7 INTRODUCED SPECIES PREVENTION AND MANAGEMENT STRATEGY

The following recommendations are put forward to help develop the introduced species prevention and management strategy for the Ashmore Reef and Cartier Island Reserves. They are aimed at protecting biodiversity and ecosystem processes in remote Reserves, and could assist assembly of similar strategies for other marine protected areas managed by DEH.

7.1 Determine specific objective, performance targets and review mechanism

The following is proposed:

- Specific Objective: Minimise chance of establishment of NIS introduced by anthropogenic means, which on the basis of current evidence and knowledge, may be capable of surviving and possibly establishing a self-reproducing population within the Reserves.
- Performance Targets: No viable populations of NIS, which based on current evidence and knowledge, may have a detrimental impact on the ecology of the Reserves. No incidence of disease from introduced pathogens.
- Performance Monitoring and Review: Implement quarantine procedures and undertake regular monitoring of all vessels arriving at the Reserves using ACV personnel. Undertake a scientific NIS survey of Reserves every 3-5 years. Where feasible, eradicate NIS, which on the basis of current evidence and knowledge, may be capable of surviving and establishing a self reproducing population within the Reserves and may have a detrimental impact on the ecology of the Reserves.

7.2 Management of risk and introduced species prevention

Management of the risk of introduction of NIS to the Reserves is best built around a simple strategy of minimisation of the risk of transfer of NIS by visitors and vessels to the islands.

We recommend that the current level of management presence at the islands be maintained to enforce present access restrictions for visitors and traditional fishermen, including the prospect of people going ashore on Islands in closed areas of the Reserves. The continued presence of the Australian Customs vessel at Ashmore is essential as a means of enforcing the restrictions. To complement this, quarantine guidelines for personnel working in the Reserves are proposed to address the potential problem of accidental introduction of soil, eggs, seeds or other life stages of NIS.

7.2.1 Quarantine procedures – scheduled vessel arrivals

We strongly recommend that detailed quarantine standards and procedures be adopted that are appropriate for Ashmore and Cartier islands, similar to those developed for Barrow and Thevenard Islands off the Western Australian Coast (Chevron Texaco Australia 2003a, 2003b).

Similar quarantine procedures to minimise the introduction of exotic organisms, including diseases, into Australia from the Ashmore and Cartier islands should also be implemented as and if required by AQIS. The NAQS survey (Curran 2003) identified that quarantine measures may be required to prevent the introduction of the ginger ant into Western Australia, where it does not yet occur, and also suggested a 'watching brief' on aphids, leafhoppers, thrips, borers and spiders at Ashmore Reef National Nature Reserve.

Quarantine procedures for Ashmore Reef National Nature Reserve and Cartier Island Marine Reserve should include the following:

- minimising materials transported to islands (maintain minimal visitor facilities);
- using new field equipment as far as possible;
- use of clean, sealable containers for transport of gear and equipment;

- implementation of quarantine manifest of all plant and equipment, transportable units, containers, building materials, weed matting, etc, to be landed on the islands, with mandatory inspection for signs of earth, seeds, eggs, webs or vegetation prior to departure from Australian ports;
- washing down and/or de-seeding any old equipment to go to the islands, using water blaster equipment with sufficient pressure to penetrate to base metal or painted surfaces and remove any encrusting earth;
- treating (sterilising or fumigation) any bulk materials to go to islands (any plants being utilised for rehabilitation should be grown in soil-less mix in a weed free nursery area as per McDonald unpublished);
- clear labelling of all inspected/treated plant and equipment and/or sealing with quarantine tape;
- immediate loading on transport vessel of all quarantine inspected/treated plant and equipment;
- close inspection of personal effects and clothing, especially footwear, for earth, seeds and plant material, and cleaning by brushing with disinfectant or picking off seeds, paying special attention to the soles, tongue and lace up parts of boots and shoes;
- ensure appropriate vermin and pest control measures are in place on all vessels used to transport equipment. The use of bait stations (Bromkokil or similar), insecticides and insect traps are recommended;
- inspection of boats used for ferrying personnel and equipment ashore for insects and other vermin;
- preventing live animals and/or domestic pets from being taken ashore;
- discouraging research and management personnel from camping on the islands; if camping is to be undertaken checks should be made to ensure NIS are not transferred on or in equipment and that all foodstuffs and rubbish are removed in sealed bags;
- ensuring quarantine procedures are also applied to all movements *between* islands at Ashmore Reef, to minimise the risk of inter-island transfer of NIS.
- inspection by ACV personnel of clothing and footwear of visiting yachtsmen (and where practical of Indonesian fishermen) before permitting them to go ashore. Except for personal gear no equipment or foodstuffs to be allowed ashore from vessels unless quarantine inspected;
- reducing risk of introduction of NIS by Indonesian fishermen by:
    - preventing past practices of introducing food crops such as maize;
    - preventing live animals, such as chickens, from being taken ashore;
    - ensuring that piped water from the well at West Island is available at the landing beach;
    - limiting access to grave sites by establishing marked paths, which can be more readily monitored for possible non-indigenous weed species.

7.2.2 Quarantine Procedures – SIEVs

All SIEV arrivals should be regarded as 'high risk' for both marine and terrestrial NIS, irrespective of their Port of Origin or Port(s) of last call. The risk of inoculation of eggs and larvae of non-indigenous marine species into the lagoon at Ashmore Reef by heavily fouled vessels is unacceptably high, and in general, we recommend that SIEVs or other 'high risk' vessels should not be held in the lagoon unless the hull has been carefully inspected (see Section 7.2.4 below; Appendix 5) and shown to be free of fouling and unwanted vermin. As a precautionary measure, rat poison, cockroach baits and other insecticide should be routinely

laid on all intercepted SIEVs. Dead animals should be disposed of appropriately outside of the Reserve areas.

We recommend a policy that all SIEVs should be intercepted at sea wherever possible and safe to do so, and that DEH investigate the practicality of establishing one or more permanent moorings outside of West Lagoon to receive such vessels. If the vessel is unseaworthy and passengers must be transferred ashore for safety, a suitable landing craft or ferry should be mobilised to Ashmore Reef to re-embark them as soon as possible.

The potential for SIEVs evading apprehension and landing people on Islands is of concern from a NIS perspective. The continued presence of the Customs vessel at Ashmore is therefore recommended. Should people be required to land and camp on West Island, the area around the water well and pump should be avoided to ensure that contamination by *Vibrio cholerae* does not occur. It is recommended that routine water testing of the well water be undertaken if it is suspected that people have camped on West Island undetected or if there has been a large influx of people to the island.

7.2.3 Possible pathogen and marine NIS inoculations via ballast trim and bilge water

While the risk of possible pathogen and marine NIS inoculations via ballast trim and bilge water is generally considered low (Table 12 below), a precautionary approach should be taken, with the following procedures recommended to minimise risk:

- except in the case of emergency, all vessels inside Reserves to avoid pumping out bilge water (including ballast trim water carried by modern yachts);
- formalise need for all ACV, RAN, ADF or charter vessels to avoid discharging any ballast trim or bilge water, through application of a standing order that applies to any vessel visiting the Reserves;
- in case of grounding by a merchant ship at Ashmore or Cartier Reefs the risk of discharge of ballast water is likely to be outweighed by any possible environmental risk caused by leakage of fuel or cargo, and the master or salvage director should be permitted to discharge ballast water at any time to avoid the ship becoming a total loss. Should all refloating attempts prove unsuccessful, check safety and practicality of pumping the contents of both unbreached ballast and fuel tanks to a reception vessel before the hull is stripped and abandoned.

Table 12: Risk of pathogen and marine NIS introductions to Ashmore Reef and Cartier Island Reserves (pathway management)

Vector	Route History (previous ports of call)	Types of Non-Indigenous Species	Deduced Inoculation Risk
BALLAST-TRIM AND/OR BILGE WATER ACV, charter vessels, research vessels, RAN units	Darwin, Broome	Viral, bacterial and fungi pathogens; [including coral diseases] protozoans; benthic microalgae; dinoflagellate cysts.	Very low
	Cairns		Low
Cruising yachts	Darwin, Groote Eylandt		Very low
	Kupang, Port Moresby, Cairns, Noumea, Fiji		Low to Moderate
FFVs, SIEVs	South Asian and/or Indo-Malay trading ports		Low to High [various factors]
	Minor Indonesian ports		Low

7.2.4 NIS transfers via hull fouling

Even well maintained vessels such as ACVs can transfer species to the Reserves via hull fouling (eg. barnacles and tubeworms in the water strainer; see Section 3) and this vector is

considered generally to be of high risk (Table 13 below). Protection of native marine species and habitats in the IUCN Category Ia by application of a 'no access policy' is compromised by hull fouling risks of cruising yachts which visit the IUCN Category II area inside West Island lagoon, particularly yachts not undertaking hull cleaning at Darwin after voyaging from ports east of Torres Strait. However the need for freedom of navigation requirements for vessel safety (eg. UNCLOS) prevents a practicable permitting strategy for visiting yachts, and the issue is equally if not more pertinent to Type III (motorised) fishing vessels and SIEVs.

Table 13: Risk of NIS introductions via hull fouling to Ashmore Reef and Cartier Island Reserves (pathway management).

Vector	Route History (previous ports of call)	Types of Non-Indigenous Species	Deduced Inoculation Risk
HULL FOULING Type III Fishing Vessels	Surabaya	Serpulid worms, acorn barnacles, molluscs; possibly other taxa.	Low to High [increases with degree of fouling, duration of stay, in-water cleaning, grounding, beaching or sinking at site]
	Minor Indonesian ports	Unknown	
SIEVs	South Asian and/or Indo-Malay trading ports (eg. Colombo, Jakarta, Surabaya)	Serpulid worms; acorn barnacles; molluscs; (+ possibly macroalgae; hydroids, ascidians)	
	Minor Indonesian ports	Unknown	
Cruising Yachts	Darwin – hull cleaned	None at present	None
	Darwin – hull uncleaned	[depends on previous ports]	Low to High [reasons as above, but rarely occurs?]
	Kupang, Port Moresby, Cairns, Noumea, Fiji, Hawaii - hull uncleaned	Serpulid worms; acorn barnacles; molluscs; (+ possibly macroalgae and other taxa)	
ACVs , RAN Units,	Darwin, Broome	None at present	None
	Cairns	*H. sanctaecrucis, P. viridis*	Low
Tourist charter vessels	Darwin, Broome	None at present	None

The following actions are therefore recommended:

- no in-water hull cleaning or careening by any vessel inside the Reserves.
- brochures and other information materials compiled by DEH for the two Reserves and other marine protected areas should include a section describing the risk of transferring non-indigenous species via hull fouling, including internal surfaces such as anchor lockers, water strainers and pipe work. DEH should make available this and other information on quarantine requirements for the Reserves on its website and distribute information to the International Cruising Yacht Association and the Yacht Clubs at Darwin, Gove, Cairns, Townsville and cruising yacht clubs in State capital cities.
- hull inspections using the protocols outlined in Appendix 5 for all visiting yachts suspected of having hull fouling, especially those from non-Australian ports. We recommend that ACV personnel be instructed in undertaking simple hull inspections using basic snorkel equipment. A check should be made of the hull near the waterline, bustle, buttocks, transom and rudder of all yachts and other small vessels visiting the West Island lagoon for signs of excessive fouling (eg. thick patches or bands of green filamentous algae such as *Enteromorpha compressa*, goose barnacles, acorn barnacles), and the owner asked to check water strainers, anchor locker and supply the names of the vessel's home port and previous five ports of call. Unless it can be shown that hull cleaning and fresh anti-fouling had been undertaken, yachts with demonstrable heavy fouling should be asked to leave as soon as weather and tide conditions permit safe passage. Results of the inspections to be recorded on

pro-forma record sheets, and sheets and samples to be transferred to NT Fisheries Aquatic Pest Management Group, Darwin, at ACS crew turn-around in Darwin.

- using the same inspection protocols, ACV personnel to routinely inspect similar areas of the external hull of Type I, II and III fishing vessels, and to record both homeport and the last three ports of call to help develop a database.
- Undertake inspections of all SIEVs using the hull inspection protocols outlined in Appendix 5, and as recommended in 7.2.2 above, ensure that heavily fouled SIEVs are removed to anchorage or mooring outside of the lagoon.
- ACVs and other supply vessels departing Australia for the Reserves as a matter of routine operation should ensure anchor lockers and water strainers are clean, and should be slipped, inspected and repainted within the period specified by the anti-fouling manufacturer.
- If non-indigenous fouling species such as *Austromegabalanus* spp*, Megabalanus* spp*, Perna viridis* or *Hydroides* spp establish nuisance populations at Darwin or Broome, review hull cleaning procedures undertaken by ACVs and RAN units that undertake regular patrols to the Reserves. It is recommended that DEH ensure that it is on the national notification list for NIS alerts of the Consultative Committee on Introduced Marine Pest Emergencies (CCIMPE).

7.2.5 NIS transfers via marine debris

Floating marine debris such as boat timbers, plastics and discarded fishing nets drifting into the Reserves has the capacity to transfer non-indigenous fouling species.

While this risk vector is difficult to assess (Table 14), we recommend that ACV personnel undertake regular patrols of beach areas and examine and collect suspect plant material and shoreline debris as a means of monitoring for marine NIS. Any suspect material should be clearly labelled and preserved dry in a sealed plastic bag and forwarded to Darwin for scientific examination (see Appendix 5: collection protocol 8-9).

Table 14: Risk of NIS introductions to Ashmore Reef and Cartier Island Reserves (pathway management)

Vector	Route History (previous ports of call)	Types of Non-Indigenous Species	Deduced Inoculation Risk
MARINE DEBRIS Discarded fishing gear	SOURCE: E. Indonesia to Papua New Guinea, plus Ships, Foreign and Australian fishing units	Unknown	Unknown
Drift wood, plastics		Unknown	Unknown

7.3 Monitoring and data collection

7.3.1 Vessel arrivals

In order to better quantify risks of introduction of NIS to Ashmore Reef National Nature Reserve and Cartier Island Marine Reserve, and to build a clear picture of vessel movements to and from the Reserves, it is necessary to ensure that accurate and detailed record keeping is undertaken of all scheduled and unscheduled vessel visits.

We recommend that DEH develop a common reporting proforma for all vessel visits to the Reserves, and these records be maintained on a computer database. Data should include:

- name and type of vessel (if Indonesian fishing boat whether Type I, II or III);
- master's name, and number of crew, including master;
- date of arrival at Ashmore or Cartier Reef and date of departure;

- home port, immediate port of departure, and previous recent ports visited on voyage;
- next port(s) of destination;
- state of hull (and inspection results if undertaken);
- purpose of visit (stopover, watering, visit to grave sites, fishing etc);
- number of persons permitted ashore and number of visits ashore;
- observations (signs of vermin on vessel, etc).

In the case of Indonesian vessels it is particularly important to correctly note the Indonesian names of master, vessel, home port, previous ports visited, and port of destinations.

7.3.2 Marine NIS

The surveys undertaken as part of this Report do not indicate the establishment of any marine NIS. However, the presence of live individuals of the non-indigenous barnacle, *Austromegabalanus krakatauensis,* detected on the hull of a Type II Indonesian fishing vessel in the lagoon near West Island in August 2002, indicate the need for ongoing vigilance and monitoring.

Table 15: Examples of hull-fouling species potentially capable of surviving at Ashmore Reef or Cartier Island Reserves

Species	Native Range	Nearest introduced population and *Record of Entry*	Ability to tolerate open tropical coral reef habitats with large tides	Pest Status
MACROALGAE				
Acanthophora spicifera	NW Pacific	Central Pacific	Probable (subtidal)	Suspected
Hypnea musciformis	NW Pacific	Central Pacific	Probable (subtidal)	Suspected
TUBE WORMS				
Hydroides elegans	Cryptogenic	Darwin *Cartier Is?*	Possible	Fouling pest
Hydroides sanctaecrucis	Caribbean	Cairns *Darwin*	Low	Fouling pest
Hydroides ezoensis	NW Pacific	Singapore *?*	Low	Fouling pest
BARNACLES				
A. krakatauensis	Indo-Malaya	? *Ashmore Reef*	Unknown	Suspected
M. coccopoma	Trop Atlantic	E Pacific, *Geraldton*	Possible	Suspected
Megabalanus zebra	Cryptogenic	NW Australia *?*	Possible	Unknown
Balanus reticulatus	Cryptogenic	Singapore *Geraldton*	Possible	Suspected
Chthamalus proteus	Caribbean	Midway *Geraldton*	Probable	Suspected
CRABS				
Charybdis japonica	East Asia	Auckland *?*	Unknown	Known pest
Charybdis hellerii	Nth Indo-Pac	Brazil-Florida *?*	Unknown	Known pest
BIVALVES				
Mytilopsis sallei	?	Surabaya *Darwin*	Low tolerance	Fouling pest
Musculista senhousia	?	Singapore *Perth*	Low tolerance	Fouling pest
Perna viridis	NW Pacific	Singapore *Darwin*	Low tolerance	Suspected
Brachidontes exustus?	Caribbean	? *Geraldton*	Unknown	Unknown
GASTROPODS				
Crepidula plana	Caribbean	San Fran. *Geraldton*	Unknown	Unknown
Thais haemostoma	Caribbean	? *Geraldton*	Unknown	Oyster pest
Thais rustica	Caribbean	? *Geraldton*	Unknown	Suspected
OPHISTOBRANCHS				
Cuthona perca	Caribbean	Hawaii, NZ *?*	Unknown	Unknown

We recommend monitoring for the presence of marine NIS species (especially those listed in Table 15 above) should be undertaken a regular basis, and that given the rapidly changing knowledge of marine pest species that the status of NIS be reviewed every 3-5 years.

In addition to regular hull inspections of suspect vessels (see Section 7.2.4 above) and marine debris (see Section 7.2.5 above) we recommend that artificial substrates (wrecks, mooring blocks, mooring buoys and channel markers) at Ashmore Reef be checked preferably annually, but at least every 3-5 years for the presence of marine NIS (sooner, if it is suspected that a NIS incursion has occurred; or opportunistically, if diving research is being undertaken). In particular, evidence of establishment of *Austromegabalanus krakatauensis* should be checked as soon as possible.

Visits by coral reef scientists should include checks and photographs on the incidence, type and extent of external signs of coral disease.

Any suspect marine NIS should be collected following the procedures recommended for hull inspection protocols (Appendix 5) and forwarded to Darwin for taxonomic identification.

7.3.3 Terrestrial NIS

A number of non-indigenous plant and animal species have established or have a moderate to high risk of establishing on the Ashmore and Cartier islands, (Section 6.2.2, 6.2.3, Table 11).

We strongly recommend that plant surveys be undertaken on a regular basis on all three islands at Ashmore Reef National Nature Reserve and Cartier Island Marine Reserve, to detect changes in populations and impacts of established weed species and the presence of new NIS. . Regular monitoring of plant species present on the Islands is needed at an appropriate time of year (March-May). Annual monitoring would be ideal, but once every 3-5 years may be a more practical interval.

We recommend that regular surveys of terrestrial invertebrates be undertaken to gain an understanding of the dynamics of the populations and the detection of potentially harmful introductions both to the ecology of the islands, and as potential quarantine risks to Australia. We support the continued inclusion of Ashmore Reef in NAQS surveys.

Monitoring should target known insect pest groups such as boring beetles and termites (especially drywood termites, *Cryptotermes* species, which may occur in Indonesian fishing vessels that visit the Reserves, and can live in relatively small pieces of timber for many years before they are noticed) and include boat wrecks and large pieces of driftwood, as possible sources of introduction. Any timber from abandoned boats should not be allowed to remain on the islands, and it is preferable to burn and destroy vessels at sea. Similarly, boat timber driftwood should not be allowed to sit for extended periods on beaches, especially at West Island and should be removed or burned.

Because of the potential impact on nesting birds and turtle hatchlings, we strongly recommend a detailed survey of the Ashmore and Cartier islands for ant species such as the ginger ant, *Solenopsis geminata*, and other potentially damaging species such as the crazy ant, *Anoplolepis gracilipes,* which is widespread in Indonesia including Timor, and has been intercepted in quarantine in Darwin on a number of occasions. CSIRO's Tropical Environment Research Centre (TERC) in Darwin is currently monitoring non-indigenous ant species in northern Australia and should be approached to extend their work to Ashmore and Cartier Islands.

Monitoring should also target 'high risk' terrestrial molluscs such as the herbivorous giant African snail, *Achatina fulica*, which is widespread in Indonesia, including Timor. It occurs in many habitats including vegetated sandy soil at the beach margin, similar to that found on Ashmore. It is capable of aestivating during the dry season. It could survive on Ashmore and, by its presence, have a devastating effect on the vegetation and the ecology, including the re-establishment of native plants such as *Argusia argentea*. This snail and others such as *Parglogenia* (family Camaenidae) are regularly intercepted in quarantine in Darwin on shipping containers from Timor. Although there is a risk of introduction by Indonesian fishing

vessels, there is a much higher risk of translocation through the arrival of people such as illegal immigrants or equipment on the islands.

To reduce the potential for introduction of NIS terrestrial species by Indonesian fishers, and/or control the spread of existing NIS, it is recommended that the piping of water from the well on West Island to the landing beach (thereby avoiding walking over the island) be maintained, and limit access to the grave sites to marked paths, which can be more readily monitored for possible non-indigenous weed species.

7.4 Management of established terrestrial NIS

The use of the term non-indigenous species (NIS) throughout this report makes no distinction between 'harmful' or 'harmless' species. Rather, we consider that the precautionary approach towards prevention and management of all NIS, irrespective of their ecological status, is the most appropriate in achieving the proposed management goals for Ashmore Reef National Nature Reserve and Cartier Island Marine Reserve. Nonetheless, the present surveys have identified several NIS that based on knowledge of the species elsewhere, we consider may have a detrimental impact and present a high risk to the ecosystems of the Reserves. We recommend the eradication of these NIS as a matter of priority, and control or monitoring of others.

7.4.1 Weed eradication

The potential risk of spreading existing weeds from areas where they occur is considered to be very high. Foot traffic through these areas will increase the risk of spread of weeds and should be avoided.

Regular monitoring of plant species present on the Islands is needed at an appropriate time of year (March-May). Annual monitoring would be ideal, but once every 3-5 years may be a more practical interval. Monitoring of existing weed species (Table 11) should be maintained.

As a matter of urgency, two weed species, buffel grass, *Cenchrus ciliaris* and feather grass, *Pennisetum pedicellatum,* both of which occur at present in only small populations on West Island, are aggressive colonisers and have the capacity to form large monocultures and impact on native vegetation. Buffel grass threatens the natural plant communities by replacing almost entirely the understory cover of native grasses and herbs. It also alters the characteristics of the soil and ecology of the islands, and substantially increases the risk of fire. Both buffel grass and feather grass should be eradicated before they become well-established and spread to adjacent islands. This was also a recommendation of the NAQS survey (Mitchell in Curran 2003). Hand pulling or grubbing of these plants combined with herbicide treatment is recommended. In the case of feather grass, this should be done before the end of the wet season before seed has set. Buffel grass sets seed all year round and the seed heads should be removed before pulling the vegetative parts. Buffel grass seed in particular persists in the soil for many years and on-going monitoring after treatment or removal will be required.

Elimination of other identified weed species (Table 11) that are more widely established may be more difficult and persistent effort over a number of years may be required to remove them. These species appear to be less aggressive colonisers than buffel grass and feather grass and their removal is less of priority. Nonetheless, we recommend that a long-term plan for their removal be implemented, over a number of years, perhaps at the end of each wet season, when vegetative growth is at a maximum.

Extensive patches of beach caltrop, (*Tribulus cistoides*) are well established on East, Middle and West Islands. On East Island the removal of this species may be disruptive to nesting seabirds. However, on East Island, the edges of *Tribulus* patches are parasitised by the slender vine *Cuscata australis*, which provide some natural measure of control.

Burr grass, *Cenchrus brownii*, is established in sizeable populations on West Island close to the old Department of Territories Camp, and elimination is likely to be more difficult than for buffel grass, but could still be achieved through hand pulling over a number of years.

Cats whisker, *Cleome gynandra*, is an annual herb that has significantly extended its range on West Island. The value of removal of the species may be debatable as the plants frequently occur in sparsely vegetated areas where few other species were currently growing, with some birds nesting under the low canopy. Again, control or elimination could probably be achieved by hand pulling, repeated towards the end of each wet season over a number of years.

Asthma weed, *Euphorbia hirta,* is restricted to vicinity of the old weather station on West Island. It is hardy and able to colonise coastal habitats away from obvious disturbance but does not appear to form monocultures either on West Island or on coastal dunes in NT. Elimination by hand pulling is recommended.

Watergrass, *Bulbostylis barbata,* is found on West Island only near the old Department of Territories camp, and may also be eliminated by hand pulling.

Weed eradication could be undertaken by suitably trained ACV personnel.

7.4.2 Ginger ants

The ginger ant, *Solenopsis geminata*, is a small aggressive fire ant that lives in large subterranean colonies, and attacks in large numbers. It normally feeds on insects and other animals including vertebrates. However, sick, vulnerable or tethered animals are also susceptible to attack, and this ant is regarded an extremely dangerous threat, particularly to ground nesting birds and turtle hatchlings. It is likely that it could hinder and deter nesting birds, and attack and kill hatching young and older surviving hatchlings. Ginger ants may already have had a significant impact as they has been recorded on Middle and West Islands since at least 1992, and now occurs on all three islands. In the NAQS survey, Postle (in Curran 2003) observed that there has been an apparent increase in numbers of ginger ant from 2000 to 2003 on East and West Islands at Ashmore Reef.

We recommend, as a matter of urgency, that further surveys of this and other ant species be undertaken to determine the extent of its spread and its possible impacts. Such surveys should be carried out in both the dry and wet seasons, and consideration should be given to the eradication of ginger ants.

7.4.3 Other insects

The ecological impact of other non-indigenous insects, the black field cricket (*Teleogryllus oceanicus*), hide beetles (*Dermestes* spp) and Redlegged ham beetle (*Necrobia rufipes*), are difficult to determine, and we recommend that populations of these species be monitored during regular surveys.

7.4.4 Asian house gecko

The Asian house gecko, *Hemidactylus frenatus,* was rare at Ashmore Reef in May 1995, but is now widespread and abundant on West Island. It was not detected on either East or Middle Islands. The ecological impact of this species has yet to be determined. However, it is widely distributed on many islands throughout the Indo-West Pacific region and at Ashmore Reef appears to have no other competitors. It feeds mainly on insects and may have a significant impact on some species. We recommend that further research be undertaken on this species and that the population on West Island is monitored during regular surveys.

7.4.5 Rodents

Black rats introduced to West Island probably during the phosphate mining era were successfully eradicated in the 1980's. Although fluctuating populations of the house mouse apparently persist on East and Middle Islands, no firm evidence of rodents was found during the present survey. However, because of the potentially devastating impact of these species, we strongly recommend that an annual intensive trapping program on all three islands be undertaken to monitor for rodents. Such a program could occur over a period of a week, with twice-daily monitoring of baited Elliott traps (set off the ground to avoid depredation by hermit crabs). Such monitoring could be undertaken by suitably trained ACV personnel.

8 RESEARCH NEEDS AND REGIONAL COOPERATION

In addition to the recommended survey and monitoring programs outlined above (Section 8) this report has identified a number of knowledge gaps, which relate specifically to management of NIS in Reserves and to broader regional issues specifically associated with incursions of marine NIS.

8.1 Research projects

Three priority research projects to which DEH should consider supporting through National Heritage Trust funding and/or support for researchers visiting Ashmore and Cartier Reefs are:

- the effect on bird and turtle nesting sites of the ginger ant, *Solenopsis geminata*, with a view to eradication of this species;
- a better understanding of the differences in ecology and vegetation between islands, the underlying soil factors and the changes in vegetation taking place on the islands. There is also a need to build a knowledge base on non-indigenous plants invading similar coastal environments in monsoonal northern Australia and in Asia, especially islands used as sea bird nesting sites. Data on responses of individual NIS to the particular conditions associated with bird nesting sites are lacking and need investigation.
- the extent of dying bushes on East and Middle Islands and, if rehabilitation of plants is considered necessary, the effect any additional vegetation will have on the current ecosystem;
- the effect of the Asian house gecko on the insect fauna and ecology of West Island.

8.2 Regional research and cooperation

Because of the location of the Reserves and the nature and patterns of visitation to them, we strongly recommend that DEH take an ongoing broad regional interest in the issues of introduced species prevention and management, encompassing both northern Australia and the adjacent Indonesian region.

In particular:

- DEH through liaison with other appropriate Commonwealth, State and Territory agencies should encourage port NIS surveys to be undertaken for the Ports of Broome and Wyndham that follow CRIMP protocols, and support continued regular monitoring of fouling taxa at Darwin and Cairns. The survey for Broome should include Willy Creek (north of Broome) where SIEVs have been previously been abandoned. DEH lobbying and communications should include the two Port Authorities and WA Fisheries Department (agency responsible for NIS incursions in WA), as well as NIMPCG, CCIMPE or AQIS.
- DEH should encourage and support any further marine debris monitoring at Cape Arnhem (or other sites) by WWF to include a sampling and documenting component for attached biota.
- DEH should encourage NIMPCG to take a regional approach to the control and prevention of introduced marine pests and support APEC MRC-WG recommendations (Williamson *et al*. 2002: Section 5), aimed at improving knowledge of the distribution of marine pest species, with:
- *"the undertaking of baseline port surveys of all major trading ports in the region using consistent protocols"* and;
- "*the development of a complete list of introduced species in the APEC region*", particularly those that target harbours in the SE Indonesian archipelago for fouling pests. An example of the need for such cooperation is the discovery during the present survey of the first record for Australian waters of *Australomegabalanus krakatauensis*, a barnacle species with congeners that have a nuisance fouling status.

Present lack of knowledge regarding the types and sources of this and other marine species attached to hulls or marine debris in the region prevents any meaningful risk assessment of this vector. DEH should particularly encourage and support work with Indonesian authorities to identify ports in Indonesia that have established populations of NIS and which are 'High Risk' for vessels transferring these species to Ashmore or Cartier Reef.

- DEH should encourage NIMPCG, AFFA and CCIMPE to support and help fund a pilot program of joint, collaborative surveys with Indonesia for rapidly sampling and assessing ports and harbours in the Nusa Tenggara region for fouling pests, using a similar approach applied to Ashmore Reef. These surveys should contain a training component for Indonesian marine scientists and could be conducted under the auspices of the UNDP-IMO GloBallast Program with AusAID support. In this context, port NIS survey training has recently been undertaken under the UNDP-IMO GloBallast Program at the East Asian and South Asian regional demonstration ports, but these sites are very distant (ie. Dalian, NE China, and Mumbai, west India). It is also unlikely that the GloBallast Program will stimulate port surveys in the Indonesian archipelago in either the short or mid-term without active encouragement and support from Australian government bodies such as DEH, AFFA, NIMPCG, CCIMPE, DBIRD etc. For example, all countries sent senior representatives to the recent inaugural East Asian Regional Meeting of the GloBallast Program (Beijing, October 2002) with the exceptions of Indonesia and Russia.
- As Port States, both Indonesia and Papua New Guinea are members of the Tokyo Regional Memorandum of Understanding of Port State Control (Tokyo MOU). DEH could request AMSA to put the topic of rapid port surveys for fouling NIS on its agenda (China and Japan are planning a port alert system for 'red tide' outbreaks of toxic dinoflagellates that can operate under the Tokyo MOU).

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