Burning on the Beach – is this the best option for GhostNets?

Author. Jennifer Goldberg, GhostNets Australia

Abstract People living along the remote northern coastline of Australia are faced with an issue that wasn't recognised until recently (Gunn *et al.,* 2010), that of vast amounts of marine debris particularly ghost nets(abandoned fishing nets), brought to shore by the winds and currents of the Arafura Sea. The majority of this debris (70-90% by weight) is from fishing industries and reflects the increasing use of plastics in an industry that traditionally used more eco friendly, biodegradable materials (Kiessling., 2003).

GhostNets Australia (GNA), based on a grass-roots alliance of Indigenous communities, is aimed at finding a solution to the issue of ghost nets accumulating on this coastline. Currently, large numbers of nets are collected from beaches, but there is no solution as to what to do with this rubbish. Disposal of the nets is one area that GNA has struggled to resolve due to constraints of funding and distance, and which to date has unfortunately been done through landfill or burning *in situ*. GNA continues to explore alternative recycling measures and seek partnerships assisting with these alternatives in a continual bid to develop long term, permanent solutions to the problems of ghost nets and marine debris.

This paper represents an argument for the formation of long-term bulk-use solutions within a remote area that will circumvent the inherent high transport expenses and logistical difficulties encountered.

Introduction GhostNets Australia (GNA) was born out of concern by remote Indigenous communities who had observed an increasing amount of marine debris being deposited on north Australian coastlines. Of particular note was the large quantity of ghost nets, often with the remains of entrapped animals, tangled rope and other fishing accoutrements. Nets are classified as either mono or multifilament with the core construction products being polyethylene or nylon. These synthetic materials have produced nets that are stronger, cheaper, more buoyant and take longer to break down (Gunn *et al.,* 2010).This composition in contrast to the traditional manufacture that use organic fibres such as cotton, flax or hemp (Donohue *et al* ., 2002). The persistence of these synthetic nets coupled with increasing effort to harness fisheries has led to larger nets, more intense operations and a build-up of nets ranging in size from small scraps to 6 ton in weight, accounting for approximately 5 percent of the total debris found in the ocean (Minton., 2000).

The extent of the problem affecting remote area beaches is demonstrated by the following examples;(i) A clean-up effort between July 2010 and May 2011 during which 23 ute loads of nets were removed by the Northern Peninsula Area Rangers;(ii) further south Mapoon Land and Sea Rangers collected over 30 ute loads of Net and Plastic fishing rubbish within a 12month period. Plastics represent a substantial amount (Dhimurru, Northern Territory 59% plastics; Lockhart River, QLD 64% plastics) of the total rubbish collected during community beach clean-ups (Heathcote *pers comm.*, 2011; H. Taylor *pers comm.,* 2011).

Worldwide, multiple research journals supply specific details of the magnitude of the marine debris problem. Examples of the types of impacts of ghost nets on non target wildlife are; up to 30,000 northern fur seals die from entanglement in Alaska each year (Fowler, 2000); in Japan, as many as 500,000 octopuses may be accidentally killed yearly (Matsuoka, 2004); Limpus (2008) states that “turtle mortality in Australia’s Gulf of Carpentaria "ghost net" fishery is unquantified but appears to be hundreds, if not thousands of turtles annually.”

The actual physical and economic impact of ghost nets on ocean farers is also well documented; Johnson (2000) describes marine debris as a propeller-snagging problem for fishermen; for example the Japanese fishing industry spent $4.1 billion repairing boats damaged by debris in 1992 (Watanabe, 2004). Further impacts known to be associated with ghost nets are the potential damage to benthic substrates, and the biosecurity risk to north Australian environments (Heathcote *et al., 2011*). There can be no doubt about the need to remove the nets from the marine system, but plenty of direction is needed for management of the net post shore removal in terms of disposal options. Additionally, due to the nature of the problem there has been no comprehensive estimate of tonnage or impact which means any solution needs to incorporate a degree of flexibility to cope with the unquantified elements.

However, rather than attempting to quantify the magnitude of the problem, or its causative factors the focus of this paper is to;

1) Outline the issues faced by remote Australia in relation to dealing with the removal of ghost nets in a sustainable (economic, environmental and social), and acceptable manner
2) Highlight knowledge gaps in dealing with recycle and reuse options for as much of the most undesirable debris as possible.

Methods GhostNets Australia (GNA) operates in an area that is expansive, remote and sparsely populated, stretching more than 4600km across north Australia. Over 70% of this coastline is held under Aboriginal ownership, with the main infrastructure focused around a few large mining centres’ (See figure 2).

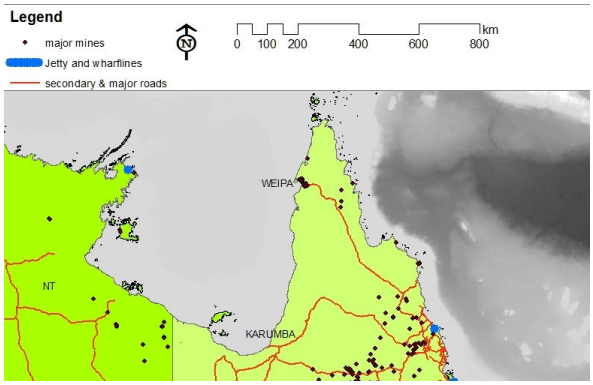

Figure 2: Major infrastructure and Roads present in northern QLD.

From Princess Charlotte Bay on the East Coast of the Northern Peninsula Area, across the Torres Strait to Broome, cleanup of ghost nets and other marine debris is mostly conducted by, but not limited to, Indigenous Rangers and volunteer organisations.

Removal of ghost nets across Northern Australia is sponsored by GNA with funding provided by the Federal Government. This funding provides benefits for the rangers, GNA and the environment. Rangers benefit in terms of wages, capacity building and the promotion of ecological,

spiritual and human health through working on country. GNA receive valuable spatial data and information on the nets enabling them to better target the source. GNA have identified that the bulk of the nets come from South East Asian fisheries with Australian fisheries making up only 8.6% of those found (Heathcote *et al*., 2011). The environment benefits are obvious particularly in protecting sea life as the net is prevented from washing back to sea. An East Arnhem Ranger noted that "after years of nets being removed from eastern Gulf beaches, there has been a decline in *the number of nets washing ashore in the western Gulf*" (Roeger, *pers. com*. 2010 in Heathcote *et al*., 2011).

A simplified flow chart of the factors involved in the loss of fishing net and the management options indicate no structure is in place to assist ranger organizations with acceptable practices for net disposal or reuse (Figure 1, below). Three main factors are causative in the loss of net to the ocean (environmental, economic and social), these factors are also adversely impacted by the loss of net. Few options exist for what to do with the rubbish, they are recycle or reuse, *insitu* burning or landfill. These approaches are constrained by logistics and economics. I put forward a case that the only sustainable option is to recycle or reuse what we are recovering, and that we should be targeting effort towards achieving this outcome. The discussion that follows analyses the different models for dealing with shore recovered debris in north Queensland and in so doing sets a goal to source an environmentally and socially acceptable solution.

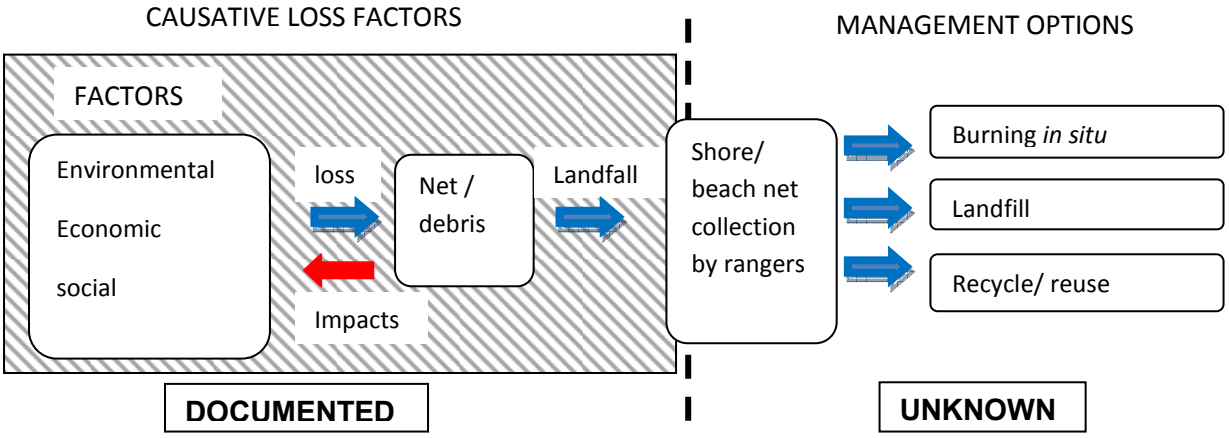

Figure 1: Factors involved with net loss through to recovery.

Results and Discussion

Burning The decision to burn is always a last resort and based on the limitations imposed by the environment. Field conditions for net collection are harsh (with temperatures regularly exceeding 30^{o}C), distances traveled are large across difficult terrain, constrained by weather and season and coupled with the fact the work is physically demanding.

Many ranger groups are against burning nets *in situ*. The Dhimurru Ranger Land and Sea Ranger Coordinator states "evidence still exists from prior burning on the beaches in the form of a huge, heavy, immovable mass of melted plastic that will take forever to deteriorate or bury" (V.

Drysdale *pers comm.,2*011). Indeed the residual slurry from beach burning not only is a visual eyesore but is also difficult to remove as it fragments and contains both burnt and un-burnt net.

Health risks associated with the burning of plastics are commonly understood. A study assessing the inhalation toxicity of polyethylene's found carbon monoxide (CO) and Acrolein to be the most predominant toxicants formed in an oxidated atmosphere simulating real fire conditions when polyethylene's were burnt (Paabo & Levin., 1987). Both of these combustion products are considered toxic to humans. Acrolein is a severe pulmonary irritant and lachrymatory agent (tear gas). It was used as a chemical weapon during World War I. Carbon monoxide is colorless, odorless, and tasteless, but highly toxic, and the most common type of fatal air poisoning that occurs in many countries (Omaye, 2002; Beauchamp *et al*., 1985). Additionally there may be some synergistic effect on health of these and other gas byproducts of burning plastics. Certainly an action such as burning plastic that is illegal in most countries, and that within an urban context would never be allowed, should not be tolerated just because it is occurring within the part of Australia inhabited by less than 1% of the continents total population.

Landfill Should the rangers bear the added expenses and effort to transport the debris to the local tip, the resultant disposal (to landfill) of the huge amount of rubbish found on these beaches places an enormous burden on local refuse systems. Not only does this approach place additional stress on small rubbish depots, but depending on management strategies this method often only results in bringing the problem closer to home. Anecdotal evidence suggests burning of tip contents by most remote area shire councils though not sanctioned, does occur (R. Lawrence, DERM *pers comm..* 2011; C. Buckinham DERM *pers comm.*., 2011).With most community tips located between one and three kilometers from schools and homes, the fires risk spreading toxic and unacceptable fumes throughout these communities.

At the Weipa tip attempts were made to "rip-up" net with the machine that tears and shreds the other rubbish, but it fouled up the mechanism, so net cannot now be put through it (P. Harper *pers comm*., 2007). Operators are unwilling to burn net, and unable to landfill it, so Rangers are stockpiling net until a working solution is found.

Recycle/ Reuse Government policy is now targeting green goals, this intent is reflected in the recent Queensland Waste Reduction Strategy which highlights recycling and reuse as two of the top three priorities within the waste and resource management hierarchy (DERM 2010). However, the same document fails to address plastic recycling. The remoteness of northern Australia restricts access to plastic recycling plants in not only other parts of the country, but also the world mostly because of the prohibitive costs involved with transportation.

A partial solution to this dilemma has been through an innovative project where GhostNets Australia, *reuse* the net through a large network of renowned fibre artists that facilitate workshops marrying traditional weaving and fibre techniques with these modern materials. The resulting art has multiple benefits spanning social health, building cottage industry, through to creating awareness of the ghost net issue. However sexy and successful, the reuse strategy of these art workshops still do not tackle the vast bulk of the net and other debris that is being

collected. A recycling solution grounded in strong partnerships and based on firm research, new technologies and knowledge of the area will deliver a permanent and productive outcome.

Fishing net substance is mostly polyethylene and nylon which are both useful reusable base material. The recovered net is in a form that is often encrusted with sand, entangled with other debris and fishing products such as floats (polystyrene), ropes, and sinkers or squid jigs. It is also in various states of decomposition dependent upon the duration the net has been at sea or buried on land. These are factors that impinge upon its reuse value as a resource.

Several steps can be highlighted as milestones towards achieving a plastic recycling protocol for north Queensland, all of which will involve existing, or the development of new, partnerships. The steps that have been identified as essential in order to recover useful material are; storage, chopping and cleaning, transportation, and finding a market for the final product.

1) Storage - The amount of debris rangers collect varies dependent on effort, location, and input - that is how much net is entering the system, which can be sporadic (reliant on currents and wind). A centrally organized storage space is needed where the many groups involved in marine debris collection can take their net and recyclable plastics until the bulk is sufficient for cutting and cleaning. In Hawaii, Schnitzer Steel services a 27m^3 bin located at a sea port where fishermen and other ocean users can dump net. At present there are no facilities in northern Australia's ports where nets can be disposed of. Therefore, this also highlights a potential avenue to assist fisheries to better manage old or damaged nets (Lambeth *pers. Comm.,* 2011 in Heathcote *et al*., 2011).
2) Chopped and Cleaned - Chopping has multiple benefits. It makes the rubbish smaller so it occupies less bulk, is in a more recycle friendly form, and is easier to transport. In Hawaii steel recycler (Schnitzer Steel), cuts fishing net recovered by the Coast Guard and NOAA into foot-long pieces that can be used by a Waste to Energy (WTE) company, larger pieces would be rejected and buried in a landfill. Cutting the net into smaller pieces has the added advantage of shaking free a lot of the encrusting sand that would foul a recycling processor. Additional thought might go into incorporation of a wash system using recycled water similar to those wash stations operated by Australian Quarantine to prevent the spread of weeds.
3) Transportation to the recycler - This step really needs a regional solution to avoid the need for heavy subsidies. Back loading though philanthropic transport companies may not be a long term sustainable option as it depends on charity and a supportive, strong economy. Existing plastic recycle plants capable of dealing with marine debris are located in South Australia, and Taiwan.
4) Market for the recycled product - An ideal solution for product recycled on Cape York would be for it to be retained within the Cape. Suggestions mooted include use as a road base aggregate, building material for house structures, or a similar product used by QPWS as boardwalks.

How can we make this all work? Within Queensland the recent introduction of a levee to landfill for urban areas has opened up funding opportunities that are to be channeled into waste reform. The objectives outlined within this reform align perfectly with the targets for infrastructure upgrades and establishment of resource recovery facilities that the north is in need of. Many stakeholders and agencies beyond GNA could find benefit in the development of strategies that divert waste from landfill. These stakeholders include local councils and shires; state and federal government; alternative manufacturing business; other NGO's involved in beach clean-up (Tangaroa Blue); Rio Tinto; RAAF and the Scherger Base to name a few. The spin off benefits to regional communities of a regional recycling hub would be a source of raw materials that could be used in building applications, road fill or for the establishment of new industry.

To take advantage of these opportunities a need is identified to establish a pilot project to design an approach to recycling in remote QLD. This pilot project could be run as a post graduate research project through a university Sustainability course.

In summary, this paper isn't about drowning in the waste issues facing remote coastal communities. It's about being proactive, and creating opportunities. What has been termed a tyranny of distance may actually be seen as a clean slate, as outlined above, nothing is happening in the Cape with regard to recycling. However, an opportunity exists through government funding and support, and collaboration between stakeholders to set up truly innovative recycling measures for remote Australia.

Take Home Messages".

- The issue of marine debris is complex, and not going away, it requires more than just a quick fix cleanup. We need to find solutions to marine waste other than burning and landfill. The product is recyclable and so the end result needs to be more positive than landfill or burning both of which are unacceptable in the long term.
- The establishment of waste management facilities in remote north Queensland will only be successful through multiple partnerships.
- Work together to take advantage of new funding streams to establish a recycling future for remote north Queensland in the first instance, and to set a path for northern Australia.

Acknowledgments. .

The rangers of the GNA saltwater people network, C4OC and NGRMG.

References.

Beauchamp R., Andjelkovich., D, Kligerman A., Morgan K., Heck H. A critical review of the literature on acrolein toxicity. Crit Rev Toxicology. 1985;14(4):309-380.

Donohue, M.J., Brainard, R., Parke, M., Foley, D., (2002) Mitigation of environmental impacts of derelict fishing gear through debris removal and environmental monitoring. In: International Marine Debris

Conference: Derelict Fishing Gear and the Ocean Environment Proceedings. Hawaiian Islands Humpback whale National Marine Sanctuary Publication, pp. 383–401.

Drysdale, V (2011) Dhimurru Ranger Coordinator; personal communication

Fowler, Charles, Alaska Fisheries Center. 2000. “Ecological Effects of Marine Debris: The Example of Northern Fur Seals,” IMDC.

Gunn, R., Hardesty, B.D., and Butler, J. (2010) Tackling ‘ghost nets’: Local Solutions to a global issue in Northern Australia. Ecoogical management and Restoration 11(2), 88-98

Harper, P (2009) Napranum Ranger, personal communication.

Heathcote, G., Gunn, R., Goldberg, J., Hamblin, L., and Morrison, S. (2011) Summary Report 2004-2009, GhostNets Australia, Darwin.

Johnson, Lane, U.S. Coast Guard, 2000 “Navigational Hazards and Related Public Safety Concerns,” IMDC.

Kiessling., I (2003) Finding Solutions: Derelict Fishing Gear and other marine debris in Northern Australia, Report prepared for the National Oceans Office for the Key Centre for Tropical Wildlife Management, Charles Darwin University, Darwin.

Limpus, C (2008)A biological review of Australian Marine Turtle Species. Olive Ridley Turtle Lepidochelys olivacea(Eschscholtz). Report prepared for the Queensland Environmental Protection Agency.

Matsuoka, T (2004) *in* Wiig,H.C (2004) A Cost Comparison of Various Methods of Retrieving Derelict Fishing Gear. Paper presented at the APEC Seminar on Derelict Fishing Gear and Related Marine Debris, Honolulu, Hawaii Jan 2004.

Omaye ST. (2002). "Metabolic modulation of carbon monoxide toxicity". Toxicology 180 (2): 139–150

Paabo., M and Levin,. B (1987) A literature review of the chemical nature and toxicity of the decomposition products of polyethylenes Fire and Materials Volume 11(2); 55-70, 1987.

Queensland’s waste reduction and recycling strategy Waste Reform Division, Department of Environment and Resource Management, State of Queensland 2010
http://www.derm.qld.gov.au/environmental_management/waste/pdf/waste-strategy.pdf