $6 million dollars over a 30-year period, in the absence of protection activities to prevent establishment and spread. Though the expected impacts on animal industries, the urban environment and the natural environment were not quantified, it appeared that these impacts were likely to be significant, and in total would probably greatly exceed the impact on horticulture. McElwee concluded that the benefits of the starling control program in Western Australia exceeded the costs of control, possibly by a large margin. 'The benefits to horticulture alone appeared to exceed the costs of control. If impacts on animal industries and the urban and natural environment were also taken into account, it is probable that the control program produces considerable net benefits for agriculture and the community.'

By way of comparison, within 100 years European starlings spread across continental USA from an initial population of just 170 birds released at three localities (Long 1981). Together, the European starling and the house sparrow cause economic losses of US $1 billion per year to crops in the United States alone (Pimentel *et al.* 2002).

Inaction with regard to fox control in Western Australia would most likely have lead to the extinction of two or possibly three species of mammals in the last decade (11 species are already listed as extinct in Western Australia). It is impossible to place a dollar value on such environmental losses, but, as an example, it would not have been acceptable to allow the State faunal emblem (the Numbat) to become extinct because it was decided not to control foxes when they were a known threat and the capacity existed to do something.

**Disease**

*Phythophthora cinnamomi.*
CALM has developed and applied plant quarantine procedures in lands that it manages and that are affected by this fungus for more than 30 years. While these measures have not had any impact on the presence or absence of the disease they have had a major impact on slowing the rate and extent of spread.

*Boid Inclusion Body Disease.*
CALM has imposed an embargo on the importation and keeping of any python species (native or exotic) from anywhere else in Australia in an effort to keep this disease out of Western Australia. Until such time as a viable diagnostic technique is available this embargo will remain in place.

## *SENATE TERM OF REFERENCE – 1 (C)*

## *The adequacy and effectiveness of the current Commonwealth, state and territory statutory and administrative arrangements for the regulation and control of invasive species*

*Independence and Adequacy*

The Western Australian Departments of Agriculture and Conservation and Land Management have significant concerns about the independence, validity and adequacy of the process currently in place for dealing with applications to amend the list of species suitable for live import [see Part 13A of the *Environment Protection and Biodiversity Conservation Amendment (Wildlife Protection) Act 2001*].

It appears to be the approach of DEH that the person who applies to amend the list of specimens approved for live import should also be the person responsible for preparing terms of reference and assessment reports, and for covering the costs of the assessment. The Act itself does not seem to specify this.

If the proponent is responsible for 'preparing draft terms of reference for a report into the potential impacts on the environment of the species being proposed for import', they are likely to have a conflict of interest. They will want to get the import approved and so will have a motive to bias their proposal towards a position that will favour this outcome. This directly conflicts with the need for a balanced and rigorous assessment process.

If the proponent is responsible for 'preparation of a draft report based on the terms of reference', either by conducting the assessment, or by nominating and employing an assessor, they or their employee may also have a conflict of interest. An assessor nominated or employed by the proponent may want to be employed again by the proponent and so may have a motive to bias their assessment towards a position that may favour import being approved. Given the level of detail required in a full risk assessment, it would be more difficult for a third party (e.g. an DEH administrator or State agency reviewer) to pick up any such bias unless they undertook a full independent assessment to check if any relevant references/information had been

excluded or not given balanced coverage. There is also an increased onus on DEH or State agency reviewers to be highly experienced in risk assessments in order to not only judge the risk assessment report but to also identify any inaccuracies or omissions (intentional or accidental). It is questionable whether there can be any in-built transparency in any review processes to mitigate this risk. Neither transparency nor review will show up missing information unless an independent person undertakes an equivalent full risk assessment to determine what information is available and should have been included.

It would be far more efficient, transparent and unbiased if a suitably qualified and independent person was appointed to conduct the assessment. The applicant could still pay for this to occur, perhaps by forwarding payment through DEH. The relationship between such an assessment and the more comprehensive approach required by Biosecurity Australia and the Vertebrate Pests Committee, covering potential economic, environmental and public safety impacts of an exotic species also need to be considered.

*Consultation with States and Territories*

As there is a strong link between the import of species to Australia and their movement and keeping in the country, it is important that States and Territories have an adequate opportunity to comment on assessments. The current *Environment Protection and Biodiversity Conservation Amendment (Wildlife Protection) Act 2001* appears to allow for two possible opportunities where consultation of this type could occur:

- S.303EF An assessment must provide for (b) the publication of the draft terms of reference for public comment for a period of at least 10 business days and (e) the publication of the draft report for public comment for period of at least 20 business days that is specified by the Minister, and

- S.303EC (3) Before amending the list the Minister (b) must consult such other Minister or Ministers of each State and Territory as the Minister considers appropriate, and (c) may consult such other persons and organizations as the Minister considers appropriate.

It is not clear which State and Territory Ministers or which other persons or organizations the Minister may consider it appropriate to consult with, or how these consultations will be managed.

Under the proposed invasive species amendment bill, the State and Territory agencies that have responsibility for managing exotic species within their jurisdictions, will not be represented on the Minister's Invasive Species Advisory Committee, or at least not in a capacity as State or Territory regulatory agencies. At best only individuals who may work for such agencies might be co-opted onto the Invasive Species Advisory Committee.

It would appear efficient to develop a system where consultation occurred with those bodies that will be expected to manage the risks posed by the import of new species to Australia, and which currently possess the bulk of the available expertise and operational capacity in this area.

*Risk Assessment Model*

In consultation with the Vertebrate Pests Committee (VPC), Dr Mary Bomford from the Bureau of Rural Sciences has produced an updated risk assessment model and an associated report (Bomford, *in press*). These two documents provide information and guidance to assist the Commonwealth, State and Territory Governments to assess the risks of exotic vertebrates kept in, or proposed for import into, Australia. The updated model and report replaces the ones published by the Standing Committee on Agriculture (1991) for this purpose.

The report examines the factors that can be used to distinguish between species that pose a high risk of becoming a new pest and those that pose a lower risk. This information is used to construct the scientifically based risk assessment model.

The States and Territories, through the VPC, have accepted the model for use in determining the risk posed by exotic vertebrates and have recommended to Biosecurity Australia (BA) and DEH that it be used to assess the risks posed by vertebrates proposed for entry into Australia. BA, in Agriculture, Fisheries and Forestry Australia (AFFA), has independently assessed the model and accepted it. It is understood that DEH is in the process of conducting an independent assessment and that in addition to assessing the model for its intended use for terrestrial vertebrates, DEH is also assessing the report to see if it can be adapted for assessing risks posed by other animal groups. In the meantime, it is unclear how assessments of applications made by the applicant are being assessed. It would appear very efficient to use one agreed system to assess the risks posed by exotic vertebrates both entering the country and being managed within the country.

## *SENATE TERM OF REFERENCE – 1 (D)*

## *The effectiveness of Commonwealth-funded measures to control invasive species*

*Activities of the Vertebrate Pests Committee (VPC)*

The VPC reports to the Land, Water and Biodiversity Committee (LWBC) and through it to the Natural Resource Management Standing Committee (NRMSC), and when requested, provides information to the Primary Industry Standing Committee (PISC). Appendix 2 shows VPC's current terms of reference.

A review of the activities, role and future direction of the VPC is currently underway.

*Guidelines for the Import, Movement and Keeping of Exotic Vertebrate Animals in Australia*

National Guidelines for the movement and keeping of exotic vertebrates across Australia have been in place since 1983. These guidelines recognize that there are differences in legislation and policy across the States and Territories, but provide guidance for standardization where possible.

All of the VPC members, including Western Australia, recognized that these guidelines needed significant revision to ensure they were consistent with current best practice in risk management and as a consequence has revised its *Guidelines for the Import, Movement and Keeping of Exotic Vertebrate Animals in Australia*. The approach outlined in the revised guidelines is based on a risk analysis process, consisting of risk assessment for any species of exotic vertebrate, management of that risk by appropriate measures (e.g. restriction or prohibition of entry, restrictions on keeping) and communication of the risks posed by exotic vertebrates. The principles used in developing this approach are contained in the guidelines.

Western Australia believes that adoption of this preventive, risk management approach to exotic vertebrates will be far more cost-effective than allowing species to enter the country and establish wild populations and then attempting to manage the impacts. Without effective management, the risks posed by a range of exotic vertebrates are likely to be realized in the medium to long-term with consequences that are in the major to catastrophic range.

Exotic vertebrates already in Australia should be managed according to the results of the risk assessment model developed by Dr Mary Bomford (Bomford, in press). Therefore, the new Guidelines provide an approach to the needs of the States and Territories, which have statutory responsibility for managing vertebrate species once they are in the country and have cleared the quarantine barrier.

These Guidelines have been approved by VPC and submitted for approval by the Land, Water and Biodiversity Committee (LWBC), which is a subcommittee of the Natural Resource Management Standing Committee. The LWBC is seeking clarification on some aspects of the resource needs for the guidelines, before approving them.

*Direct Regulation by the Commonwealth*

Between 1996 and 2001, Environment Australia administered the National Exotic Bird Registration Scheme (NEBRS). This scheme was intended to provide a national approach for registering classified exotic birds throughout Australia. The scheme was implemented to assist the Commonwealth Government in meeting its international obligations under:

- the Convention on Biological Diversity – by preventing the introduction of exotic species that threaten the Australian environment; and

- the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) – by improving controls on trade.

Because of the apparent duplication in bird keepers having to register with both the Commonwealth and State agencies, some States ceased to regulate the keeping of exotic birds.

During the life of this scheme the Commonwealth carried out few aviary inspections and obtained only a hand full of prosecutions. This low inspection rate and prosecution rate was not an accurate reflection of the level of compliance by bird keepers, but a reflection of DEH's capacity to enforce the legislation. The Commonwealth was unable to reach agreement with the States to use State wildlife enforcement staff to ensure compliance with the NBRS, principally because it was unwilling to fund the training of State officers in order to meet the standards set by the Commonwealth themselves. Rather they chose to rely on the services of staff within the Australian Federal Police and Customs. While these agencies already had the necessary skills to conduct inspections under Commonwealth laws, they lacked the skills to be actively involved in matters involving exotic wildlife. In 2001, without any prior consultation with the States, the NEBRS was abandoned when the *Wildlife Protection (Regulation of Imports and Exports) Act 1982* was repealed and replaced with the *Environment Protection and Biodiversity Conservation Amendment (Wildlife Protection) Act 2001*.

The experience of NEBRS indicates that without a large increase in resources, and much better co-ordination and co-operation between the Commonwealth and the States, it seems unlikely that national regulation of the keeping of exotic animals could work.

*National Strategies for the Management of Feral Vertebrates*

Commonwealth legislation relating to exotic species has a number of limitations under current arrangements. Primarily Commonwealth legislation deals with regulating the movement of animals into or out of the country, across the quarantine and customs barrier. Quarantine legislation has a limited capacity to influence the movement and keeping of species after they have passed through the quarantine barrier, and the bulk of the regulation of such species is carried out by State and Territory agencies. The State and Territory agencies have varying amounts of legislation to support their capacity to manage invasive species that might enter each State or Territory or to manage feral populations of species already in the country.

While there is a reasonable level of cooperation between adjacent States and Territories on some issues, there is no national approach to dealing with most species. This is partly a function of differing priorities (e.g. a pest in one State is of little concern in another, or beyond control already). The problem is also complicated by the nature of the agencies in each State currently responsible for invasive species management – primary industry departments have carriage of this in some States, while in others it is the conservation agencies. The level of networking and quality of those networks is affected by these circumstances. Coordinated, national approaches to managing invasive species would be a worthy goal.

The VPC's guidelines will enable continued co-operation between the States and Territories on captive exotic animals with the potential to become pests. The National Threat Abatement Plans go some way towards this for vertebrate pests widespread in the wild, but still require all of the on-ground work to mitigate the threat to be carried out by the States and Territories. In recent years the States and Territories have received almost no funds to carry out research into effective and humane control techniques and no funds whatsoever for on-ground control activities.

*Marine*

The Centre for Research on Introduced Marine Pests (CRIMP) is the nation's key introduced marine organism research group. It is recommended that CRIMP continue to be supported with resources for introduced marine organism surveys and risk assessment in Western Australia be given a high priority.

It is also recommended that the work of the National Introduced Marine Pests Taskforce, reporting to Marine and Coastal Committee of the NRM Ministerial Council, continue to be supported in its work on marine pests.

**Disease**

Currently the list of exotic diseases that are not present in Australia and for which effort is expended in keeping them out of the country is biased almost entirely towards diseases of domestic livestock and commercial plant species (forest species and crops). AQIS and Biosecurity Australia now have a charter that requires them to consider the risk of disease to both agriculture and the environment, but there appears to be little effort to identify and list diseases that pose a threat to the environment.

## *SENATE TERM OF REFERENCE – 1 (E)*

## *Whether the Environment Protection and Biodiversity Conservation Amendment (Invasive Species) Bill 2002 could assist in improving the current statutory and administrative arrangements for the regulation, control and management of invasive species*

There are a number of areas where current Commonwealth legislation and administrative arrangements could be improved in an effort to control invasive species. Some of these areas are documented below with examples and recommendations as to how current arrangements can be improved.

The *Environment Protection and Biodiversity Conservation Amendment (Invasive Species) Bill 2002* has some merit but falls well short of the level of improvement required.

Some sections of the proposed bill are unrealistic, unworkable and/or would create a backlash from some sectors:-

- Scientific research institutions (including Genetic Resource Centres (GRC)), zoos, botanic gardens and agency field trials are described as "controlled environments" (p. 4, lines 9 to 17). Experience shows that this is far from the real situation when zoos and botanic gardens have introduced plants like rubbervine, mimosa and *Acacia karroo*. GRCs have introduced plants like jointed goatgrass (*Aegilops cylindrica*). Government and industry research groups have been the most consistent introducers of weedy pasture species.

- The proposal is to prohibit all pasture grasses, ornamental plants and aquarium fish (page 5, lines 4 to 8). This probably contravenes international trade agreements, because every species would probably have to undergo risk assessment.
    - In the case of pasture grasses this would also create a backlash from farmers and pastoralists.
    - In the case of ornamental plants whilst some would welcome this it would create a backlash from the nursery industry and plant collectors. It would be better to retain the weed risk assessment system that is currently in place.
    - To prohibit the importation of aquarium fish would create a backlash from the pet industry, and could lead to black-market trade.

The following comments are on the various sections of the current Commonwealth legislation;

*266AA Listing of invasive species*

- Part (b) appears to need some sort of catch-all statement to ensure that only those species that had been assessed for the risk they posed and that had been found to have low or no risk were imported. It would be impossible to list all species in the world, though presumably such species would be prohibited until they had been assessed and found to be low risk.

- Within the country, it would appear that a particular species could vary greatly in its status under part (c). e.g. starlings are considered eradicable in Western Australia, but not in other parts of the country.

*266AB*

- (1)(a) The definition of invasive species does not appear to include animals that are dangerous to humans, of significant nuisance value or which damage structures like buildings. The definition appears too limited in its scope in looking only at the environmental and primary production impacts of invasive species.

- (4) The keeping of invasive species in facilities such as zoos and private wildlife parks and research and educational facilities will not necessarily prevent the release of potentially invasive species into the wild. Such facilities

vary greatly in professionalism around the country. Some field trials do also end in the release of organisms into the wild.

*266AC*

- (1)(b) Many species already in Australia would not be considered low risk using modern assessment processes. This would prohibit further imports of such species. Many species considered beneficial to agriculture are also not low risk species.

- (4)(a)(b) There should be threat abatement plans for species considered to be eradicable or substantially containable. In fact such plans could have more far reaching effects than those for species already widespread in the wild, particularly if species could be eradicated.

- (4)(d)(B) There are some hundreds of exotic vertebrate species present in zoos and wildlife parks in Australia, and so there would need to be many threat abatement plans, unless plans could be drawn up for genera or families of animals.

- (4)(f)(i) Many species of domesticated animal established in Australia are very severe pests. e.g. goats.

- (4)(f)(ii)(A) Using recognized risk assessment methods, very few species pose no risk.

- (4)(f)(ii)(B) It is difficult to see how a species which has already demonstrated its ability to pose a risk in some parts of Australia, could be predicted to not pose a risk in other parts of Australia, and additionally to presumably warrant no management to prevent it moving into new areas.

*266AD*

- The Minister appears able to amend lists without public comment, apart from the Invasive Species Advisory Committee.

*266AE*

- While persons applying for permits to import or possess invasive species must submit a detailed application and an assessment of the threat posed by the species, amendments to the invasive species list only require the Minister to seek advice from the Invasive Species Advisory Committee. No other details of the process of assessing the risk are given.

*266AF*

- The Minister appears able to amend lists without public comment, apart from the Invasive Species Advisory Committee.

*266AG*

- (a) It is quite likely that many of the species granted import permits under previous legislation, would not be considered suitable for import in the current environment.

- (b) If this category covered in 266AA(a) was to include all non-indigenous species that could be imported, it would include a large number of species that would need to be subjected to in-depth risk assessment. It is unclear who would pay for the assessment of species that may never be requested for importation to the country. It would be better for such assessments to be carried out as required.

- From a management viewpoint, it would appear important to maintain the whole list in an up-to-date condition, not just the species covered in part 266AA(a).

*266AH*

- The list should be available electronically via the Internet.

*266BA*

- (2) There will be very many species not listed as prohibited imports, that are not present in Australia, probably because there hasn't been the resources to list them as prohibited imports. Such species may well present a risk to Australia. A person should also be guilty of an offence if they possess such a species. This could be resolved by the use of a catchall.

- (3) Such a conviction should be accompanied by a very large penalty.

*266BD*

- The inherent problems with the system in place for international movement of wildlife specimens (see Part 13A of the Act), where the applicant undertakes an assessment of the likelihood of the species becoming a pest (see section documenting the problems with this above), has not been addressed in this Bill.

- (4) In the interests of consistency of assessment of risk, it would seem essential that the Minister also consult the Invasive Species Advisory Group.

- (6) Public comment period needs to be between 60 and 90 days.

*266BE*

- (3)(a) It may be difficult to allow the import of a species needed for food production if the species has already been made a prohibited import.

- (3)(b) Surely such a species should also present a low risk to other agricultural commodities apart from food production and native fauna and flora *per se*.

*266CD*

- (2) The requirement for a threat abatement plan for eradicable or containable species should be mentioned in 266AC.

- (4) The Minister MUST make a threat abatement plan in conjunction with the States and Territories, otherwise co-operation and co-ordination of operational activities is unlikely.

*266DA*

- (2) There are a very large number of persons engaged in the sale, trade, breeding, propagation or duplication of non-indigenous species for commercial purposes including nurseries, supermarkets and pet dealerships. While such a plan could apply to vertebrates, it is doubtful it could successfully apply to other life forms.

*503A*

- The States and Territories have constitutional responsibility for the movement and keeping of exotic species within their borders. As such, it is not acceptable that the body responsible for advising the Minister on which species should be allowed to enter the country does not include representation from the States and Territories.

- As Biosecurity Australia currently assesses the risks posed to agriculture by organisms entering the country, the Committee should also include a representative from this organization.

**RECOMMENDATION**
That a review of existing Commonwealth legislation be undertaken to address the specific items raised in this section of the submission. The review should consider whether or not, rather than legislative change, management arrangements could be put in place covering the items raised.

# MANAGEMENT OF INVASIVE SPECIES

## THREAT IDENTIFICATION AND RISK ASSESSMENT

### Issue

The Northern Australia Quarantine Strategy (NAQS) has identified high-risk threats (weeds, plant pathogens, invertebrate pests and animal diseases) present in our near northern neighbours. There are also issues with respect to the lack of commitment to managing the various means of potential introduction of invasive species. These

include transport via the importation of stock feed, contaminated sea containers and the influx of large numbers of people from overseas on a daily basis.

**Example**

The Ceylon hill cherry, or downy rose myrtle (*Rhodomyrtus tomentosa*) has been named on the NAQS target list and as such it is prohibited by AQIS. However in 1998, it was discovered in a shipment of nursery stock being shipped from the Eastern States into Western Australia. *The Aussie Plant Finder* (Hibbert 2002) lists three nurseries that sell it, and it is also listed on several Australian based websites.

**RECOMMENDATION**
Commonwealth legislation to be amended to prevent sales of identified threats such as Northern Australian Quarantine Strategy (NAQS) potential invasive species.

**PREVENTION OF ENTRY**

**Issue**

Imported personal effects such as furniture are known to be the biggest vectors of wood dwelling insects from countries with infestations. Inspection against them is largely ineffective. Presently, fumigation certificates are accepted both within Australia and from overseas countries. There is abundant proof that overseas fumigation certificates can be inaccurate with live insects frequently found post-entry. Requiring logs that indicate levels of fumigant and temperature with time should reduce the number of ineffective fumigations. Preferably, these logs should be graphical print-outs of continuous monitored fumigant levels and temperatures.

**RECOMMENDATION**
There is a need for national action on a standard requirement for the logging of fumigations undertaken both within Australia and overseas.

**Issue**

In many cases serious weeds have been discovered well after introduction into Australia, and sometimes by luck or chance. Clearly there is a need to assess invasive species that are in Australia and take action against those that are likely to become serious problems in the future.

**Examples**

- All *Hieracium* spp. are prohibited by AQIS, however in 1999 an officer from the Department of Agriculture *H. aurantiacum* from a Perth nursery. Subsequently, *H. aurantiacum* was discovered in nurseries in several States. (*Hieracium* spp. Is also listed on the Environment Australia 'alert list').
- *Nassella tenuissima* was found in the nursery trade in Victoria, Tasmania and NSW, and in the Adelaide Botanic Garden despite all *Nassella* spp. being prohibited by AQIS. This is because it was imported under the synonym of *Stipa tenuissima* when all *Stipa* spp. were permitted.

- During investigations into *N. tenuissima*, one Victorian nursery was found to be cultivating *Galactites tomentosa*, a thistle-like plant native to the Mediterranean and not previously known to be in Australia.
- Cotton thistle (*Onopordum nervosum*) was not known to be in Australia until featured on television on a popular national lifestyle program. Officers from NSW Agriculture and the Weeds CRC purchased plants to prevent them being sold to the public.

**RECOMMENDATION**

- There needs to be a national audit of all invasive species.
- Expand the charter of Biosecurity Australia to ensure screening is undertaken for species, including diseases, other than those impacting upon primary production.
- The national listing process needs to be all encompassing and take on board the views of State agencies.
- There needs to be better interaction between Biosecurity Australia and DEH with an enhanced capacity within DEH to handle invasive species issues and the associated requirements of the EPBC Act.

**Issue**

There are significant problems involving the movement of invasive species between States and Territories within Australia. In the past Western Australian Quarantine Inspection Service has scanned interstate mail for quarantine risk material (QRM) with great success. For example, in 1999/2000 WAQIS inspected 39,410 packages with quarantine risk material (QRM) and made 182 seizures (honey, seeds, fruit, vegetables, plant cuttings, cannabis etc). 31,743 parcels were also scanned with 2,664 parcels found to contain QRM.

However, there is an inconsistency between Western Australia's *Plant Diseases Act 1914* (PDA) and the Commonwealth *Australian Postal Corporations Act 1989* (APCA). The PDA states that WAQIS can inspect any vessel or package imported into the State and that we can enter any premises to do so, while APCA states that no-one can open and inspect mail other than customs, federal police and AQIS. Because APCA is a Commonwealth act it overrides the PDA and Australia Post is now refusing to allow inspection of parcel and express post. This matter has been taken up between the Western Australian State government and the Commonwealth government but currently remains unresolved.

**Example**

A Perth nursery proprietor was found to be cultivating rubbervine (*Cryptostegia grandiflora*), a WONS that is also a declared plant in Western Australia and prohibited from entry to Western Australia under the *Agriculture and Related Resources Protection Act 1976*. The seeds had been obtained from a New South Wales supplier who had sent them, illegally, through the mail. While the Department of Agriculture was able to confiscate the plants from the nursery, it was powerless to act against the New South Wales supplier

**RECOMMENDATION**
Amend the *Australian Postal Corporations Act 1989* to allow scanning of interstate mail by appropriate State authorities.

**Issue**
There is currently no scheme in place to enforce nurseries to use correct scientific names on plants and/or any other quality assurance, for example, to ensure that plants are free of pests and pathogens.

**Examples**

- The Department of Agriculture has received complaints about incorrect labelling of nursery stock, in particular where exotic species are identified as 'native'.
- In 2002 Western Australia had an incursion of olive lace bug (*Froggattia olivinia*) on nursery stock imported from the Eastern States. Olive lace bug became the subject of a targeted surveillance and eradication campaign.
- The fungal disease black root rot (*Chalara elegans*) has been identified in a Perth nursery. It is likely to have been introduced in nursery stock imported from the Eastern States. This disease is known to infect a wide range of host plants from over 30 families.

**Issue**

The global trade in QRM is made easy through the Internet. While there are comprehensive measures in place to intercept QRM at the international entry points the level of Internet trade is continuing to increase. The ease of access to supplies of QRM through Internet catalogues increases the risk of both inadvertent importation and illegal importation of serious invasive species. Countries are powerless to take action against an Internet provider from another country.

**RECOMMENDATION**
Commonwealth should foster and formalize international cooperation aimed at kerbing the trade in organisms via the Internet.

## SURVEILLANCE AND EARLY DETECTION

**Issue**

There are no clear guidelines on cost bearing/sharing in the event of post border quarantine issues. At present fumigation on discovering exotic species, such as drywood termites, is compulsory, and AQIS advises for all costs to be carried by the owners of the infested material. The general public and businesses, including the agricultural sector, are in some instances reluctant to report suspect finds. A further problem is that the Commonwealth funding for incursions would also be phased out, leaving individual States to fund incursion management.

**Example**

Disincentives in the form of fees and charges for the identification of unusual pests have an undesirable impact on the early detection of invasive species.

Governments have moved towards cost-recovery as a means of retaining services. One such method has been 'fee-for-service' where the user of the service pays. Various State governments around the country have applied fees for the identification of pests and diseases submitted by the public. The immediate effect of this approach is that the number of specimens submitted is drastically reduced. In Nairn's review of quarantine, the continuity of the 'barrier' was stressed (Nairn 1996).

This continuity involved 3 'tiers' (a) Pre-border (essentially those operations which can be undertaken overseas to prevent pests from reaching Australia), (b) Border inspection (involving quarantine officers at the point of landfall) and (c) Post-border. Members of the public, and professional pest control officers (PCO's) in particular, are a major resource in the detection and reporting of invasive organisms that have penetrated the barrier. The practice of charging a fee for identification of pests/diseases is a severe disincentive to the engagement of the public and PCO's in this extremely important, and last, line of defence.

Recently entomologists from AQIS and the Department of Agriculture held several training courses for PCO's to improve the engagement of this group in post-border quarantine. At these courses, on several occasions, PCO's said that they used to submit specimens to the Department but have not done so for some time because they 'heard' that a fee was being charged for identification of specimens. This no doubt is the result of an attempt to charge for these services several years ago and demonstrates the very negative impact of such an approach.

The red imported fire ant (*Solenopsis invicta*) incursion in Queensland should act as an object lesson. It is estimated that the fire ant was present in Brisbane for at least 10 years before its detection in 2001. This was at a time when the Queensland government moved towards a policy of charging for insect identifications. The red imported fire ant is considered the world's worst pest ant and an Australian Bureau of Agricultural and Resource Economics study estimates a conservative cost of $6 billion to the Australian economy in the first 30 years if this pest becomes established. Australia's biggest eradication program costing $145 million has been implemented to counter this threat.

Current AQIS policy seeks to recover the costs of fumigation and treatment from the owners of the affected items where exotic pests have breached the quarantine barrier. Therefore, responsible individuals who take the correct and community-conscious approach and report suspect breaches are, under AQIS policy, saddled with the cost of the resultant treatment deemed necessary by AQIS. Needless to say, this acts as a serious disincentive for the public and PCO's to report suspect cases.

In the past 7 years, PCO's have reported at least 8 serious breaches to the Department of Agriculture. These have included 3 instances of the extremely destructive West Indian drywood termite (*Cryptotermes brevis*), one incident of the American Western drywood termite (*Incisitermes minor*), one incident of the serious Formosan termite

(*Coptotermes formosanus*) in a motor launch, another of the related termite *Coptotermes travians* c.f. in a motor launch, one of another drywood termite from South Africa and one of the Tropical fire ant (*Solenopsis geminata*). In both the incidents involving imported motor launches, the owners were forced to incur the substantial costs involved. This impacts on the relationship between the PCO's and their clients – clients are hardly likely to appreciate their PCO reporting the incidents if they are then forced to pay substantial costs. Hence they may not re-employ that particular PCO therefore providing a disincentive for the PCO to report incidents in future. It is therefore imperative that AQIS cover all the costs of treatment for incidents voluntarily reported by the public or PCO's.

There is very little time and or opportunity to inspect the huge volume of goods that are imported into Australia. While Quarantine Inspectors do a good job with limited resources, it is obvious that inspection can only provide limited risk reduction. However, every container is unpacked by storemen when the containers get to their destinations. This unpacking process provides a much greater opportunity of detecting exotic pests. Therefore, a program to engage storemen in the reporting of possible exotics would dramatically improve the quality of quarantine. However, the finding of a pest would require the container to be re-loaded and sent for fumigation creating cost and time disincentives for the businesses involved. A system needs to be developed where these disincentives are removed or reduced and co-operating companies given some incentive to participate e.g. priority clearing of their containers.

**RECOMMENDATION**
Need a national approach to remove disincentives in reporting suspect finds or requesting identifications.

## CONTAINMENT/ERADICATION/MANAGEMENT

### Issue

The Department of Agriculture has difficulty in justifying and funding actions (including eradication programmes) related to non-agricultural pests. Only in cases where some agricultural effects are identified (11% in case of fire ant) and the incursion is seen as a "key threatening process", will funds be allocated towards these actions.

### Example

Virtually all eradication programs aimed at invasive species are conducted under the powers provided by one of the State or Federal agricultural industries acts of parliament. The Primary Industry Standing Committee (PISC) and Natural Resource Managemet Ministerial Council (NRMMC) machineries at national level compliment these. This has proven to be effective in the past but problems could arise if invasive organisms do not have any agricultural impact. While there are some provisions under Federal, State and Territory legislation to combat environmental threats, there may be gaps in the provision of a 'head-of-power' to gain access to private property for the purposes of inspection and treatment where required. This is further compounded if an invasive species is neither considered an agricultural pest nor environmental threat.

Such pests as West Indian drywood termites (*Cryptotermes brevis*), other timber pests and urban nuisances such as Portuguese black millipedes (*Ommatoiulus moreletii*) and pests which attack exotic trees used extensively as amenity trees could fall in this category.

Historically, invasive pests and exotic organisms that have breached the quarantine barrier become the responsibility of one government department even though they may have impacts across a variety of areas such as agriculture, environment, tourism, local government and urban areas. Sometimes action is not taken because no government agency will automatically accept responsibility. When one government department is required to take ownership for an incursion, it is usually the required to meet the entire costs of the management of the pest even though the impacts are over several agencies. An example is the red imported fire ant. In Western Australia the entire state contribution to the nationally funded eradication program is handled by the Department of Agriculture. When an increase in funding for the national program was received, Western Australia did not support the increase, due to its effect on the Department of Agriculture's budget, and hence the entire eradication program was jeopardised. What is required is an 'all-of-government' approach to funding so that when action is taken on an exotic pest, the budget is provided through contributions from all affected government departments based on the proportional impact the pest is predicted to have within each sphere of responsibility.

## RESEARCH AND DEVELOPMENT

### Issue

Most Commonwealth funding directed towards the management of the Weeds of National Significance is spent on the prevention of further spread, and control and eradication of infestations in areas where the situation is still considered to be manageable. More work needs to be done on the integrated management of larger infestations.

## GENERAL

### Issue

Organizations such as AQIS are encouraged to strive towards full cost recovery. There is an understandable reluctance to become involved in actions that would drain funds. In recent years AQIS has been diverted from its main purpose of preventing incursions of invasive species. By changing to a cost-recovery organization, one of its main reasons for existence is now producing income from its services. This is now one of the primary reporting directives of AQIS. Until recent times, quarantine was seen as a form of insurance – the cost of operating the quarantine service was seen as being compensated by the savings from not having to cover the costs of control and impact that invasive species incur. There have been actual cases where the pressure to recover costs is so great that quarantine officers have been restricted in the investigation of breaches because this is not an activity from which costs can be recovered. Quarantine should again be viewed as an "insurance policy" and the agencies should be prepared to contribute towards the prevention of future losses.

**Issue**

AQIS reporting procedures highlight successes, for example the number of interceptions. In order to highlight the seriousness of the situation it would be better if AQIS focus is on reporting and investigating barrier breaches. It is suggested that WAQIS/AQIS annual reports should be more comprehensive in this regard. Currently, one of the major key performance indicators (KPI) AQIS reports against is the number of intercepts made per year. This is a meaningless measure because the number of intercepts is dependent on a number of factors including: (a) efficiency of inspectors, (b) number of inspectors, (c) infestation levels of produce coming in and (d) volume of trade. Therefore the KPI is of little use in the improvement of AQIS performance through an analytical approach.

**Issue**

There are some weaknesses and problems with current Federal legislation that should be addressed including the issue of the naming of species likely to be imported.

**Example**

Synonymy with the permitted lists system (e.g. *Stipa/Nasella* as above) and jointed goatgrass (*Aegilops cylindrica*) is another good example.

Jointed goatgrass is a major weed of wheat in the USA. It is prohibited by AQIS but could come into Australia under its synonym *Triticum cylindricum*. This is because AQIS currently permits *Triticum* spp. other than *T. tauschii*. In addition, it is possible for wheat breeders to obtain *A. cylindrica* as it is used in wheat breeding programs. Previous experience has shown that an Australian institution which obtained *A. cylindrica* then supplied it to other institutions without having a robust system to monitor how it was being used, such as whether or not was being planted in the ground.

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# Appendix 1

## INVERTEBRATE INCURSIONS[1] INTO WESTERN AUSTRALIA SINCE 1990.

| | Year Detected | Common name | Species | Status |
|---|---|---|---|---|
| 1. | 1990 | Dock aphid | *Brachycaudus rumexicolens* | Established |
| 2. | 1993 | European earwig | *Forficula auricularia* | Established |
| 3. | 1993 | Warehouse beetle | *Trogoderma variable* | Established |
| 4. | 1993 | Western flower thrips | *Frankliniella occidentalis* | Established |
| 5. | 1993 | Codling moth | *Cydia pomonella* | Eradicated |
| 6. | 1994 | Lesser pea weevil | *Bruchus affinis* | Unknown |
| 7. | 1994 | Redbanded thrips | *Selenothrips rubrocinctus* | Established |
| 8. | 1994 | Carpenter ant | *Camponotus pennsylvanicus* | Not established |
| 9. | 1995 | Book louse | *Lachesilla quercus* | Established |
| 10. | 1995 | Citrus leafminer | *Phyllocnistis citrella* | Established |
| 11. | 1995 | Banana aphid | *Pentalonia nigronervosa* | Established |
| 12. | 1996 | Melon fly | *Bactrocera cucurbitae* | Not established |
| 13. | 1996 | Silverleaf whitefly | *Bemisia tabaci* (B biotype) | Contained |
| 14. | 1996 | White cedar moth | *Leptocneria reducta* | Established |
| 15. | 1997[2] | Mite (also predatory) | *Balaustium medicagoense* | Established |
| 16. | 1997 | West Indian drywood termite | *Cryptotermes brevis* | Not established |
| 17. | 1997 | Frosted scale | *Eulecanium pruinosum* | Established |
| 18. | 1997 | Cucumber fly | *Bactrocera cucumis* | Detected |
| 19. | 1997 | Tea red spider mite | *Oligonychus coffeae* | Established |
| 20. | 1997 | Redshouldered leaf beetle | *Monolepta australis* | Established |
| 21. | 1998 | Codling moth | *Cydia pomonella* | Eradicated |
| 22. | 1998 | Lesser Carpenter ant | *Camponotus modoc* | Not established |
| 23. | 1998 | Brown sowthistle aphid | *Uroleucon sonchi* | Established |
| 24. | 1998 | Aphid | *Eucarazzia elegans* | Established |
| 25. | 1998 | Circular black scale | *Chrysomphalus aonidum* | Established |
| 26. | 1998 | Oriental red mite | *Eutetranychus orientalis* | Established |
| 27. | 1998 | Purple scale | *Lepidosaphes beckii* | Established |
| 28. | 1999 | Cabbage whitefly | *Aleurodes proletella* | Established |
| 29. | 2000 | Formosan termite | *Coptotermes formosanus* | Not established |
| 30. | 2001 | Crazy ant | *Anoplolepis gracilipes* | Not established |
| 31. | 2001 | Ash whitefly | *Siphoninus phillyreae* | Established |
| 32. | 2001 | Melon thrips | *Thrips palmi* | Subject to eradication |
| 33. | 2002 | Olive lace bug | *Froggattia oilivinia* | Subject to eradication |
| 34. | 2002 | Olive bud mite | *Oxycenus maxwelli* | Established |
| 35. | 2002 | Carpenter ants | *Camponotus pennsylvanicus* | Intercepted |
| 36. | 2002 | Formosan termite | *Odontotermes formosanus* | Intercepted |
| 37. | 2002 | Tropical fire ant | *Solanopsis geminata* | Intercepted |
| 38. | 2002 | Western drywood termite | *Icicitermes minor* | Eradication 2002 |
| 39. | 2002 | West Indian drywood termite | *Cryptotermes brevis* | Eradication 2002 |
| 40. | 2002 | Drywood termite | *Coptotermes travians* | Eradication 2002 |
| 41. | 2002 | Kelly's citrus thrips | *Pezothrips kellyanus* | Established |
| 42. | 2002 | Chilli thrips | *Scirtothrips dorsalis* | Established |

[1] Species include those first recorded but may have been establish for a period of time beforehand.
[2] obtained pest status

| | | | | |
|---|---|---|---|---|
| 43. | Many detection's | Sirex wasp | *Sirex noctilio* | Not established |
| 44. | Most Years[3] | European Wasp | *Vespula germanica* | Eradicated |
| 45. | Most Years | Queensland fruit fly | *Bactrocera tryoni* | Eradicated |

[3] 346 European wasp nest destroyed in WA as at August 2001

# Appendix 2

**Examples of Invasive Invertebrate Costs in the USA.**

Wittenberg & Cock (2001) mention that for the USA the economic costs of European gypsy moths (*Lymantria dispar*) in eastern forests in 1981 were US $764 million, while the Asian strain that has invaded the Pacific Northwest (2001) has already necessitated a US $20 million eradication campaign. Hallman and Schwalbe (2002) mention that (in the early 90's) the US Forest Service had spend about $11 million annually on gypsy moth control.

Not much is mentioned about the financial implications through impacts on, for instance, amenity trees (cost to city councils) or on the environment in general. Pimentel *et al.* (1999) mention the accidentally introduced balsam woolly adelgid (*Adelges piceae*) that inflicts severe damage in balsam-fir natural forest ecosystems. This aphid is destroying the old-growth spruce-fir forest in many regions. Over the last two decades, it has spread throughout the southern Appalachians, where it has destroyed up to 95% of the Fraser firs. The loss of two native bird species and the invasion by three other bird species is considered to be as a result of adelgid-mediated forest death.

The red imported fire ant (*Solenopsis invicta*) kills poultry chicks, lizards, snakes, and ground nesting birds. In the USA a 34% decrease in swallow nesting success as well as a decline in the northern bobwhite quail populations was reported due to these ants. The estimated damage to livestock, wildlife, and public health caused by fire ants in Texas is estimated to be US $300 million per year. An additional US $200 million is invested in control per year. Assuming similar damages in other infested southern states, such as Florida, Georgia, and Louisiana, the fire ant damages total more than US $1 billion per year. Southern states are also affected by another insect, the Formosan termite (*Coptotermes formosanus*), which is reported to cause structural damages totalling approximately US $1 billion per year in Southern United States, especially in the New Orleans region (1999).

In the instance of the Asian longhorn beetle (*Anoplophora glabripennis*) it is accepted that the environmental impact is as devastating as the economic loss. For example, in Chicago, over 700 public and private trees were removed due to the infestation. New York has lost over 2,800 trees from the same pest. This invasive species has cost the US federal, state, and local governments more than US $5 million. These costs are expected to escalate as the beetle population spreads, resulting in the loss of more trees which will need to be replaced.

Mackellar (1997) mentions the Japanese beetle (*Popillia japonica*) which is a serious turfgrass pest as a grub, and a major pest as an adult, feeding on nearly 300 species of plants, including fruits, vegetables, ornamentals, field and forage crops and weeds. The grub is a major turfgrass pest of golf courses, recreational and industrial parks, school grounds and home lawns. It is thought to have been introduced into the USA during 1916 on the roots of nursery stock and is now widely distributed throughout the eastern USA.

# Vertebrate Pests Committee

## *Natural Resource Management Standing Committee*

*Terms of Reference*

**Background:**

**The VPC reports to the Land, Water and Biodiversity Committee (LWBC) and through it to the Natural Resource Management Standing Committee (NRMSC), and when requested, provides information to the Primary Industry Standing Committee (PISC).**

**Terms of Reference:**

1. To provide policy and strategic planning advice to LWBC on recognised national vertebrate pest issues, or as directed by LWBC or NRMSC.
2. To identify nationally significant vertebrate pest issues and recommend appropriate strategies and actions to LWBC and NRMSC by:

- developing principles, strategies and programs relating to vertebrate pests to ensure the conservation, sustainable use and management of Australia's land, water and biological resources, and
- monitoring and evaluating the implementation and outcomes of these principles, strategies and programs.

3. To promote consistent approaches to vertebrate pest issues across all relevant jurisdictions, including:

- prevention;
- reduction of the impact of established populations;
- consistent, co-ordinated and strategic approaches to management of the economic, environmental and social impacts;
- eradication of infestations where feasible and appropriate; and
- standards for management responses.

4. To promote community understanding of and involvement with vertebrate pests and their management.

5. To liaise with other committees and bodies on matters relevant to the activities of the VPC.

The Vertebrate Pests Committee will operate within its Terms of Reference by:

1. Developing a three-year strategic plan.
2. Providing an annual report to LWBC. This report will include an assessment of the Committee's performance during the previous year and details the work plan for the coming year.
3. Meeting at least annually but ensuring that business continues in between annual meetings by means of teleconferences and working groups.

**Membership:**

The Committee's membership includes one member from each Australian jurisdiction, and New Zealand, nominated to represent the interests associated with conservation, sustainable use and management of Australia's land, water, and biological resources. Membership will also include representatives from CSIRO, Bureau of Rural Sciences, Environment Australia and Biosecurity Australia. Such nominees must have sufficient professional/technical expertise, seniority and delegated authority to speak and act on behalf of those they represent. Many issues will require prior consultation and each jurisdiction will need to determine the most appropriate ways of developing a whole-of-government approach to issues.

The Chairperson and Secretariat are rotated between jurisdictions on a three yearly basis. This period of rotation ensures efficient and effective administration of the VPC.

**MARINE SUBMISSION TO THE *AUSTRALIAN SENATE INQUIRY ON INVASIVE SPECIES - WESTERN AUSTRALIA***

The following submission responds to the five terms of reference of the Senate's inquiry. This submission was prepared jointly with the Department of Fisheries. A recent University of Western Australia report prepared by Wyatt (2002) titled; '*A Review of Risks of Introduced Marine Pests to the Shark Bay World Heritage Property and its Values*', under Shark Bay World Heritage Property funding, provides comprehensive background on the issue of marine pests, with international, national and Western Australian reference.

**Senate Term of Reference - 1(A)**

There are approximately 280 known introduced marine species in Australia. Ninety of these are known to occur in Western Australian waters. The Centre for Research into Introduced Marine Pests anticipates that in the order of 10 per cent of these 280 species will become pests and this percentage applies also to Western Australia, rendering the State susceptible to about 10 marine pests.

As Wyatt (2002) points out; "Of the more that 200 introduced marine species in Australia, 12 are classified as pests and included in the 1995 Australian Ballast Water Management Advisory Council (ABWMAC) list of target species: the toxic dinoflagellates *Alaxandrium catanella*, *A.minutum*, *A.tamarense* and *Gymnodinium catenatum*; the North Pacific seastar (*Asterias amurensis*); the European green crab (*Carcinus maenas*); the molluscs *Corbula gibba*, *Crassostrea gigas* and *Musculista senhousia*; the giant fan worm (*Sabella spallanzanii*); Japanese seaweed (*Undaria pinnatifida*; and *Vibrio cholerae*. A further two species (the comb jelly (*Mnemiopsis leidyi*) and the Chinese clam (*Potamocorbula amurenis*)) are listed as ABWMAC target species but have not yet been detected in Australian waters (McEnnulty *et al*; 2001). Four more species (*Mytilopsis* sp., *Caulerpa taxifolia* (aqaurium strain), *Codium fragile* spp. *Tomentosoides* and *Sargassum muticum*) are thought likely to have major impacts in Australia if introduced (McEnnulty *et al.*, 2001)."

Wyatt (2002) goes on to discuss existing and potential key vectors for marine pest incursions to Australian water, as follows; "It is likely that further introductions into Australia of the species mentioned above, or indeed species not yet identified as potential introductions, will continue to occur in conjunction with human activities. Despite its geographical isolation, or perhaps because of it, Australia ranks as the fifth largest user of shipping in the world, with around 12,000 overseas shipping visits and almost 380 million tonnes of freight carried in Australian waters (Zann, 1995). It has been estimated that some 10 billion tonnes of ballast water is transferred around the world as ships' ballast and in Australia alone, in excess of 120 million tonnes/year of ballast water and sediments are discharged into some 40 ports (Rigby, 1995). The 72 major trading ports of Australia receive 10,000 visits per year and 160 million tonnes of ballast water discharge (Kerr, 1994). Commercial vessels discharging ballast in Australia mainly come from Asia, in terms of the number of ballast tanks in the year 2000, 37% came from Japan, 10% from China and Korea and 9% from Taiwan (McLachlan, 2001)."

Barrier control and prevention is the best option for management. Once marine pests become established they are very difficult and costly (often impossible) to completely eradicate. However, appropriate management may be effective in preventing the spread of species that have entered the country from one region to another

As an example of the high cost of controlling marine pests, the cost of damage and control of outbreaks of the zebra mussel (*Dreissana sp.*) in the USA up to the year 2000 is estimated to be US$1.8-3.4 billion (estimate from Ruiz *et al.*, 1997). On a nationwide scale in the USA, Wyatt (2002) reported that the damage caused by and the cost of control of the Zebra mussel, Asiatic clam (*Corbicula manilensis*) and European green crab was estimated to be US$4.4 billion annually (estimated from McEnnulty *et al.*, 2001). The majority of costs have been related to the implementation of measures to defoul structures (eg ships' intakes, nuclear power station cooling systems) and not to the elimination of pests. Such marine pests threaten biodiversity because of their propensity to smother habitats and outcompete with native species for habitat and food.

At present, the major recognised marine pest threats to Western Australia (Colin Chalmers, pers. comm) are believed to be the black striped mussel (*Mytilopsis sp.*), the North Pacific seastar, *Calerpa taxifolia*, the Asian green mussel (*Perna viridis*) and Japanese seaweed. These are discussed in turn. Added to this is the presence of the introduced giant fan worm in embayments including Cockburn Sound, although not yet in nuisance proportions. This species has spread from Cockburn Sound to the ports of Bunbury, Albany and Esperance.

**Black Striped Mussel (*Mytilopsis sp.*)**
This species in known to have entered Australia from Asia on two occasions, one of which was in Western Australian waters (Broome). The main vectors for introduction are yachts and illegal fishing vessels. The mussel fouls engineering structures, drains, cooling systems and ship hulls and intakes. It can reside on structures and hard substrate in layers up to 600mm thick and can attach in nuisance numbers to crustacea (eg lobsters). It is considered to be a major threat to the pearling industry due to its potential to foul pearling structures.

**North Pacific Seastar (*Asterias amurensis*)**
This species was introduced into the Derwent River, Tasmania, in the mid 1980s. It is a voracious predator, threatening many benthic animals. It is recognised as a threat to biodiversity and fish stocks. It was introduced to Port Phillip Bay in the late 1990s. It has the capacity to survive and establish in waters around southern Australia to as far north as the latitude of Perth.

***Calerpa Taxifolia* (Aquarium strain)**
This macro-algal species is an aquarium strain, the natural form of which occurs in northern waters between Brisbane to Darwin. Temperature and herbivorous fish control its distribution naturally. However, during the 1960s an aquarium clone was developed which tolerates temperate waters and which is toxic to fish and hence not controlled by fish predation. It has the potential to spread rapidly and grow in layers on the seabed in thicknesses up to 1 m. It has now spread to North America, New South Wales and South Australia and is recognised as a most serious threat to Western Australia. It is spread through the aquarium trade, the scuba industry and commercial/recreational fishing.

**Asian Green Mussel (*Perna viridis*)**
This mussel poses the same threat as the black striped mussel. It was introduced to Cairns and established in the Cairns Harbour in 2001 from the hull of a refugee vessel. There are current attempts to eradicate this species. There is a high risk of it spreading across northern Australia.

**Japanese Kelp (*Undaria pinnatifida*))**
This species has established in New Zealand, Post Phillip Bay and Tasmania. It can grow to vertically lengths of 3 m attached to the seabed, smothering the natural benthos. The main vector for its transferral is ballast water.

**Senate Term of Reference - 1(B)**

A key national initiative for the control of marine pests in Australia is the National Introduced Marine Pest Coordination Group (NIMPCG), established under the Marine and Coastal Committee of the Natural Resource Management Ministerial Council.

NIMPCG has prepared an estimate of the cost of establishing a National System to prevent and manage marine pest incursions in Australia and that estimate is approximately $40M. The shipping industry currently contributes in the order of $20M per year to support AQIS management arrangements for ballast water controls into Australia. Therefore a total barrier will cost approximately an additional $20M.

**Senate Term of Reference - 1(C)**

The 1999 Task Force Report on the Prevention and Management of Marine Pest Incursions (written jointly by EA and AFFA and which contained contributions from the States) agreed that no adequate system was in place to manage marine pests. It also contained a number of recommendations to develop a National System for the Prevention and Management of Marine Pest Incursions. Since July 2001 the AQIS ballast water management arrangements for ships coming into Australian waters probably constitute the most effective system for ballast water management in the world. The ballast water management system will form an important part of the proposed National System. It is anticipated that the proposal for a National System will be completed by July 2005.

**Senate Term of Reference - 1(D)**

See 1 (C) above.

**Senate Term of Reference - 1(E)**

NIMCOG is considering the possibility of EPBC Act powers to control marine pests. However, existing mechanisms do not appear to provide adequate instruments and hence amendments may be worth considering. Notwithstanding this, it is also likely that State powers may be able to provide adequate mechanisms to address marine pest management. The Natural Resource Management Ministerial Council has agreed that the National System will be a combination of National and State instruments.