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Oiled wildlife response for Antarctica: Practical and realistic solutions

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ABSTRACT 299917:

Through the Antarctic Treaty on Environmental Protection all of the Antarctic member nations are required to have in place contingency plans for oil spills including oiled wildlife response. The current risks for marine pollution incidents to the Antarctic environment include refuelling activities associated with Antarctic stations/bases; routine station/base activities; and shipping associated with stations/bases, tourism, commercial fishing and whaling. Between 1981 and 2011 there have been reported 33 spills or near spill incidents associated with the Antarctic marine environment. Wildlife at risk from oil spills include seabirds (flying birds and penguins), pinnipeds and cetaceans. Antarctic and polar environments both provide a number of logistical and practical complications given their climatic and geographic character. The key elements for response actions for Antarctic wildlife identified are divided amongst primary, secondary and tertiary oiled wildlife response activities. Primary activities identified include focussing containment and clean up efforts to protecting wildlife as a priority using tools such as sensitivity mapping, stochastic and real time modelling. Secondary activities specific to individual wildlife groups were identified and included specialised hazing, exclusion and pre-emptive capture mechanisms focussed to the Antarctic environment. Tertiary activities are considered with regards to the real capacity of Antarctic stations to respond, take and rehabilitate oiled wildlife given the Antarctic environment and its limitations. The paper identifies realistic mechanisms and systems considering the climatic, logistical and practical issues of the Antarctic environment. Although specific to Antarctic bases the paper outcomes can be equally applied to other polar environments.

CONTINGENCY PLANNING REQUIREMENTS:

Protocol to the Antarctic Treaty on Environmental Protection

The Antarctic marine environment (the sea area south of 60° S) has been classified as a “Special Area” under the International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 – known as MARPOL 73/78 (Annex 1, Regulation 9)1. This “Special Areas” classification has been designated due to the vulnerability of Antarctic environment to hydrocarbon pollution events. Through this legislation, discharges of any fuel material are completely prohibited to this area.

In the Antarctic and sub-Antarctic environments, treaty nations are responsible for developing, implementing and maintaining contingency plans to respond to fuel pollution incidents from their operations and activities under Annex VI of the “Protocol to the Antarctic Treaty on Environmental Protection”.

There is also a community expectation that treaty countries will also take a lead role for fuel pollution incidents from other external activities (e.g. visiting tourism operations, whaling and commercial fishers) as well as providing support to neighbouring territories if required.

Council of Managers of National Antarctic Programs

In addition to the Annex VI requirements the Council of Managers of National Antarctic Programs (COMNAP) requires the need for fuel spill contingency planning specific to OWR. This is referred to as "Bird and Mammal Cleaning" (COMNAP Fuel Manual (Version 1.0; 01-April-2008)) and identifies that planning systems need to include:

1. Descriptions of the effects of oil on birds and mammals;
2. Details of the methods for cleaning, including cleaning materials and equipment necessary; and
3. The identification of experts who can support an oiled wildlife response (OWR).

Historically there have been no contingency plans or systems in place for Antarctic and sub-Antarctic environments to respond to wildlife threatened or impacted from oil spill incidents. These actions also do not meet the public or political expectations of an oiled wildlife response for the Antarctic or Sub-Antarctic environments nor do they reflect best available practices using the three tiered OWR approach.

MARINE POLLUTION RISKS:

The current risks for marine pollution incidents to the Antarctic environment include refuelling activities associated with Antarctic stations/bases; routine station/base activities; and shipping associated with stations/bases, tourism, commercial fishing and whaling. Between 1981 and 2011 there have been reported 33 spills or near spill incidents associated with the Antarctic marine environment (Ruoppolo et al 2012). Wildlife at risk from oil spills includes seabirds (flying birds and penguins), pinnipeds and cetaceans.

EFFECTIVE OILED WILDLIFE RESPONSE ACTIONS:

Effective OWR is characterised by three different tiers of response actions that are termed Primary, Secondary and Tertiary actions (Figure 1).

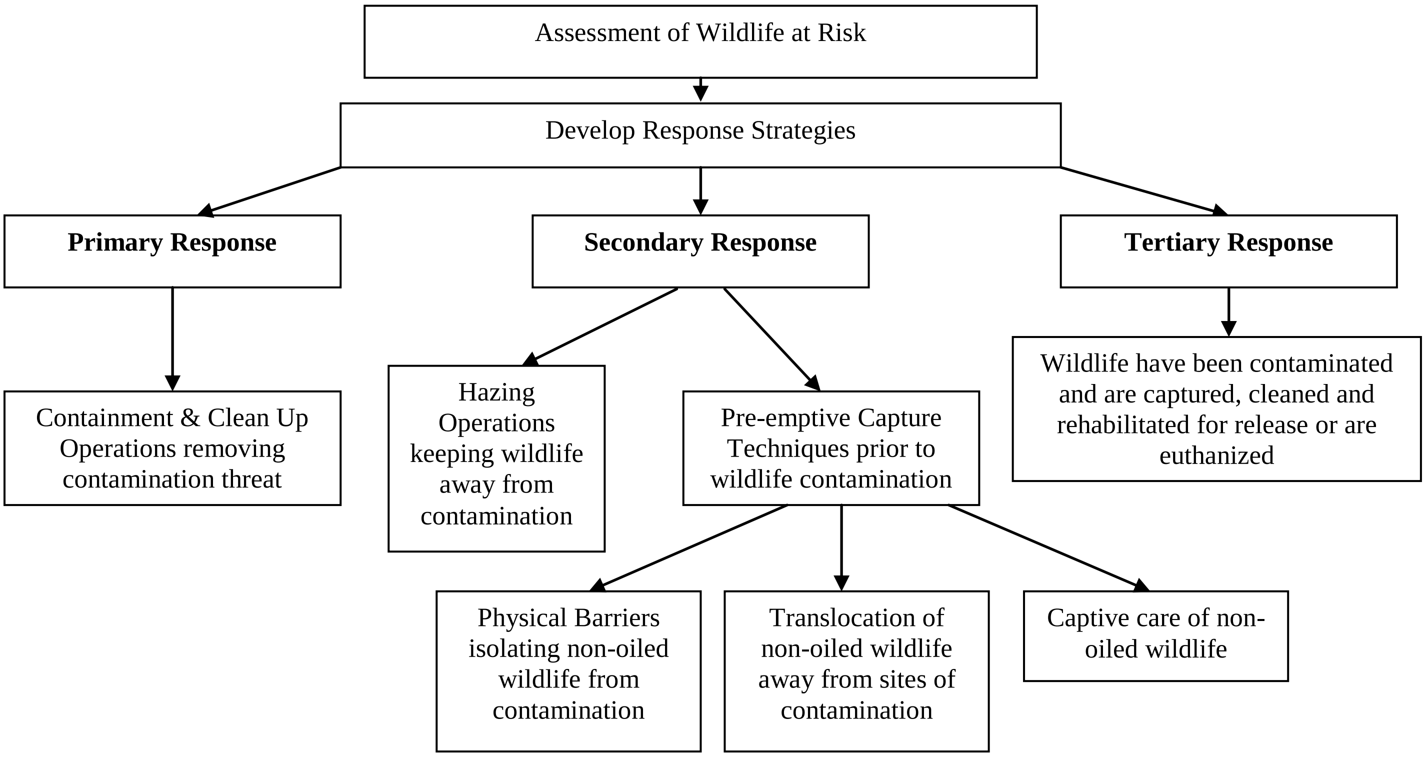

Figure 1: OWR Actions - Flow Diagram of Activities

Primary OWR actions

Primary response actions deal specifically with containment and cleaning up the fuel spill to prevent wildlife impacts in the first place. This typically involves prioritising of clean up response efforts and actions specific to wildlife protection needs. This does require a formal process with wildlife specific considerations to compliment this action. Given the difficulties and limitations of secondary and tertiary actions to the Antarctic and sub-Antarctic environments Primary OWR actions are an essential consideration.

Secondary OWR actions

Secondary response practices utilises what are known as hazing and pre-emptive capture techniques. Hazing techniques includes systems to keep wildlife away from the contamination sites through a system of artificial threats (including noise and visual devices). Pre-emptive capture involves the isolation and/or capture of wildlife from contamination sites by either physical barriers preventing access to contaminated sites; transferring the wildlife well away from the site of contamination and releasing them; or holding the wildlife in short term captivity whilst the contamination and threat is removed. These approaches have been used world wide, on very large scales and have been shown to be very effective for a range of species (Gartrell 2014) including penguins during the *Treasure* oil spill in 2000 (Wolfaardt et al 2008).

Tertiary OWR actions

Tertiary response actions are where wildlife have been contaminated and are captured, cleaned and rehabilitated for release. This is the most complicated of all the wildlife response operations in any location because of the specialised resource requirements to support this action. Tertiary response actions are however achievable in many difficult situations. Often where there are limitations prioritised wildlife, through triage processes, can still be rehabilitated even on a small scale. In some instances wildlife are captured, as a part of a Tertiary response, but are euthanized as a welfare consideration without rehabilitation. This is considered where not all animals can be effectively cleaned and rehabilitated through to release. Such considerations require specialised assessments and planning processes and cannot be viewed as the only tertiary response option.

PRIMARY OWR ACTIONS FOR ANTARCTIC & SUB-ANTARCTIC ENVIRONMENTS:

In the event of pollution releases to the marine environment it is essential to have available effective containment systems and equipment devices. Given the issues of logistical limitations and climatic issues for the Antarctic and sub-Antarctic environments this is a critical feature.

Equipment resourcing

Contingency plans need to be realistic about resourcing spill containment and clean-up equipment and specifically mobilising resources from international response resources held by treaty countries and professional oil spill response organisations. The practicalities and time frames for mobilising resources from outside of Antarctica is unlikely to provide a suitable level of response support in a timely manner. The net effect of relying on such support mechanisms that are likely to fail would be turning an acute pollution situation into a chronic response matter that may last for months to years.

First strike response capability

Treaty country stations need to develop a “First Strike Response” type capability for marine pollution events within the available on site station resources. This response approach is the most effective and the best available mechanism to strengthen an immediate response capability. This would need support for equipment purchases, training and exercising at each station based on pollution risk assessments.

As a standard approach for high risk marine pollution activities, such as ship to shore refuelling operations, it is often a requirement to have in place containment booms surrounding the refuelling vessel and fuel hose for non-polar environments. In the event of any spill incident lost materials are then contained and the situation can be controlled and responded to effectively. This is often a government or industry requirement in many countries. This is generally not considered as a standard response system for Antarctica but needs to be addressed as a priority.

The modelled weathering patterns of the Special Antarctic Blend fuel (SAB) and lighter fuels used by Antarctic and sub-Antarctic stations has shown that if contained in an open ice free environment most will largely evaporate or naturally disperse in a very short time frame (i.e. days). By expending capital into effective booming systems the ability for spilt fuels to be contained and allowed to naturally dissipate quickly with minimal long term effects is an effective outcome for both marine pollution responses and ultimately protecting wildlife. Where fuels are not contained there is the potential they become trapped under the ice and with each summer thaw and winter freeze the incident can develop into a chronic pollution incident.

Having available a marine environment boom can also provide a hazing device for penguins during across ice fuel transfers. Penguins have been observed as showing avoidance strategies to the presence of the fuel hose during refuelling operations. The placement of boom across the ice, parallel to and either side of the fuel line, would keep penguins away from the hose and away from any spilt fuel. SAB or equivalents, because of their chemical properties, would cause skin burns and ulcerations to wildlife; it may also cause chemical erosion of feathers that may compromise waterproofing and potentially the long term release of rehabilitated wildlife. Keeping wildlife away from any spilt fuels is therefore very important. For a spill during refuelling operations the focus on personnel will be to isolating and containing the immediate situation. There will not be the opportunity to keep inquisitive wildlife away at this critical point because of the response focus. Having a static boom in place will provide an immediate deterrent to wildlife from being contaminated and will also help contain or limit the flow of spilt fuel across the ice. This hazing feature is also discussed later in the paper.

Sensitivity mapping

Where there is a marine pollution incident and pollutants have not been contained it is important to identify what habitats should be prioritised for protection using the available containment/deflection devices. A system of sensitivity mapping, prioritisation of efforts and methods for protection (e.g. containment system placement and anchoring systems etc) is a standard contingency planning process for marine pollution responses at specific focal points (e.g. refuelling operations to stations etc.). This assessment and documentation action needs to be developed for all of the Antarctic and Sub-Antarctic stations. To achieve an accurate outcome stochastic trajectory modelling for likely spill pathways during a range of climatic conditions will need to be undertaken for each of the individual stations. This will identify the environments at most risk of contamination and where best to direct planning efforts and actions.

During pollution incidents it is a standard approach to model the path and weathering processes of spilt chemicals. This provides real time intelligence information for response planning purposes during incidents and is used by industry and governments nationally and internationally.

The process for stochastic modelling and real time incident weathering and trajectory modelling can be provided by specialist companies that have the capacity to provide 24/7 data support. Contingency planning systems need to identify the necessary arrangements to support these modelling requirements.

Mechanical dispersion

As a part of the natural weathering action for spilt SAB and equivalent fuels there are also simple approaches to help expedite the breakdown or weathering process. This can be applied to all of the stations as standard operational response practices for spills in open waters. They involve mechanical dispersion mechanisms such as breaking the surface tension of the floating fuels using devices such as outboard engines and fire fighting pumps to agitate the surface that promotes evaporation and dispersion. Such actions need to form a part of the standard operational procedures for spill response and be documented to existing response planning systems.

Pollutant Clean Up Systems

In terms of clean up activities, where SAB and other lighter fuels are contained on the waters surface, generally the product is collected using specialised absorbent materials. The use of traditional skimming devices is generally not considered as they are not efficient for collecting hydrocarbons of this low viscosity. Where SAB or equivalents are released to hard ice surfaces specialist absorbent products should be used. Where light fuels reach shorelines then traditional approaches of managing contaminated soils/sediments will need to be undertaken.

For an effective clean-up effort the amount of equipment available on station needs to match the likely spill volume estimates identified through risk assessment processes.

Aboard station supply ships there also needs to be spill clean-up systems that can be easily mobilised for the collection/absorption of spilt low viscosity fuels.

Dispersants and in-situ burning

The resources provided by treaty countries to stations for absorption and clean-up are specific to low viscosity spills, like SAB, they are not suitable for heavy fuel oil spills. Although there is a requirement for vessels using the Antarctic environment to only use fuels like SAB there is a possibility that not all marine operators to this environment will comply.

For heavy fuel oil spills the use of dispersants and in situ burning techniques are normal considerations. Dispersants have been considered as common practice for a range of medium to high viscosity type spills for Artic and sub-Artic environments in the past. In situ burning was originally developed for Arctic environments because of the clean up issues to these locations.

It is therefore recommended that the use of dispersants and in-situ burning be reviewed in detail by treaty nations with a consideration that they be listed as options during clean up responses. The approval process for these types of activities would require the production of a Net Environmental Benefit Analysis (NEBA) validating their use that would allow for a detailed evaluation and recommendation at the time of the incident.

SECONDARY OWR ACTIONS FOR ANTARCTIC & SUB-ANTARCTIC ENVIRONMENTS:

Given the complications of Tertiary response actions and limitations within the Antarctic and sub-Antarctic environments, where there is a high likelihood of wildlife being contaminated, the actions supporting Secondary response actions become an important priority.

HAZING:

Hazing actions for solid ice conditions

Penguins

Options for hazing include the use of: physical barriers (e.g. containment booms, barrier fencing mesh etc.) isolating the areas contaminated (i.e. ice or sediment) from wildlife; barrier systems (e.g. booms, barrier fencing mesh) to act as diversions to funnel animals away from contaminated sites when animals are transiting across areas; and effigy devices (e.g. predator effigies, station vehicles etc.) to keep animals away from sites of contamination. Noting that noise devices for hazing are not recommended for high density penguin colonies given the trampling/stampede risk and the potential for injuries and mortalities.

Flying Sea Birds

Options for hazing include the use of effigies patrolling the areas of contamination (e.g. quad bikes and other station vehicles etc.) and noise scaring deterrents (e.g. air horns and/or bird fright).

Pinnipeds

Actions include the use of: closing air holes in the ice near contaminated areas; the use of predator effigy devices and vehicles near sites of contamination; and the use of physical structures to isolate animals away from sites of contamination (e.g. half height shipping containers or similar).

Hazing actions for unstable ice and open water conditions

Penguins

Options such as barrier fencing mesh installed at major island runways to restrict birds from reaching contaminated areas or barrier fencing mesh to act as diversions to funnel animals away from contaminated sites when they are transiting should be considered.

Flying sea birds

The use of noise devices (e.g. air horns and/or bird fright etc.) and station vehicles (e.g. rotary winged aircraft) to haze wildlife away from sites of contamination are potential options.

Pinnipeds

The use of rotary winged aircraft and watercraft to haze animals away from sites of contamination are feasible considerations.

Cetaceans

There are minimal effective actions available to deal with cetaceans during marine pollution incidents in the Antarctic and sub-Antarctic environments. In most instances using the existing stranding response systems as a part of tertiary actions will be the only option.

PRE-EMPTIVE CAPTURE:

Where hazing is not an effective response action then considerations for pre-emptive capture is the next option. This can be through restricting wildlife movements, transferring wildlife to other clean sites or holding wildlife in captive care while the contaminants weather naturally, dissipate or are physically cleaned up.

Wildlife restricted to their clean habitats

Where there are limited resources to move large populations away to clean habitats it may be more acceptable to look at fencing in colonies to their nesting/roosting/moulting habitats. This could be achievable but would need to be considered on a case by case situation.

Certainly where there is a risk of frightening the animals and causing stampedes (e.g. large penguin colonies) the risk to the population would not be acceptable. There have been cases already where large numbers of penguins have died during stampede situations. This approach for penguins would need very careful consideration.

For moulting seals it may be possible to isolate the colony, in the short term, using structures such as half height shipping containers. This would not be a simple approach but if well planned and where opportunities exist could be effective.

For flying seabirds, isolating animals to habitats is not a practical consideration.

Wildlife transferred away from the areas of contamination to clean habitats

A large proportion of the wildlife populations at risk near stations have chosen these sites for very specific reasons (e.g. nesting habitat; safe moulting environments etc). In removing animals from these important habitats they will most likely return within short time frames unless they are taken a considerable distance. If during a pollution incident re-supply vessels are in close proximity then re-locating large numbers of animals at relatively large distances from the contamination may be a workable option.

HOLDING NON-OILED WILDLIFE IN CAPTIVE CARE:

The last secondary OWR option available is taking clean wildlife into captive care.

For pinnipeds the ability to anaesthetise adults, hand capture juveniles, airlift large animals with helicopter support and house animals adequately using seal experts would be the minimum requirement. The resources available on hand at stations or aboard re-supply vessels are unlikely to be able to support this action. Formal considerations should however be put in place to pre-determine the feasibility of this response approach.

For penguins, personnel skilled in penguin handling and capture would be necessary. As these animals would not be contaminated the housing requirements for penguins would be minimal and simple. Systems of temporary fencing using existing structures (e.g. walls of buildings and shipping containers) and barrier fencing mesh could be readily established to hold large numbers of penguins for a limited duration. The husbandry requirements would be minimal, in the short term, given the fat reserves commonly stored and available for penguins. Assuming that the contaminants were able to break down quickly (e.g. modelled SAB scenarios) holding times could be limited to days and may not be detrimental to the adult population under this situation. This would not be the case for juveniles that had not fledged, relying solely on adults for food and care. Considerations for euthanasia may be a better outcome for this age class. Where capture and transport of animals is required, supporting this action would be complicated and would require a high level of pre-planning.

For flying birds this is more complicated that the penguin model. The capture of healthy flying birds requires very skilled seabird experts. From time to time the stations do have seabird projects in progress with experts on site. These personnel could be used to support collection activities. The housing for flying seabirds does require specialised designs. Cages or housing systems would need to be constructed with net bottom systems, in prefabricated form and held on station if this was to be an effective outcome. Because of the limited fat reserves held by flying seabirds, feeding may be a necessary consideration whilst the animals were in captive care. Husbandry training would be specific to tube feeding and general handling practices with support of some basic levels of equipment. Food to be fed to birds could be made available through commercially available veterinarian products and such products would need to be held on station in the long term providing a simple feeding solution. This is a complicated option and would require detailed planning and resourcing and may not be a practical consideration.

TERTIARY OWR ACTIONS FOR ANTARCTIC & SUB-ANTARCTIC ENVIRONMENTS:

Where wildlife are contaminated there are animal welfare considerations that must be addressed as a part of the response decision process. For oiled wildlife there would be an expectation to collect contaminated animals and either euthanize the animals in a humane manner or decontaminate and rehabilitate the animals for release.

Under some circumstances euthanasia as a response tool may be the best outcome. The decision process supporting this would require detailed OWR capacity reviews for each station, NEBAs, other validating processes and be supported by pre-prepared media statements. Even though this may seem a simpler outcome logistically there will still be the issue of collecting contaminated wildlife, temporarily housing them, undertaking euthanasia, and disposing of the carcasses in a manner that meets appropriate waste management guidelines. Purely from a welfare consideration, as a minimum, this response action is necessary for contaminated wildlife.

In terms of providing full tertiary OWR actions to wildlife, cleaning of contaminants and rehabilitation of animals through to release, there are a number of logistical and practical limitations for each of the stations to consider. These include in the first instance: the numbers of supportive personnel to care for wildlife; the skills and experience of available personnel; the availability of controlled temperature housing environments; water for decontamination; and waste water disposal options. Because of the specialist needs for pinnipeds and cetaceans the only group of wildlife likely to be considered for Tertiary response are in fact avian fauna. Through a process of individual station assessments it is possible to determine the minimum number of birds that could be adequately cared for by each station during the summer season when there are peak numbers of station personnel available. This however assumes that specialised OWR training and resourcing systems have been established at the stations to meet the necessary wildlife husbandry needs. Where there are station re-supply ships available the number of wildlife that could be taken into captivity would increase given the onboard resources that would be available to further support response actions. The key advantage of re-supply ships is their ability to produce and manage large volumes of water for the decontamination process.

CONCLUSION:

In summary the report concludes that for the treaty nations to meet their obligations and expectations for OWR they must consider OWR formally using Primary, Secondary and Tertiary response options.

There are a number of feasible and practical options available for OWR outcomes in the Antarctic and sub-Antarctic environments and using experienced OWR contingency planning experts will be the key to an effective contingency planning outcome.

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