Feral Herald

Newsletter of the Invasive Species Council, Australia

Working to stop further invasions

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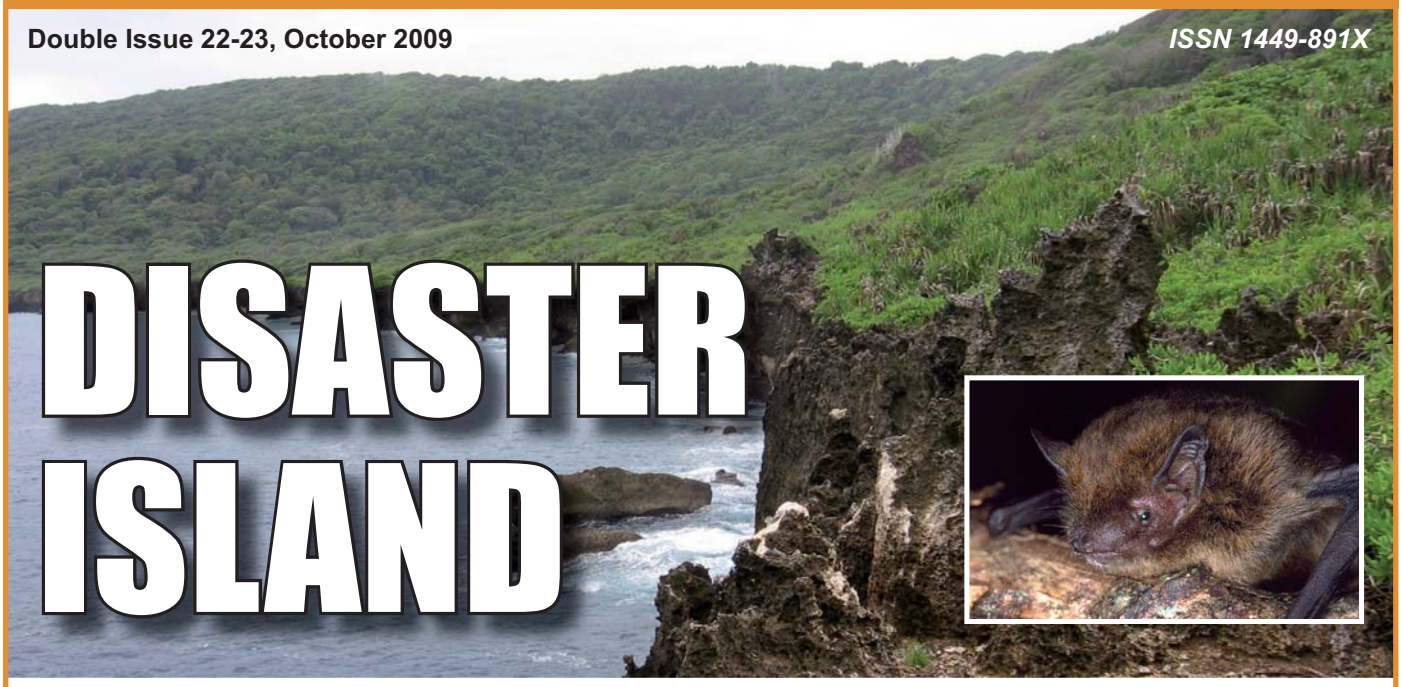

Nowhere in Australia is ecological collapse so evident as on Christmas Island. Invasives are to blame, Tim Low reports.

The demise of the Christmas Island pipistrelle bat is the latest in a litany of losses dating back to the first years of settlement.

The Christmas Island shrew *(Crocidura trichura)*, and Lister's gecko *(Lepidodactylus listeri)* have vanished in recent years. They joined two rat species *(Rattus macleari, R. nativitatis)* that vanished early in the 19th century.

The endemic forest and blue-tailed skinks *(Emoia natìvitatis, Cryptoblepharus egeriae)* face imminent extinction in the wild, and captive-breeding colonies have recently been established.

Native reptiles are now very difficult to find and the only remaining mammal, the Christmas Island flying-fox *(Pteropus natalis)*, is declining. This is despite most of the island being a national park.

Christmas Island has been subject to major conservation efforts in recent years, but most of the focus has been on the yellow crazy ant *(Anoplolepis gracilipes)*, an invasive species that took over large areas of the island, forming vast supercolonies that once covered 2500 hectares of the island.

The ants killed millions of iconic red crabs *(Gecarcoidea natalis)* endemic to the island, and were thought to pose a serious threat to birds, although this was probably overstated.

A large baiting program reduced ant densities across the island but ant numbers have risen again and a second major assault on the ants, using helicopter baiting, recently commenced.

But the recent declines of reptiles and the pipistrelle cannot be attributed simply to ants because they disappeared from some areas that ants never colonised.

An expert working group was formed by the Federal Government in February 2009 to focus on the plight of the pipistrelle, but this group broadened its brief by investigating the plight of all declining species on the island. The working group has recently produced an interim report that pulls no punches:

"The principal finding of the working group is that the extremely high biodiversity values of Christmas Island are in a perilous state. The cause is the intrinsic vulnerability of Christmas Island as an oceanic island to the direct threats posed to biodiversity by a succession of human-related

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Views expressed in this newsletter are not always those of ISC.

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... disaster island

from page 1

introductions of non-indigenous species and their ecological consequences. It is of concern that the lack of effective quarantine to prevent further introductions may exacerbate the decline in the future."

This is the most definitive statement yet made identifying invasives as the cause of Christmas Island's environmental problems.

The pests apart from ants doing serious harm include the giant centipede *(Scolopendra morsitans)*, wolf snake *(Lycodon aulicus capucinus)*, Asian house (barking) gecko *(Hemidactylus frenatus)*, black rats, cats, and scale insects that feed crazy ants.

The emphasis in the report on giant centipedes is very welcome. Biologist Charles Andrews recorded the arrival of these Asian centipedes on the island early in the twentieth century and they have since become abundant. Anyone entering the rainforest at night can see them scuttling over the ground and climbing trees.

The working group postulates that crazy ants, by reducing numbers of red crabs, facilitated a population explosion of centipedes, and these poisonous predators are probably attacking lizards and pipistrelles resting at night.

The 2004-09 Recovery Plan for the Christmas Island pipistrelle did not mention centipedes but they are now considered a possible agent of extinction. There is no precedent anywhere else in the world for exotic centipedes posing problems on this scale.

The report includes many recommendations focused on invasive species and biosecurity. It proposes the eradication from the island of black rats and feral cats, and calls for the development of techniques to reduce giant centipede numbers.

It also calls for an overhaul of quarantine on the island to bring it up to a standard commensurate with the island's biodiversity values, declaring that quarantine facilities are inadequate (there are no fumigation or washdown facilities).

Another recommendation is that potential "sleeper species of both exotic plants and animals be identified and eradication be conducted for those identified as having high threat to the island's biodiversity". There is also a call to sample disease (including parasite) levels in exotic plants and animals present on the island.

The situation is likely to worsen before it gets better. The recommendations made by the working group are very welcome, but the cost of implementing them will be high, and there is no guarantee that the island's biodiversity values can be restored.

As the working group notes, "the conservation problems on Christmas Island are pervasive, chronic and increasing and, unfortunately, will not have simple solutions".

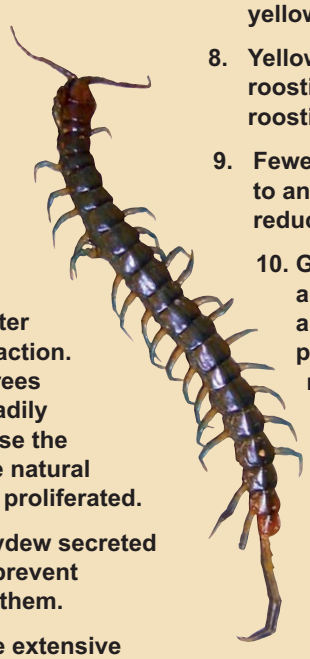
But we can at least learn from the mistakes made. Christmas Island is a classic example of how easily invasive species can destroy vulnerable ecosystems. Governments should be looking for other 'Christmas Islands' in the making. They should devote more funding to invasive species

Christmas Island pipistrelle's path to extinction

The Christmas Island expert working group postulated the following 'ecological cascade' to extinction. It does not fit all the available evidence, but we present it here as an important contribution towards a better understanding of the problems on the island.

1. **Many non-indigenous species, including the yellow crazy ant and the giant centipede, invade due to lack of quarantine.**
2. **Scale insects are introduced on fruit trees, establish in low numbers on rainforest trees, and spread throughout the island.**
3. **In the 1980s rainforest trees became stressed, possibly because of lower water tables due to drought and/or water extraction. Scale numbers increase on rainforest trees (insects attack stressed plants more readily than healthy ones). Alternatively, because the introduced scale insects had ineffective natural predators and parasites, they gradually proliferated.**
4. **Yellow crazy ants are attracted to honeydew secreted by scale. The ants 'farm' the scale and prevent predators and parasites from attacking them.**
5. **Excess honeydew from scale allows the extensive growth of sooty mould on the leaves of rainforest trees, stressing them further.**
6. **Feedback mechanisms cause population explosions in both scale insects and yellow crazy ants. The ants form super colonies with multiple queens.**
7. **Yellow crazy ants kill red crabs, leading to changes in rainforest structure. Red crab recruitment is low due to unknown factors in the ocean and/or because yellow crazy ants kill crablings.**
8. **Yellow crazy ants attack Christmas Island pipistrelles roosting in live trees. Pipistrelles are limited to roosting in dead trees.**
9. **Fewer red crabs leads to more giant centipedes due to an increase in leaf litter on the forest floor and reduced predation.**
10. **Giant centipedes expand their foraging range and kill Christmas Island pipistrelles while they are roosting under bark in dead trees. They possibly also kill small island reptiles that are now highly threatened.**
11. **Yellow crazy ant super colony control by Fipronil possibly leads to additional stress on insectivorous fauna.**

– Beeton et al. 2009



Photos: pipistrelle bat, Lindy Lumsden; giant centipede, B Navez; red crab, Peter – flickr.com/photos/86978295@N00/

Are you upset about the extinction of the Christmas Island pipistrelle?

You can't bring it back, but you can support ISC, the main NGO calling for more government action on invasive species.

Go to www.invasives.org.au to find out how.

problems to make sure they are not caught out again.

The key question now is whether crazy ant numbers can be reduced by introducing biological control agents to attack the scale insects they rely on for food. Despite all the efforts to control crazy ants there has been no significant recruitments of red crabs since the late 1980s. An increase in crab numbers is the key to restoring ecological health by reducing numbers of centipedes, rats, giant African snails, and certain weeds.

Any future intervention will come too late for the pipistrelle. An Australasian Bat Society group was finally given permission to visit the island in August to capture the last few to create a captive breeding colony.

They were able to detect the presence of only one bat, and it vanished during their visit. The Christmas Island pipistrelle, which was Australia's smallest bat, thus appears to be extinct, with the exact date of its demise known. It is the latest reminder of why the Invasive Species Council formed.

However, habitat loss could pose a new threat to the island. There is a serious bid by the Phosphate Mining Company of Christmas Island to mine new areas of rainforest. They have been lobbying the Federal Government at a very high level.

– Tim Low

Beeton, B. et al. (2009) Revised Interim Report Christmas Island Expert Working Group to Minister for the Environment, Heritage and the Arts. Available at www.environment.gov.au/parks/publications/christmas/interim-report.html.

An early version of this article appeared in the islandNet network August newsletter published by the Invasive Animals CRC at http://www.invasiveanimals.com/research/detection_and_prevention/index23456789101112l314.html.

INVASIVE SPECIES COUNCIL – from the president

The Invasive Species Council has been very busy, with one of the consequences being a delay in bringing you, our valued members, this newsletter. We apologise, and hope that in this super-sized *Feral Herald* you will see how hard ISC has been working.

We've been busy

We have been particularly busy in NSW battling proposed hunting legislation that would see the release of new exotic animals and worsen feral animal problems. This has been a major campaign focus for ISC, consuming more time than we would like. However, it is also an issue with relevance to Victoria, where the government announced a plan to promote deer hunting on private land (see *Feral Herald*, edition 20).

We have also been active at the federal level advocating reforms for the new biosecurity legislation and environmental legislation.

We have also developed a new website. Please take a stroll around it. We intend it to powerfully represent the need for much stronger laws and policies on invasive species – www.invasives.org.au.

Thank you ever so much to our donor who has made it possible. I also commend our communications adviser John Sampson for managing the project so competently, designer Ben Williams and website developer Robert Alfaro for getting it right. ISC is also very appreciative of the former voluntary efforts of Steve Page, who gave so much time establishing and maintaining our original website.

Recognition for invasive species threats

Invasive species have been getting a lot of airplay in recent times, including contributions from ISC. It has been particularly encouraging to hear our federal environment Minister Peter Garrett acknowledging them as key threats:

"Something I see every day is the impact of feral species, invasive species, on the environment. It's impacting on the Great Barrier Reef, on Kakadu, it impacts on agricultural lands as well."

– 7.30 Report, 18 August 2009

"… we have discovered and named only about a quarter of Australia's estimated number of flora and fauna. We need this essential information to do a better job of managing our biodiversity against the threats of invasive species, habitat loss and climate change."

– media release, 29 September 2009

Kakadu National Park: federal environment minister Peter Garrett recently highlighted invasives as a threat to its values. Photo: Robert Mynard – flickr.com/photos/daedicurus/

"Feral and pest animals cause significant land degradation, damage to our water resources, impact on our primary production industries, prey on our wildlife and are also a major threat to species conservation in Australia's World Heritage Areas."

– media release, 3 December 2008

"We have not read or responded to the signs of an ecosystem unravelling under the pressures of invasive species."

– referring to Christmas Island, address to the 10th International Congress of Ecology, 17 August 2009

We will continue to urge the minister to turn this concern into reforms and funding sufficient to address the threats.

Please support ISC

Please do. We need you! We promise we will turn your support into persuasive, scientifically grounded advocacy to protect the Australian environment from invasive species.

We think we do it well. Professor Tony Peacock of the Invasive Animals CRC recently said on his blog site that our work was of "very high" quality.

So, please renew your membership, make a donation, and recommend us to your friends and colleagues. This is all much easier now with our new website.

– ISC President, Steve Mathews

Shooters' Party takes pot shot at NSW national parks

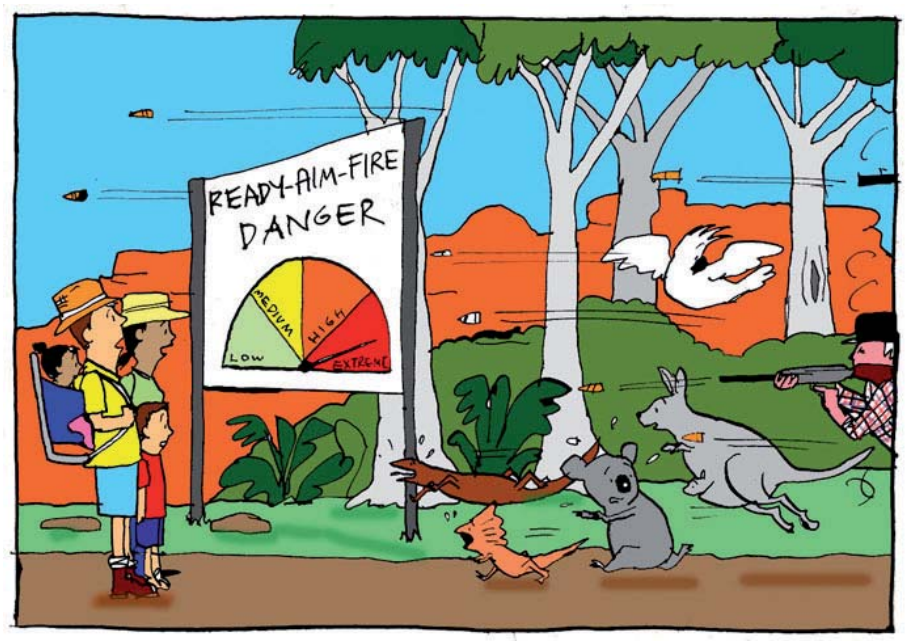
Imagine if laws were proposed to allow the release of new exotic animals for hunting, ad hoc recreational hunting in national parks, and hunting of a broad range of native animals. You'd probably think it wasn't worth worrying about because no government would contemplate such laws.

That's what the Invasive Species Council first thought when we heard about the NSW Shooters' Party Game and Feral Animal Control Amendment Bill 2009 in June this year: surely, the NSW government wouldn't seriously consider passing it!

But the NSW Shooters' Party holds (in part) the balance of power in the NSW upper house, and has been passing government legislation that the Coalition and the Greens don't support. So they expected the government to pass their outrageous bill as payback. The government may well have done so had not ISC and a coalition of environment and animal welfare groups raised the alarm and generated a strong community protest.

The NSW Government remains under pressure to pass the bill in some form because the Shooters' Party has since refused to support government bills.

Contrary to Shooters' Party claims that the bill is largely about control of feral animals, it is likely to worsen existing problems and create new ones. In particular, ISC was horrified by the proposal to allow the release of nine exotic bird species and deer onto private game reserves. The bill also provides for the establishment of



Cartoon by Fiona Katauskas

> **"... ISC was horrified by the proposal to allow the release of nine exotic bird species and deer on to private game reserves.**

such reserves. Each of the birds has been assessed by the Vertebrate Pests Committee as either a serious or extreme pest threat, and game reserve licencees would be exempt from any responsibility for their escape. They include pheasants, chukar partridges and Californian quail.

The list of animals that could be released onto game reserves could be added to simply by ministerial order. A story broke in the *Sydney Morning Herald* that one hunter had bought blackbuck antelope from Taronga Zoo to use as breeding stock for potential future hunting.

The bill would allow for recreational hunting in NSW national parks on the same basis that it now occurs across 2.2 million hectares of state forests, regulated by the NSW Game Council.

Prior to the bill, ISC had analysed the performance of Game Council hunting for feral animal control on public lands, finding that it was ineffective (see 'Is Hunting Conservation?' on the ISC website).

Our analysis has been widely used to discredit the claims of the Shooters' Party that the Game Council offers a low-cost, effective service that should be extended to national parks. We have been pleased to see the NSW Opposition and Greens drawing on our reports in their criticisms of the bill.

The bill also adds 26 native animal species to the list of game animals that could be hunted on public and private lands.

There is evidence to show that

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National debate lifts profile of feral deer threat in Australia

Two recent radio programs examining the impacts of deer and the politics of hunting are helping to explode the myth that deer are environmentally benign.

In a bizarre action for a state government authority, Game Council NSW issued a media release in June this year entitled 'Declare Invasive Species Council feral, not wild deer'.

This was their reaction to a call by the Invasive Species Council for the NSW, Victorian and Tasmanian governments to follow Queensland's lead in declaring deer pest species.

In these states, deer are protected as a hunting resource – requiring a licence to kill them, and imposing bag limits and closed seasons for some species.

The Game Council's reaction exemplifies the efforts of the hunting lobby to prevent control of feral deer.

However, it did assist in efforts by the Invasive Species Council to raise the profile of feral deer as an environmental threat.

In June, Radio National's Bush Telegraph program interviewed Tim Low for ISC and Brian Boyle, the CEO of the Game Council, about whether deer should be declared pest species. In September, Radio National's Background Briefing investigated the growing threat posed by deer and the problems associated with managing them as a hunting resource. Tim again featured for ISC.

On Bush Telegraph, Tim contended that deer "should be treated in a similar way to say goats, pigs, other hoofed animals where we know their impact is serious. The difference with deer is that their numbers are just in an early stage of escalating in a lot of parts of Australia as a result of escapes from deer farms and hunters releasing them into forests."

A dead deer, butchered and left to rot, was found upstream of a public campsite near Dargo in Eastern Victoria. Inset, road accidents are an increasing problem as deer populations expand. This sambar deer was photographed by the roadside in McMahons Creek, Victoria.

He said declaration was important to change perceptions of deer. One result of the Queensland declaration of deer was the "premier coming out and saying, why have we got deer on the Queensland coat of arms, why do we have this exotic animal?"

However, Brian Boyle claimed that in declaring deer pests, "Queensland has actually taken a retrograde step" and that hunters were effective in managing deer populations.

The ineffectiveness of hunters was made clear in Di Martin's Background Briefing investigation, with evidence indicating that deer populations are expanding rapidly. Professional shooters, pest experts and hunters said they're seeing a big build-up in deer numbers.

Deer hunter Errol Mason said that when he first started hunting sambar in the late seventies, he would see perhaps one deer in four or five days of full-day hunting. "Now you can go out and typically over a four-day hunt, hunters are reporting seeing up to 20 deer."

A former managing ranger of NSW's Pest Authority in Moss Vale, Andrew Glover, who was

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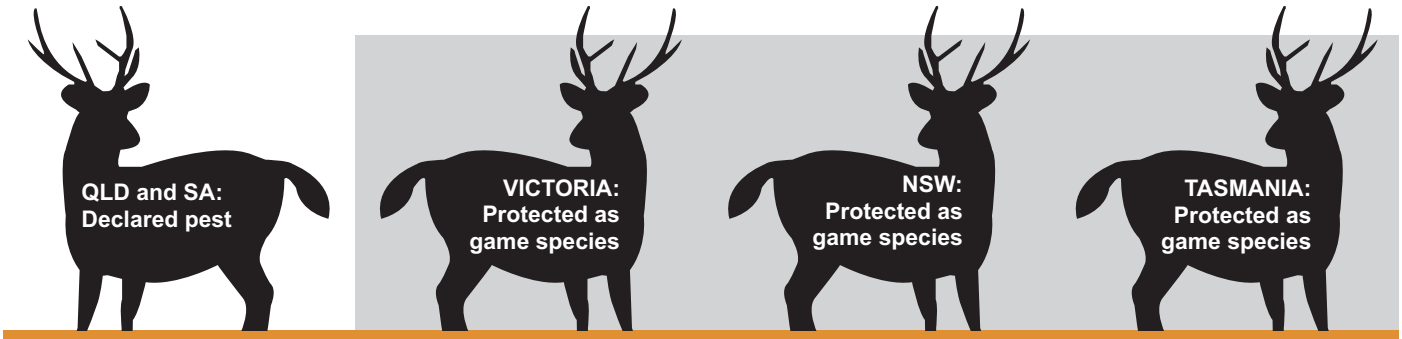

Queensland declares deer pests

In May, the Queensland Government declared feral deer pest species "because of their growing numbers and the increasing damage they are causing to agriculture, forestry and the environment".

There are an estimated 30,000 deer of four species established in Queensland – Chital, Rusa, Red, and Fallow.

Chital: Released near Charters Towers 1886. New herds have recently appeared in many places all over the state.

Rusa: Released on Friday Island in the Torres Strait in 1912. There are about 500 animals on the Torres Strait Islands. There are 100-500 animals around Townsville, Rockhampton, Stanthorpe and Charters Towers due to recent translocations.

Red deer: Released in 1873 and 1874 by the Queensland Acclimatisation Society. Original animals were a gift from Queen Victoria to provide "additional food and sport". 10,000-15,000 around the upper reaches of the Brisbane River valley and into the headwaters of the Mary and Burnett rivers. Small populations near Rockhampton and in the Roma-Injune-Mitchell area.

Fallow deer: Released at Westbrook and Warwick between 1870 and 1872. Around 2800 south-west of Warwick. Smaller populations in other areas of Southern Queensland.

ISC congratulated the Queensland Government on the decision to declare deer pests and urged the Victorian, NSW and Tasmanian governments to follow suit.

The Queensland declaration, on its own, will not prevent deer numbers rising in that state, and ISC has serious concerns about the lack of commitment to eradication of small new herds, but the state has at least recognised that deer should be treated as pests rather than conserved as game.

"Without deer trails, deer tracks in the trail, and the potential presence of deer at each new dip and bend of the hillside, the southwest would be to the outdoorsman an empty shell, a spiritual vacuum.

– A hunter quoting from the writings of American conservationist and hunter Aldo Leopold when trying to describe the inner meaning of deer hunting on ABC Radio's Background Briefing recently.

responsible for an area stretching from the state's south coast to north of Sydney, told Di Martin that about 60 to 70% of their pest time was spent on deer.

"They were causing more damage and had the potential to cause more damage than rabbits," he said.

The independent MP for Gippsland East Craig Ingram said hunters were not able to control deer.

"The shooting fraternity like to keep numbers up reasonably high so they have a sport," he said.

"And I don't think they are necessarily actually targeting deer to reduce their numbers, it's about taking the odd one for a feed, it's about the experience, and it's about bagging a trophy deer, which is the ones with the great big antlers."

Andrew Glover added another reason for the failure of hunters to control deer.

"Deer in most circumstances are very, very clever, and if they've seen somebody walking around and then takes a shot at them, then the next time they're far more elusive and you have to use other more expensive and time-consuming techniques, like working of a night and using equipment like night vision equipment, and things like that, which is far more expensive and far more cumbersome and far less productive than if you were going out to shoot a naïve population, a population which hadn't been hunted."

This media focus on feral deer problems is a necessary part of destroying the hunter-engendered myth that deer are mostly benign and hunters can manage them.

Transcripts for each of the programs can be accessed via the ISC website under media coverage.

NSW hunting council pits spin against science

The Game Council NSW has adopted extraordinary tactics to attack the Invasive Species Council.

Rather than respond to the substance of our critique of what they call "conservation hunting", they have hurled insults in the media and their publications, and misquoted and misrepresented us. We do not expect such behaviour from a government-funded statutory authority.

Here is a smattering of their rhetoric about ISC:

Declare Invasive Species Council feral, not wild deer
– media release, 2 June 2009

ISC – the bunnies of conservation
– media release, 6 July 2009

Dr Booth … appears to be prosecuting the ISC's agenda with an emotive mix of anti-gun fervour and green politics with little focus on science, common-sense, or basic wildlife management principles"
– paper by Moriarty et al. 2009 published on Game Council website

…a self-appointed Council, … its sole purpose is to disband the Game Council
– CEO of the Game Council on Background Briefing September 2009

The Game Council published a paper on their website to defend their claims that recreational hunting of feral animals represents sound conservation (they claim hunters are 'first in conservation').

The paper by Game Council employee Andrew Moriarty and councillors Anthony English and Robert Mulley purports to demolish criticisms by the Invasive Species Council of claims made about hunting.

Moriarty et al. 2009 argued that hunters are motivated for conservation because they want to conserve species for hunting – the 'sustainable use' argument. This argument is used to justify hunting elephants, for example – this one was shot in Zimbabwe by the chairman of the Game Council NSW. But it completely undermines their claims that hunters are motivated to reduce feral animal populations – for that would reduce hunting opportunities.

The first criticism Moriarty et al. make is that the deer shown on the cover of ISC's report *A Deer Mistake* is not a species feral in Australia, from which they conclude that ISC is confused about deer identification and impacts.

The front cover of the report is merely a cartoon silhouette of white-tailed deer, which the Queensland Government recently declared a prohibited species, and which we do not label as any particular species (it's a design feature, not a claim about which deer are feral).

What most concerns us is that Moriarty, English and Mulley misquoted ISC in order to denigrate us. In our report *A Deer Mistake* we say the following:

> *In his classic book about feral animals in Australia,* They All Ran Wild*, Rolls (1969) claimed that "Deer have done no noticeable harm to Australia". We now know this to be untrue, that deer can wreak as much environmental harm as feral goats or pigs.*

Moriarty et al. attack us in the following way:

> *There is, however, no evidence that "deer wreak as much harm as feral goats or feral pigs" in Australia as claimed by the ISC. This type of*

continued next page

emotive generalization clearly demonstrates the ISC's lack of understanding of game and feral animal impacts in Australia and their lack of knowledge of the literature.

They removed the word 'can' from our quote, and completely changed its meaning. Nowhere does ISC say what they claim we say, as it is obviously not true – because deer are nowhere near as abundant as goats and pigs.

(We note that in the recent Background Briefing report on deer, Andrew Glover, former pest control ranger in NSW, said deer potentially caused more damage than rabbits – see story, p6.)

There were other inaccuracies and misrepresentations in the paper as well.

In response to ISC's requests for corrections, the Game Council published a revised paper that toned down some of the insults, but failed to correct the misquote and misrepresentations.

As we said in our response to the Game Council paper, far from debunking ISC's reports, the paper by Moriarty, English and Mulley fails to address ISC's substantive critiques of the Game Council program. They have misquoted, misrepresented and made unsubstantiated criticisms of ISC's and others' works, but have not presented evidence to show that recreational hunters are contributing to effective feral animal control across NSW's state forests. By stating that hunting should be part of integrated or strategic or coordinated programs, they provide support for ISC's position that skilled shooters have the potential to contribute to professional control programs with defined management goals. Such programs contrast with the ad hoc culling by hunters in NSW state forests.

The behaviour of the Game Council in publishing the paper and refusing to remove or correct the misquotes and misrepresentations is highly inappropriate for a statutory authority. It is also inappropriate for them to misrepresent the activities of recreational hunters as conservation where there is no evidence to sustain that. 'Conservation hunting' is a misnomer for most of the hunting conducted under Game Council licences.

To download 'Conservation Hunting and its role in game and feral animal management: A response to papers by the Invasive Species Council of Australia' by Andrew Moriarty, Anthony English, and Robert Mulley go to http://www.ssaa.org.au/research-archive.html.

See Response to Game Council criticisms of ISC on our website just follow the links Our Work>Feral Animals>Is Hunting Conservation?

SHOOTERS' PARTY TAKES POT...

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ad hoc recreational hunting does not achieve feral animal control. In NSW state forests, access by hunters is deliberately rationed to reduce hunting pressure. Recreational hunters can contribute to effective control when they are part of coordinated programs, but the Shooters' Party has rejected a compromise that would make this possible.

Policy Officer Carol Booth has spoken at three public meetings in NSW and been interviewed by Stateline, ABC Radio, *Sydney Morning Herald* and others. We were invited to contribute an opinion piece to the journal *Pacific Conservation Biology*.

Tony Peacock, CEO of the Invasive Animals CRC, and Terry Korn, President of the Australasian Wildlife Management Society, have also spoken out against the bill. Professor Peacock likened recreational hunting for feral animal control to trying to fight the Black Saturday bushfires with water pistols.

No pest control experts have yet expressed support for the bill, which conflicts with best practice pest management guidelines developed by the NSW Government.

The public debate about the bill has been beneficial in educating people about feral animal biology and control, and increasing appreciation that hunting is futile for control unless it is part of coordinated programs.

However, the episode has also been very frustrating, sucking up a lot of ISC effort to defeat something that should never have seen the light of day.

The bill remains before parliament, so it is not yet over, although the government has ruled out supporting it in its current form. Our concern is that the most controversial parts of the bill will be removed – hunting in national parks and hunting of native wildlife – leading to government support for a bill that allows release of game birds and establishment of game parks.

A strong invasive species advocacy voice is needed to respond to such misguided policy.

For reports and ISC's policy on recreational hunting and feral animal control and ISC's policy, see http://www.invasives.org.au/page.php?nameIdentifier=ishuntingconservation.

Genetic boosters a shot in the arm for super weeds

***Climate change and the introduction of new weed varieties into Australia could lead to an outbreak of super weeds,* Carol Booth reports.**

Most catastrophes have their winners, and just like profiteers in war many invasive species are likely to benefit in a time of rapid climate change.

Ross Garnaut flagged this in his 2008 climate change report: "the ultimate outcomes are expected to be declines in biodiversity favouring weed and pest species…." (i)

Some weeds will spread as suitable conditions expand or as new opportunities for colonisation arise in the wake of extreme climate events. Some are likely to spread from introductions that are responses to climate change, including weed species cropped for biofuels, and garden or pasture plants developed to withstand drier conditions.

To make matters worse, some weed species are being granted genetic boosts with the introduction of new variants that could help them adapt and flourish under climate change.

Super invaders

One difference between natural colonisations and many weed introductions is that weed species are often imported from multiple locations (or bred from multiple sources), providing them with more genetic potential to adapt to new, changing or variable environmental conditions.

Andrew Lowe, professor of plant conservation biology at the University of Adelaide, has highlighted the potential for this to create super-invaders:

"Our research shows that in most cases super weeds become a problem after multiple introductions from different sources. By combining this genetic variation, new genetic mutations can arise that can give the alien species the potential to adapt and turn super-invasive." (ii)

"... despite government rhetoric about the need to prevent new weed threats, most new cultivars are not subject to government risk assessments.

The introduction of multiple genotypes can increase invasive risks through the direct impacts of particular strains or due to genetic recombination. Under climate change, weeds could benefit in the following ways: (iii)

- some strains may be pre-adapted to new climate conditions;
- they may gain genetic variation for particular adaptive features, such as tolerance of extended dry conditions;
- there is greater potential for hybridisation, resulting in hybrid 'vigor';
- there is increased potential for adaptive evolution to conditions under climate change.

Plant breeders in Australia and overseas are developing new varieties of already weedy species to increase their tolerance of drought, low rainfall, frost and other stressful conditions – "improvements" that are likely to increase invasiveness.

A kikuyu grass *(Pennisetum clandestinum)* breeding program, for example, is aiming to produce varieties that have shade and drought tolerance and resistance to disease.(iv) Kikuyu already poses a threat to at least 16 threatened species in NSW.(v)

New cultivars of the pasture grasses and environmental weeds cocksfoot *(Dactylis glomerata)* and tall fescue *(Festuca arundinacea)* are being bred for lower rainfall areas (400-700 mm), with tolerance to drought and persistence in acid and/or low fertility soils, and suitable for sowing across up to 20 million hectares.(vi)

New cultivars can worsen weed impacts. The scientific advice for the recent listing of lowland native grasslands of Tasmania as critically endangered under the EPBC Act identified new cultivars of existing pasture species with increased drought tolerance as a threat.(vii)

CSIRO researcher Robert Godfree and others have recently examined the risks of releasing new clover cultivars *(Trifolium repens)* with resistance (either through genetic modification or conventional breeding) to clover yellow vein virus. They found that the viral infection limits the invasiveness of wild populations by reducing fecundity, growth and survival, and concluded that virus-resistant genotypes "may pose a

New cultivars of weeds such as cocksfoot are being bred for lower rainfall areas. Photo: Steve Dewey, Bugwood.org

threat to some high conservation-value non-target ecosystems in SE Australia."[viii]

Yet despite government rhetoric about the need to prevent new weed threats, most new cultivars are not subject to government risk assessments.

Hybridisation has been documented as a catalyst for invasive evolution of plants for at least 35 cases in which hybridisation preceded invasions of introduced plants.[ix]

In the US, for example, naturalised specimens of the garden plant *Pyrus calleryana* were found to be a cross between genetically distinct cultivars from different parts of China.[x]

The serious wetland weed canary reed grass *(Phalaris arundinacea)* has higher genetic diversity (and heritable phenotypic variation) in its invaded US range than in its native European range. Genetic reshuffling and recombination within the introduced population has given rise to novel genotypes that are highly invasive.

Researchers Sebastien Lavergne and Jane Molofsky concluded that "multiply introduced invasive species are particularly predisposed to exhibit high rates of phenotypic evolution after their introduction, and may be very successful in adapting to predicted climate change in future decades."[xi]

Many of Australia's worst weeds have come from multiple sources – lantana *(Lantana camara)*, blackberry *(Rubus fruticosus)*, mesquite *(Prosopis spp.)*, spartina *(Spartina anglica)*, and scotch broom *(Cytisus scoparius)*.

As climate change mitigation fails, there is an increasing focus on adaptation. One of the most important measures to help native species survive inevitable climate changes is to reduce the threats or pressures of invasive species. Yet current practices seem more designed to assist invasive species to adapt to climate change and flourish.

The lack of risk assessment of new weed strains and cultivars is one of many regulatory and policy deficiencies the Invasive Species Council is seeking to address through our Double Trouble: Pests and Climate Change project. We have been advocating federally that the introductions of new weed genotypes should be restricted.

Climate change adds far more urgency to the need to prevent and control weed invasions. As readers know, it can be hard exciting the public about weed impacts on biodiversity. In contrast to other serious environmental problems, such as land clearing, climate change and dams, there haven't been marches in the streets, huge petitions and election promises about environmental weeds. Very few environment NGOs focus on invasive species.

Despite reforms in recent years, particularly in federal biosecurity, there is still a large gap between what is needed and what is being done. In these circumstances, people with knowledge and passion for weed issues are essential to the advocacy effort.

Full references for this story can be found on page 16.

Projects with an invasive species focus received more than $28 million in federal funding from Caring for Our Country grants.

Invasive species dominate Caring for our Country grants

Although the vast majority of applications for federal environmental funding this year missed out, invasive species featured strongly in successful projects, winning more than half the competitively allocated funds.

More than 1300 applications for projects totalling $3.4 billion were submitted for this year's Caring for our Country funds – about 7.5 times the $450 million available.

There was intense competition for the $57.5 million competitive funding pool. Just 57 projects were successful, with projects predominantly focused on invasive species receiving more than $28 million (see table), and many others having some invasive species component.

The lion's share of Caring for our Country – 65% or $293 million – is base funding for the 56 regional natural resource management bodies across the country.

The applications from two-thirds of these groups included some kind of weed or pest management activity but the lack of detailed information available makes it hard to calculate exactly how much has been directed at invasive species projects.

By far the largest project is $19 million allocated to feral camel management. The Desert Knowledge CRC project aims to identify biodiversity refuges and protect them by reducing camel numbers to <0.1 animal per square kilometre.

More than $1 million will help Southern Gulf Catchments control athel pine and other environmental weeds.
Photo courtesy Colin WIlson

The Invasive Animals CRC was granted $1.515 million to strengthen rabbit biocontrol methods.

In Victoria, the DPI will receive $2.175 million for community implementation of biological control of weeds.

Two north Queensland projects addressing Weeds of National Significance (WONS) were successful, with more than $1 million dollars for the Southern Gulf Catchments Ltd to control prickly acacia, parkinsonia, rubber vine, parthenium and athel pine, and $217,000 for South Cape York Catchments to control salvinia, hymenachne and feral pigs, among other activities.

WA's Department of Environment and Conservation will receive $1.88 million to eradicate exotic rats from high conservation value off-shore islands, and reduce the impacts of rabbits on threatened flora.

The University of Queensland and the Marthakal Homelands Resource Centre also won $294,000 and $282,000 respectively to eradicate exotic rats from islands.

In the Northern Territory, the NRM Board was allocated $1.42 million for mimosa control in the Daly and Moyle catchments.

Other projects included an invasive species component. The North Eastern Catchment Management Authority received funding to manage threatened grassy woodlands, including to remove Chilean needle grass and blackberry.

In addition, there was a special category of funds to implement an election commitment about cane toads, which saw just over $1 million going to community control efforts, communication and research.

– Sarah Moles

Photo credits: feral camels, andreakw - flickr.com/photos/greentea/; rabbit, GFDL licence – upload.wikimedia.org/wikipedia/commons/7/7b/Wild_rabbit_in_grass.jpg.

Caring for our Country – competitively funded projects with a dominant invasive species focus		
APPLICANT	**PROJECT**	**FUNDING**
The Desert Knowledge CRC	Feral camel management to increase biodiversity and cultural values in remote Australia	$19,000,000
DPI Victoria	Community implementation of biological control of weeds across south-eastern Australia	$2,176,448
Invasive Animals CRC	RHD Boost: Import and evaluate new RHD virus strains to strengthen rabbit biocontrol	$1,515,000
NRM Board (NT)	Coordinated response to on-ground control of *Mimosa pigra* in the Daly and Moyle catchments	$1,420,000
Southern Gulf Catchments Ltd	Biodiversity Enhancement – WONS targeted across northwest Queensland	$1,020,000
WA Dept of Environment and Conservation	Reducing rabbit impact to regenerate threatened flora, communities and critical habitat – WA wheatbelt	$993,000
WA Dept of Environment and Conservation	The eradication of exotic rodents from several WA islands with significant conservation values	$890,000
The University of Queensland	Eradication of Pacific rats on Maer Island, Torres Strait	$294,900
Marthakal Homelands Resource Centre	Eradication of ship rats from Truant Island NT	$282,493
South Cape York Catchments Inc	Community solutions for managing natural resource challenges in South Cape York	$217,250
Director of National Parks (Parks Australia)	Protecting the Ramsar listed Pulu-Keeling National Park from the impacts of threatening invasive species.	$165,000
Loxton to Bookpurnong Local Action Planning Committee Inc	Suppress the threats posed by invasive plant and animal species at a HCVAE site, Katarapko Wetland	$66,450
Apollo Bay Kennett River Public Reserves Committee of Management	Coastal communities reducing the impact and spread of WONS and other environmental pest plants along the Angahook-Otway Coast	$35,500
Wildcare Incorporated	Weed management, erosion control, and revegetation on Deal Island	$30,040
Friends of Adventure Bay Inc	Dune erosion control, weed management and rehabilitative planting on Adventure Bay Foreshore, Bruny Is	$20,400
Greening Aust Qld & Fitzroy Basin Association	Invasive species management across the (Shoalwater Bay / Corio Bay) Ramsar Wetland system	–
Total		**$28,126,481**
CANE TOAD PROJECTS		
Stop the Toad Foundation	Community control activities	$204,000
Kimberley Toad Busters	Community control activities; community research, and a forum	$200,000
University of Sydney	Research cane toad communication and ways to help threatened northern quolls survive	$621,000
Total		**$1,025,000**

More details at http://www.nrm.gov.au/business-plan/funded/09/index.html

No signs of slowing cane toads

An excerpt from a paper by Saunders et al (2009):

Backed by considerable expenditure of public money as well as by high levels of participation by volunteers, community groups have attempted to stem the toads' advance by direct removal using traps, fences and hand collection.

Those efforts have removed many hundreds of thousands of toads but appear not to have slowed down the rate of the toad invasion, which has averaged around 40-60km per annum across the Northern Territory (Urban et al., 2007).

The inability of direct removal to have any long-term effect on toad numbers on a broad spatial scale is a direct result of the species' high fecundity (a female can lay up to 30,000 eggs in a single clutch: Zug and Zug, 1979; Lever, 2001) and density-dependence in recruitment (toads are cannibalistic, and highly competitive in both larval and metamorph stages: Pizzatto and Shine, 2008).

Strong density-dependence means that the more toads are removed, the more the ones left behind will prosper due to reduced predation risk and enhanced food supply. As a result, removing cane toads faster than they can replace themselves is impossible without some form of biological control.

Saunders, G., et al. Modern approaches for the biological control of vertebrate pests: An Australian perspective. Biological Control (2009), doi:10.1016/j.biocontrol.2009.06.014.

CRC lands $1.5m for rabbit project

The Invasive Animals CRC received $1.5 million under Caring for our Country for a project called RHDV Boost to investigate the potential for increasing the strains of rabbit haemorrhagic disease in Australia.

Globally there are at least 30 strains, some of which may be able to supplement the effects of the Czech strain now in Australia. Release of new strains would take at least five years.

Resistance to the current strain of RHD has been detected in medium rainfall areas (300-650 mm), a dozen years after its release.

Glyphosate resistance spreads

The use of glyphosate-tolerant crops in the US is leading to glyphosate-resistant weeds, a recent survey of farmers has found.

One of the authors of the paper reporting the results of the survey, Bill Johnson, a Purdue University associate professor of weed science, said it was only a matter of time before the use of glyphosate products became much less effective in some places.

"We have weeds that have developed resistance, including giant ragweed, which is one of the weeds that drove the adoption of Roundup," Johnson said. "It's a pretty major issue in the Eastern Corn Belt. That weed can cause up to 100 per cent yield loss."

Roundup Ready' crops, including soybean and cotton, are genetically modified to withstand glyphosate so Roundup can be used to kill weeds without crop damage.

At least 16 weed species worldwide have developed resistance to the glycine group of herbicides (which includes glyphosate and glyphosate-trimesium), according to the website of the International Survey of Herbicide Resistant Weeds at http://www.weedscience.org/In.asp. There are three in Australia: annual ryegrass *(Lolium rigidium)*, awnless barnyard grass *(Echinochloa colona)* and liverseed grass *(Urochloa panicoides)*.

Greg R. Kruger, William G. Johnson, Stephen C. Weller et al. (2009) U.S. Grower Views on Problematic Weeds and Changes in Weed Pressure in Glyphosate-Resistant Corn, Cotton, and Soybean Cropping Systems. Weed Technology 23(1): 162-166.

A bait trap set for wild hogs in the US. Photo: volunteer Mike Vroegop

US data shows big pig kills barely pack a punch

If feral animal control was as easy as encouraging more recreational hunting, Australia wouldn't have the pest problems it does.

Unfortunately, as recent US research exemplifies, even killing large numbers of feral pigs may not be sufficient to reduce population densities and impacts. Pigs can breed up to three times in a 14-month period, producing ~5-7 piglets per litter.

Laura Hanson and others tested the effects of lethal control on pig populations in Georgia, noting that impacts on population survival and recruitment are rarely tested.

They compared pig populations that underwent 'moderate' or 'heavy' harvesting, the former by hunting and the latter by hunting plus intensive trapping and shooting.

The proportion of pigs killed in the heavily harvested population was close to double that killed in the moderately harvested population (measured by mark-recapture methods) – 46% compared to 26%.

However, neither was successful in reducing population densities, which increased over the course of the 2004-2006 study. The number of individuals added to the heavily harvested population per pig per year was double that added to the moderately harvested population – six compared to three.

Higher recruitment rates (which include both reproduction and immigration) increased in the population with high harvest intensity to make up for the extra deaths.

The researchers concluded that compensatory reproduction and immigration can easily outpace typical rates of removal in the US.

Hanson, L., Mitchell, M., Grand, J., Jolley, B., Sparklin, B., Ditchkoff, S. (2009)
Effect of experimental manipulation on survival and recruitment of feral pigs. Wildlife Research 36: 185-91.

ISC pushes biosecurity reforms

Opportunities have opened for biosecurity reforms at a federal level, with the government drafting new legislation to implement recommendations of the Beale review, and federal environment laws (the Environment Protection and Biodiversity Conservation Act 1999) being independently reviewed.

ISC has been active in both cases pushing for reforms to improve regulation of invasive species. Policy Officer Carol Booth has been on an 'industry' working group responding to drafting proposals for the new biosecurity legislation, and ISC has made comprehensive submissions and met twice with the reviewer of the EPBC Act, Dr Allan Hawke, and members of the review panel.

In particular, ISC has been advocating the need for much greater federal involvement in post-border biosecurity because the current mishmash of state and territory laws are failing to stem the rate of naturalisation and spread of invasive species that threaten biodiversity.

We advocate that recommendations from the previous senate inquiry into invasive species be implemented and that existing provisions under the EPBC Act be used to list nationally significant invasive species and regulate trade and use.

ISC wants to see federal biosecurity reform that helps reduce invasive species pressures on native Australian biodiversity.

ISC has also stressed the need for risk assessment of new cultivars/biotypes/breeds of existing weeds and pests that could either have more severe impacts or could hybridise with existing varieties to become much more invasive. See story, page 10.

Climate change has been a very important context for our recommendations, for it adds great imperative to the need for reforms. Climate adaptation measures should include:

1. Reducing invasive species threats to increase the capacity of native biodiversity to adapt to climate change;
2. Controlling invaders or potential invaders likely to benefit under climate change; and
3. Preventing new introductions, ensuring that responses to climate change do not worsen invasive species problems.

To read ISC's submission on federal reforms, see 'federal biosecurity' on the ISC website.

Queensland eliminates tilapia from private dams

On 4 September, the Queensland minister for primary industries Tim Mulherin reported that 5500 tilapia had been poisoned in dams on two properties near Bundaberg.

The dams had been deliberately stocked with tilapia.

Mr Mulherin warned that tilapia "is an aggressive species, competing with native fish for food and space, capable of taking over artificial waterways and causing havoc in creeks and rivers".

Most tilapia infestations are caused by deliberate illegal releases.

Tilapia *(Oreochromis mossambicus)* were imported into Australia as aquarium fish, and have become invasive in Queensland and WA. They are listed in the World Conservation Union's 100 of the World's Worst Invasive Alien Species.

Figures reveal size of agricultural footprint

Recent figures from the Australian Bureau of Statistics highlight the very large footprint of agriculture and exotic pastures in Australia.

In 2007-08 about 54% of the total land area was managed by agriculture businesses, ranging from 23% of Tasmania to 82% of Queensland.

Grazing accounted for 87% of agriculture by area.

The area sown with exotic pasture species ('improved pasture') is 16% of agricultural land – about 66 million hectares. Close to two-thirds of agricultural businesses in Australia (62%) applied fertiliser.

The percentage of agricultural land used for crops totalled 8%, ranging from 38% in Victoria to <1% in the Northern Territory.

Australian Bureau of Statistics (2009) Land Management and Farming in Australia. See http://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/4627.02007-08?OpenDocument.

GENETIC BOOSTERS A SHOT IN THE ARM... **continued from page 11**

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(ii) Lowe, A. (2009) Stop the aliens invading says biologist. Media release.

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(iv) See www.agcsa.com.au/static/atm_articles/html/9_4_3b.html. "Promising selections" include "aggressive forms suitable for pasture production."

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(xi) Lavergne, S. and Molofsky, J. 2007. Increased genetic variation and evolutionary potential drive the success of an invasive grass. Proceedings of the National Academy of Science 104: 3883-88.

This story was also published in the newsletter of the Queensland Weeds Society.

Phytophthora gets a stranglehold on WA

More than a million hectares of southwestern WA is infected by *Phytophthora cinnamomi*, a four-year mapping study has found. This was 20% of the area surveyed – from Enneabba to Esperance – and another 1 million hectares was considered at high risk of infection.

At least half of the southwest's endemic plants are vulnerable to dieback, including an estimated 24 species of banksias threatened with extinction due to the disease.

ISC has previously written to the federal environment minister Peter Garrett urging that sufficient funding be provided to implement the threat abatement plan. We have not yet received any response. No funding was provided for threat abatement in the recent Caring for our Country grants. Despite its threat to hundreds of plant species, Phytophthora dieback is not listed as a priority for funding.

See edition 1 of Double Trouble on our website to learn more about the threats under climate change.

Draft invasives framework out

The Victorian Government recently released its draft Invasive Plants and Animals Policy Framework for public comment.

ISC made a submission advocating the adoption of a permitted list approach, which was mooted in the framework.

While there were positive approaches to commend, we were concerned by the intended focus just on high-risk invasive species and high-value conservation assets, neither of which was defined.

The prioritisation of fewer 'high-risk' invasive species and 'high-value' conservation assets could take the place of providing adequate resources and undertaking effective legislative and policy reform.

We recommended recognition of climate change as an important context: what is considered low-risk now may become high-risk, and the value of conservation assets will change as well. Climate change warrants greater precaution in release and spread of invasive species and increases the imperative to address threats.

To download our submisison visit www.invasives.org.au.

Download the IPA policy framework from www.dpi.vic.gov.au.

Carcinus maenas

Undaria pinnatifida

Cirolana harfordi

Asterias amurensis

Caulerpa taxifolia

Hydroides elegans

Tridentiger trigonocephalus

Online database of marine pests

The National Introduced Marine Pest Information System has been upgraded and is now accessible online from the marine pests webpage of the Australian Government.

It contains information about the biology, ecology and distribution of more than 80 invasive marine species in Australian waters and others considered to be potential invaders.

There are more than 250 introduced marine plants and animals in our waters.

Access the database at www.marinepests.gov.au/nimpis.

Australia, a continent under threat

Australia has the worst animal extinction record in the world, due mainly to invasive species.

With fire ants turning up in Brisbane, foxes in Tasmania, ongoing weed and disease spread, it could get worse. Australia needs a strong community voice to stop that happening.

The Invasive Species Council is the main conservation group pressuring governments to do more about weeds, pests and wildlife diseases.

Help make us stronger. With your membership we can do more.

– Tim Low, a founder of the Invasive Species Council

PS You can now join online. Go to **www.invasives.org.au** and click on the JOIN OR RENEW link.

Tim Low on Australia's Macquarie Island, a World Heritage site now overrun by rabbits.

Invasive Species Council membership application form

☑ **Yes**, I want to help protect Australia's native plants and animals from weed, pest and disease invasions.

PERSONAL DETAILS

Mr/Mrs/Ms/Other First name Surname

Address Suburb/Town

Postcode Tel (home) Tel (work) Fax

Email (please print clearly)

Work or voluntary position(s) (if relevant)

Affiliations

☐ I do **not** wish to receive email bulletins and news from the Invasive Species Council.

SELECT MEMBERSHIP (prices include 10% GST) ☐ NEW MEMBER ☐ RENEWING MEMBER

Regular	☐	1 year $22
Concession	☐	1 year $11
Group	☐	1 year $55

☐ **I would also like to make a donation* of: $**

Does not include GST. Donations of $2 or more are tax deductible.

* Representing a donation to the Invasive Species Council Fund – the Invasive Species Council Fund is a public fund listed on the Register of Environmental Organisations under item 6.1.1 of subsection 30-55(1) of the *Income Tax Assessment Act 1997*.

TOTAL: $

WHERE TO SEND YOUR CHEQUE/MONEY ORDER

Thank you for joining the Invasive Species Council. Please send this form and a cheque or money order to: **Invasive Species Council, PO Box 166, Fairfield, Vic 3078**. Cheques and money orders should be made out to the **"Invasive Species Council Inc"**. We apologise for not having credit card facilities available at this time. Please email us, isc@invasives.org.au, if you would like to organise a bank transfer.

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