5th Western Australian State
COASTAL CONFERENCE 2009
Whose Coast Is It?
adapting for the future

South West Marine Debris Project

11A:
South West Projects:
1.25–1.55pm
Friday 9th October 2009
Pleiades Room

PRESENTER:

Mrs Heidi Taylor

Tangaroa Blue Ocean Care Society

CONTACT DETAILS:
Phone: +61 0410 166 684
Email: heidi@tangaroablue.com
Postal Address: PO Box 1063, Dunsborough WA 6281

CO-AUTHOR:

Wally Smith

Tangaroa Blue Ocean Care Society

Introduction

The impacts of marine debris on the marine environment and fauna are well documented: 'Injury and fatality to vertebrate marine life caused by ingestion of, or entanglement in, harmful marine debris' was listed in August 2003 as a key threatening process under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Australian Government's Draft Threat Abatement Plan for the impacts of marine debris on vertebrate marine life—states that 'Harmful marine debris impacts on a range of marine life, including protected species of birds, sharks, turtles and marine mammals.' Twenty marine species listed as threatened under the EPBC Act were identified as part of the designation of marine debris as a key threatening process, as they are known to be impacted by harmful marine debris. Impacts of marine debris on wildlife include entanglement that can cause restricted mobility, drowning, starvation, smothering and wounding, in turn leading to infections, amputation of limbs and death. Debris such as plastic bags, rubber, balloons, plastic fragments and confectionery wrappers may be confused with prey species and ingested by marine wildlife, causing physical blockages in the digestive system leading to internal injuries and starvation.

In March 2004, The Minister for the Environment and Heritage, Dr D. Kemp stated:

- Every year more than 6 million tonnes of rubbish are dumped in the world's oceans.
- It is estimated that one million seabirds and 100,000 marine mammals (including 30,000 seals) and turtles are killed by plastic marine litter every year, around the world.

The United Nations Environment Programme estimates that 46,000 pieces of plastic litter are floating in every square mile of our oceans.

In 2004 Tangaroa Blue Ocean Care Society (TBOCS) founded the South West Marine Debris Project (SWMDP) to focus on the issue of marine debris in the southwest region of Western Australia with an aim of finding ways of reducing the amount of marine debris making its way into our oceans and impacting on our marine life.

Between 2004 and 2009 Marine Debris Projects have been created in the North West of Western Australia, Far North Queensland, Fraser Island, New Zealand, Fiji and Hawaii.

Background

Since 2004, Tangaroa Blue Ocean Care Society volunteers have conducted regular coastal clean ups on beaches in the southwest. During this time more than 1,000 volunteers have removed over 350,000 items of marine debris. Data collected during clean ups indicate that marine debris is continually present along the southwest coastline, originates from a variety of sources and impacts on local marine life including whales, seals and seabirds.

To mitigate marine debris many aspects need to be addressed. The South West Marine Debris Project focuses on the removal of debris from the coast, data collection and tracing of debris to find its sources, workshops and reports to examine ways to change practises and designs to reduce marine debris, and presentations and workshops to educate the broader community, industry and agencies on the impacts of marine debris and practical ways we can all help to reduce it.

The South West Marine Debris Project comprises:

1. The annual Cape to Cape and South West Beach Clean Ups—community coastal clean up events in the South West of Western Australia. The 2009 event will be held on October 10th and 11th and volunteers will clean beaches from Perth to Walpole;
2. Monthly marine debris monitoring along specific stretches of WA coastline. This more regular and detailed monitoring provides a truer indication of the annual marine debris load and seasonal variability at specific sites;
3. An educational marine debris website www.oceancare.org.au that is a networking tool for organisations, industries, government agencies, schools and the broader community on the marine debris issues. We have had over 5 million hits on the site since mid 2007, and over 750 registered users from around the world;
4. Marine Debris Educational Presentations for community groups and schools. The project has a strong educational message, which is spread through the community via presentations and workshops and is key to creating a stewardship for local communities for their coastal and marine environments.
5. Marine Debris Educational Materials including the Marine Debris Identification Manual and the Marine Debris Fact Sheets;
6. Papers and reports based on the data collected in the project are distributed to all stakeholders and interested parties to enable policy, legislation and best practices to be implemented, based on the issues identified through the data.

This project has successfully worked on these goals since 2004 along the Capes coastline. In 2009 this project model will expand the objectives to cover areas of the coastline between Walpole and Perth to create a more detailed picture of the entire south west coastline.

Initial proposals to expand the project to other WA coastal regions will also be addressed in 2009, with the ultimate goal to cover a large number of locations along the WA coastline within the next five years.

Sister projects have also been successfully implemented in the Far North Queensland region, Fraser Island and the North Island of New Zealand.

Methodology

With a growing number of individuals and organisations becoming involved in beach clean ups, there is a corresponding growth in available data. The collection processes and measurements used in community-based clean ups do not usually meet the stringent requirements of scientific studies. So is there a use for community-based beach clean up data? It is our view that these data can provide useful, useable and over time, accurate information. To that end we are developing a number of marine debris data analysis tools.

Volunteer workshops are used to train volunteers in collection methods. Since 2007 five sites along the Capes coastline have been monitored monthly and detailed data collected on marine debris found, significant weather changes and major beach erosion occurrences.

The annual clean up event is conducted by volunteers who are given information and directions on how

the data is to be collected. This ensures consistent methodology.

Once submitted the data is inputted in Tangaroa Blue Ocean Care Society's national database and analysed for annual site reports.

Marine Debris Analysis Method

Our approach is to look at the inner makeup of a given site's data by creating a 'site signature' graph. A site signature graph is created by grouping debris items into seven categories. These categories serve to distinguish:

- End User—All items intended for personal use in any activity;
- Packaging items—All packaging but not accessory items such as straps etc;
- Industrial, Commercial, Farming and Fishing—All items used in all production and service activities;
- Linear (long) items—Rope, net, fishing line 1 metre or greater and intact cut and uncut strapping band. One linear metre is equated to a count of 1 item;
- Oil and tar;
- Remnant items—All fragmented synthetic remains.

Interpretation of a site signature takes into account the site and regional context including the main conditions affecting the marine debris process. Site signatures can give a quick view of the characteristics of the debris load in a given site. They also allow sites and regions to be compared.

Results

The 2008 Cape to Cape Beach Clean Up was the fourth time this event has been held and each year has seen increases in both the number of volunteers and of sites cleaned, which resulted in a higher number of items removed from the coastline.

Figure 1: Comparison Summary of the Cape to Cape Beach Clean Up 2005–2008

	Cape to Cape Beach Clean Up Year			
	2005	2006	2007	2008
Number of volunteers	100	191	274	571
Number of clean up sites	30	43	47	72
Number of items collected	9,244	11,566	19,081	26,363
Weight of marine debris collected	1,044kg	1,739kg	1,190kg	1,876.5kg
Number of kilometres cleaned	72km	106km	107.7km	158.5km
% of marine debris made of plastic	90%	86.5%	83%	79.5%

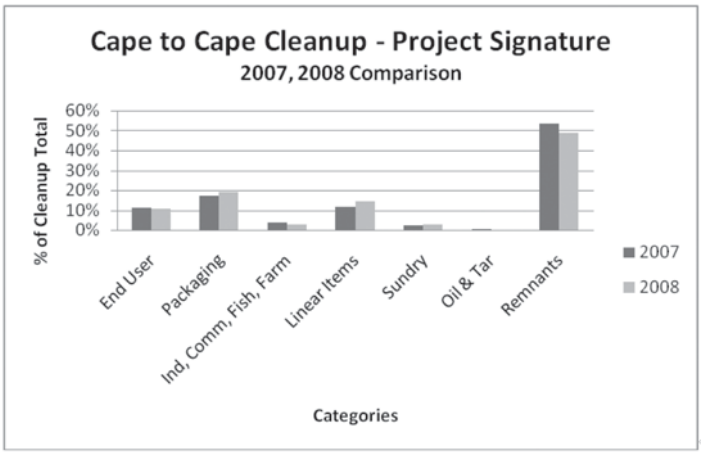
It is interesting to note that there have been ongoing clean ups at many Capes beaches between each of the annual Cape to Cape Beach Clean Up events. Therefore the 2005 data may show items that have potentially been on the beaches for years, where the 2006, 2007 and 2008 data will show data on debris that has predominantly arrived on the beaches within the previous 12 months.

A total of 26,363 items were collected in the 2008 Cape to Cape Beach Clean Up; this was 7,202 items more than the 2007 total. This is partly accounted for by the increase in the area being cleaned. However, five out of seven areas on the Cape to Cape coast showed increases from 2007. These data and the fact that clean ups are now conducted regularly throughout the year on the Capes coast, suggests that overall debris has increased.

The Project Signatures from the 2007 and 2008 Cape to Cape Beach Clean Up data (figure 2) shows that the types of debris impacting the coastline have remained consistent with a majority of debris coming under the category of remnants.

Figure 2: Cape to Cape Beach Clean Up Project Signatures 2007 and 2008

The remnants category accounts for an average of 51% of all debris collected in the 2007 and 2008 Cape to



Cape Beach Clean Ups. The items in this category should be viewed as items continually breaking down—eventually into microscopic fragments. The preponderance of visible remnant items gives us concern as to the levels of micro plastics in our coastal environments—especially along the Capes coast where our plastic resin pellet and micro plastic surveys have indicated a significant level of this type of pollution.

After remnants, the next highest count of items was in the packaging category with an average of 18%. Based on the distribution of packaging items across the various clean up areas, which shows a distinct rise in high usage areas, we estimate 60% of all packaging items are the result of littering while 40% come from offshore sources. The highest ranking items were plastic drink bottles, food wrap, plastic wrap (non food), glass drink bottles, plastic containers and aluminium cans.

The clean up data consists mostly of macro debris—debris larger than 5mm. There is however a generally unrecognised level of micro marine debris—less than 5mm—which is comprised of both intact items (e.g. plastic resin pellets) and fragmenting plastics of all kinds polluting the coastal zone. The high numbers of plastic fragments in the remnants category together with results from studies of plastic resin pellets and plastic fragments carried out previously indicate that a significant level of micro plastic pollution is being introduced into and produced within the clean up area—especially in the Capes region. Also unexplored is the distribution of marine debris on the surface, in the water column and in the benthic regions of the nearby sea. The amount of debris both micro and macro coming ashore during winter suggests this to be also significant.

This high percentage of remnants is also shown in the monthly monitoring clean ups at the five Capes' sites. (Figures 3 and 4)

Figure 3: South West Marine Debris Project Signature 2007 and 2008

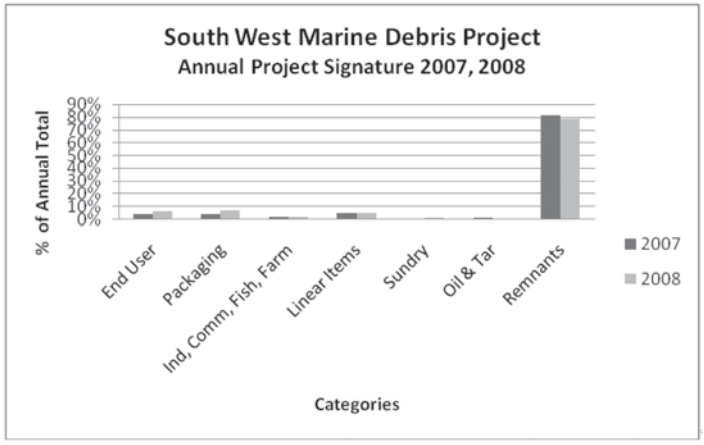
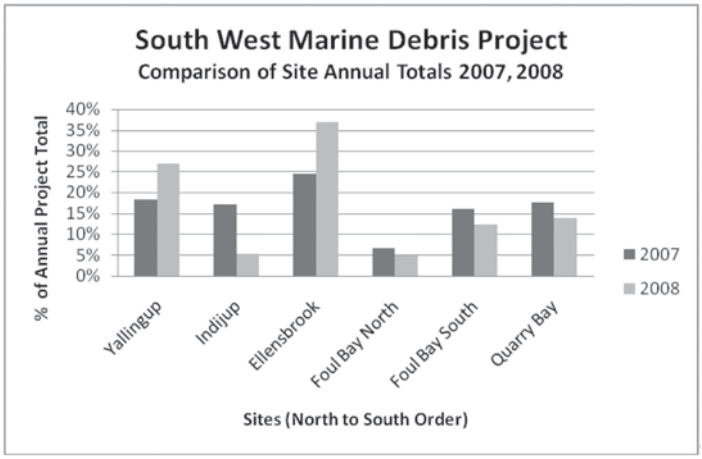


Figure 4: South West Marine Debris Comparision of Site Data 2007 and 2008



The data from the monthly monitoring clean ups suggest several major factors influencing the debris load:

- High visitation and usage with Yallingup in particular showing this trend.
- The capacity of a given site to trap and hold remnants, especially pieces of plastic. This can be observed particularly at Ellensbrook, Foul Bay and Quarry Bay.
- Heavy influxes of offshore sourced debris during winter seen at all sites.
- The alongshore movement of debris especially in winter which affects sites that trap and hold debris such as Foul Bay and Quarry Bay.

Remnants Plastic Resin Pellets

- All sites are heavily polluted by remnants, especially pieces of plastic. The remnant category in figure SWMDP Project Signature indicates the extent of fragmenting plastic debris along the Capes coast and provides an indicator for a hidden level of plastic pollution. During 2007 the presence of plastic fragments >5mm (micro plastics) and plastic resin pellets were surveyed at selected sites. The highest concentration was recorded in July 2007, at 10,854 items per square metre on a section of beach at Foul Bay (south end). Samples of plastic resin pellets were sent to Japan in August 2007 and tested for absorbed organic pollutants. The tests showed the following results; PCBs—20ng/g-pellet, DDT—9ng/g-pellet, PAHs—0.4ng/g-pellet, Hopanes—14ng/g-pellet and HCH—<0.2ng/g-pellet. These levels were considered low in terms of persistent organic pollutant levels globally.

Figure 5: Project Comparison of Total Items and Percentage of Annual Totals

	Total Number of Items		Percent of Combined Annual Total	
	2007	2008	2007	2008
Cape to Cape Beach Cleanup (Annual Cleanup)	19081	26363	42%	58%
SWMDP (Monthly Monitoring Project)	26055	14600	64%	36%

As a sample of the whole clean up area the Cape to Cape Beach Clean Up data shows a 16% increase in numbers of items collected (figure 5). The South West Marine Debris Project annual totals on the other hand show a 28% decrease. We intend to analyse this data in our 2009 reports but in our current view the data suggest an increasing debris load on the coast as a whole while the data from the sites undergoing regular cleanups suggests these clean ups can have a big impact on the debris load at a given site.

Performance Assessment

The South West Marine Debris Project has continued to expand in both the scope of the area being monitored and cleaned up as well as participation numbers by volunteers, supporters and partners.

The Annual Cape to Cape Beach Clean Up Event will in 2009 expand to form the South West Beach Clean Up covering the coastline between Walpole and Perth. This annual event has been successful in removing large volumes of debris with strong support from individuals and groups. This data gives a good snapshot of debris of a whole section of coast at an important time in the annual debris cycle.

The additional data collected over the last two years from Capel, Mandurah and Perth has allowed for the beginnings of a characterisation of the marine debris pattern in the whole South West. The broad features of this are:

1. An ever present and high volume of remnant debris on the entire coast, but not strongly expressed in Geographe Bay;
2. A growing beach/coast littering problem especially at high visitation sites and in built up areas;
3. The migration of buoyant members of these debris items along the coast and thus polluting downstream sites;
4. Significant fragmentation of this migrating debris along the Capes coast producing a cascade of small synthetic pieces and fragments which penetrate into all parts of the Capes coastline; and
5. An annual beaching of large amounts of debris from offshore activities and from remote regions during winter.

Monthly Strategic Site Monitoring has produced three years of seasonally based data at five sites along the Capes coastline. AQUIS tags, oil spills and other reportable finds have been reported to the appropriate authorities enabling regular monitoring for a number of agencies as well as access to data which provides a seasonal context for annual data and information on coastal debris processes in the region.

The School Education Program has included marine debris presentations and clean up workshops with both primary and secondary schools in the South West. An Educational Kit was created and distributed state-wide with the help of Keep Australia Beautiful Council WA. The kit and presentations have received positive feedback from both teachers and students, many of who have adopted their local beach and continue to provide data to our national database. The data recording and additional information from schools has been excellent in its quality and detail and has enabled a long term project to be created at additional sites.

The South West Marine Debris Project has been represented at festivals and local community events as well through presentations and workshops with other community groups. There is some difficulty conveying certain aspects of the marine debris issue and we believe that there is a lot of room for an improvement in public perception especially about the threats that debris poses.

One our major educational tools is the **www.oceancare.org.au** website. Since the site was launched in 2007 over 5,031,642 hits have been logged, over 750 users have registered, and many community groups and schools contribute content to the site keeping it current and a central location for networking and information on the issue.

A large volume of data have been gathered through the monthly monitoring program as well as school and community group clean ups and the annual clean up events has produced a good volume of data. We have discovered that not everyone likes to sort and count debris, therefore some data are lost. However, in general, the greater the volume of data collected the more reliable the information interpreted from it will be.

In the last year, a number of data analysis tools have been implemented which aim to make the community clean up data both more useable and useful.

Although some reportable finds have led to investigation and prosecutions, reports and recommendations that have been sent to various levels of government have been slow to be implemented. Collection data from past years is now available on request and we hope that as this national database grows, more stakeholders utilise the information.

Conclusion

'Pollution is a symbol of design failure.' William McDonough, American architect.

With the continued occurrence of marine debris on southwest beaches, it is critical that industries and governments take proactive steps in changing and improving products, tools and legislation in order to have a resulting effect on the current unsustainable situation. The first step is to identify sources of debris production and then to work on ways of stopping the continued input of debris into the oceans and waterways.

For example, uncut plastic strapping bands have been sourced in part back to the commercial fishing industry. These items present a threat to marine life including sharks, seals, sea lions, dolphins and turtles. Campaigns in other states including South Australia have successfully removed plastic strapping bands from fishing vessels, preventing them from becoming marine debris in the first place. Environmentally safe packaging is the responsibility of both manufacturers and consumers. Proactive measures must be taken by both parties to reduce the amount of single use packaging and the percentage of bands ending up as marine debris and litter.

Photo: SeaNet SA—this mammal entangled with packing tape around its neck

The southwest region is well-known for its high social value providing many recreational activities including recreational fishing and spending time at the beach. The data suggests that both these activities contribute to high levels of marine debris. We estimate 60% of packaging items in the SWMDP data are from littering at popular sites.

Infrastructure provided by local and state authorities is key to providing people the option to dispose of their rubbish correctly. Large amounts of debris have consistently been found at popular beaches within the Cape Leeuwin—Cape Naturaliste National Park. There is no rubbish infrastructure available for visitors, which contributes to much rubbish being left in the car parks, lookouts and on beaches.

Enforcement of anti-littering laws by local Fisheries Officers, Department of Environment and Conservation Rangers and Shire Rangers is vital in getting the message across to those community members who offend and do not learn by other means.

There is increasing scope to design data collection strategies for targeted areas and for ongoing monitoring, and looking ahead this will be a focus for Tangaroa Blue Ocean Care Society. In addition, we look forward to further expansion of the Marine Debris Projects as national initiative and invite any organisation or agency interested in joining or creating a Marine Debris Project in their area to contact Tangaroa Blue Ocean Care Society.

The close partnerships formed with government agencies, organisations, industry members and the broader community has formed a holistic approach to addressing marine debris in the South West region which has also resulted in a successful and long-term monitoring project.

We would like to thank Coastwest, Keep Australia Beautiful Council WA, Shires of Busselton, Augusta Margaret River and Capel, The Department of Fisheries and the Department of Environment and Conservation for their continued support.

We would also like to show our appreciation and thanks to the volunteers who have removed such a huge amount of debris from our coastline over the years helping to protect our marine environment.

References

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