



AUSTRALIAN MARINE DEBRIS INITIATIVE



2014 West Australian Beach Clean-Up Report

Tangaroa Blue Foundation

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Cover photo: Yallingup Steiner School students at the completion of a beach clean-up at Canal rocks, Yallingup, Western Australia

Disclaimer: Australian Marine Debris Initiative (AMDII) data has been submitted by the public and partners; it has been accepted by the Tangaroa Blue Foundation (TBF) to meet project requirements. However, TBF makes no guarantee as to the accuracy and completeness of the data submitted. TBF does not assume any responsibility for the nature in which the data is used.



Executive summary

2014 marked the tenth anniversary of the West Australian Beach Clean-Up event. This annual report has been prepared as a special edition: commemorating the efforts of the WA community and Tangaroa Blue Foundation over the past ten years; as well as analysing a decade of marine debris data to help inform forward planning for the Australian Marine Debris Initiative (AMD I) in Western Australia.

Looking back over the past decade of beach clean-up action in WA reveals an inspiring story of community momentum and achievement. In 2004 a few concerned individuals commenced the process of collecting and recording marine debris from a few selected beaches between Cape Leeuwin and Cape Naturaliste in the state's south-west. The process of removing and cataloguing marine debris items quickly gained momentum. In 2005 over 100 people participated in the first Cape to Cape Beach Clean-Up event, resulting in the removal and recording of 8,313 marine debris items weighing approximately 900 kg. Word spread quickly and it wasn't long before other coastal communities around the state were keen to join in. By 2012 the Australian Marine Debris Initiative was a national program and today Tangaroa Blue Foundation supports a network of over 39,000 volunteer opportunities in clean-ups of over 1,400 beaches around the country. In Western Australia, local communities can be proud to acknowledge that this national program was started in their own backyard on the shores of the Indian Ocean. The 2014 West Australian Beach Clean-Up event supported over 1,243 people in clean-ups at 137 beaches, removing and cataloguing 87,159 marine debris items weighing just under 5,613 kg.

The program has been highly catalytic, involving a rapidly widening breadth of communities around the country to enact change required to reduce marine debris. However, as commonly stated by Tangaroa Blue Foundation: If all we do is clean-up, that's all we'll ever do. The AMD I program engages those people on the ground that are concerned with the state of their coastline, and provides them with the opportunity to be involved actively in natural resource management – finding ways to stop marine debris at the source, before it enters the environment. This report documents ten years of action towards this common goal.

'In 2004, when I first started talking about levels of local marine debris, people thought I was talking about driftwood. There was really no one in this space except for Coastcare groups and individuals doing their own clean-ups along with the link to Clean Up Australia Day. Today there are so many groups/organisations/agencies in this space and working on the marine debris issue it gives me hope we may be able to solve it.'

Heidi Taylor, 2015



Program momentum over ten years

The West Australian Beach Clean-Up has demonstrated consistent growth in both community momentum and on ground action over the past ten years. The number of volunteers involved in beach clean-ups has grown steadily from 107 in 2005 to 1,243 in 2014 (Figure 1). The maximum volunteer involvement occurred in 2012 / 2013 when additional federal government funding (Caring for Our Country) was available to assist with facilitation of the AMDI in WA. An unusually high level of school students were also involved during 2013, which increased the total volunteer count for that year. A steady increasing trend in the length of beaches cleaned around the state and the number of items collected has also been evident. The most recent West Australian Beach Clean-Up covered 292 km of coastline and collected 87,159 items, up from 60 km and 8,313 items in 2005 (Figures 2 and 3).

A significant spike in the number of items collected in 2013 can be explained by the severity of winter storms and high swells experienced in the south of the state in that year, and should not be interpreted as a fall in overall achievement. In 2013 an unusually large number of 'microplastic' fragments were collected from many WA beaches, particularly in the Capes region. These are believed to have been sourced from old broken up fragments that were mobilised during heavy dune erosion by waves and onshore wind/wave flows. The sheer number of these fragments led to a very high overall count of items collected, as displayed in Figure 3. These results highlight the strong spatial and temporal variability of marine debris data, and emphasise the benefits of monitoring over a long time frame to ensure accurate information is gathered to inform management.

The widening network of community members that are actively participating in these beach clean-ups is leading to heightened awareness and understanding of the marine debris issue among WA coastal communities. This improved awareness has been catalytic with regard to community drive for the development of local Source Reduction Plans for commonly collected items. In 2015 Tangaroa Blue Foundation will be facilitating a series of community workshops to assist in the development of marine debris Source Reduction Plans. It is expected that this planning process will flow on to further on ground action to reduce the volume and number of items collected from WA beaches. Each local plan will identify which marine debris items are occurring locally (since each area is different) and then define what is coming from local sources. Stakeholders will work together to develop solutions so that these items are prevented from being released into the ocean in the first place.

The overall community involvement in the West Australian Beach Clean-Up event is still quite variable across the state, with centres of population and the availability of community support for the beach clean-ups being key influencing factors (Figure 4). The Capes region, where Tangaroa Blue Foundation was first formed, has consistently achieved the highest number of beaches cleaned. There is a strong network of local people based in this area that have long been committed to undertaking regular beach clean-ups themselves as well as providing support for the involvement of other individuals and groups. The coordination of the West Australian Beach Clean-Up is also based in the Capes region. This support and the receptive nature of the Capes' communities outweighs the influence of population here (which is lower than in coastal urban centres to the north).



Other key hotspots of activity are Geographe Bay, west coast (which includes Perth metropolitan area) and the mid-west coast. Other more remote locations such as the Kimberley, Island Territories (Christmas and Cocos Islands) are growing in terms of their involvement but are also faced with the difficulties of small population and logistical challenges for individual clean-ups (e.g. access, tides).

The quantity of marine debris collected from each region over the ten years from 2005 to 2014 should be interpreted with the knowledge that community involvement in these regions does vary, and that beach clean-ups have occurred in some areas for much longer than in others (Figure 5, Map 1). For example, while the highest number of items collected was in the Capes region, this area has also had the highest level of participation over the longest period of time. Community involvement commenced in the Capes regions and from there spread to Bunbury, then Geraldton and beyond. More recently clean-ups have commenced in the Kimberley and Eucla.



Above: The team from Iluka Resources following the 2014 West Australian Beach Clean-Up

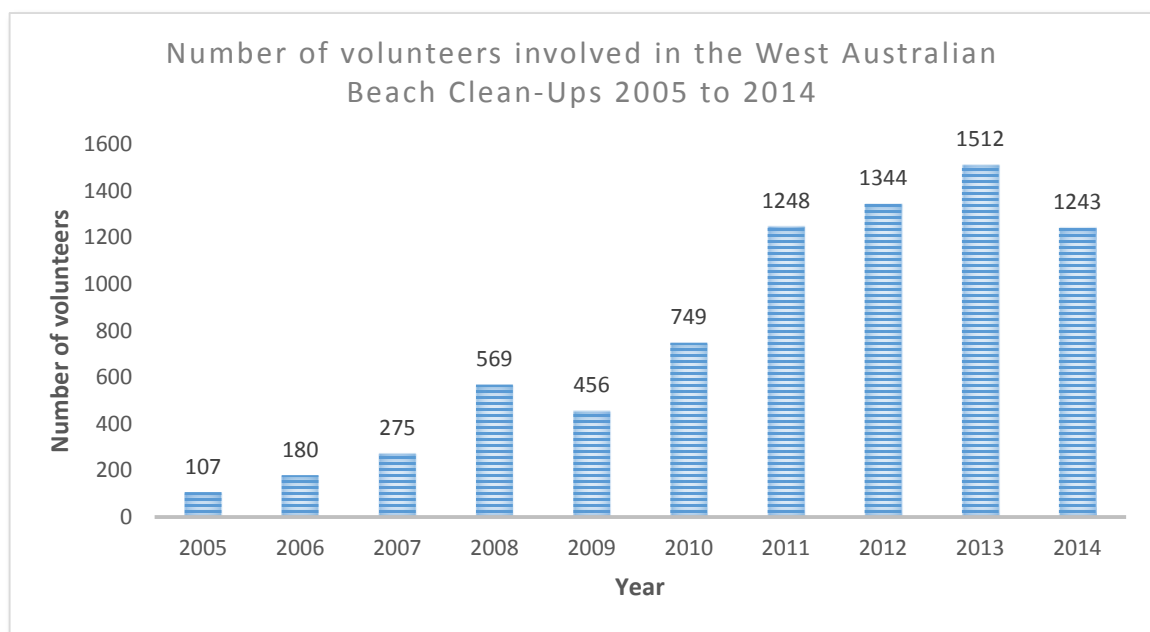


Figure 1: Number of volunteers involved in the West Australian Beach Clean-Ups 2005 to 2014

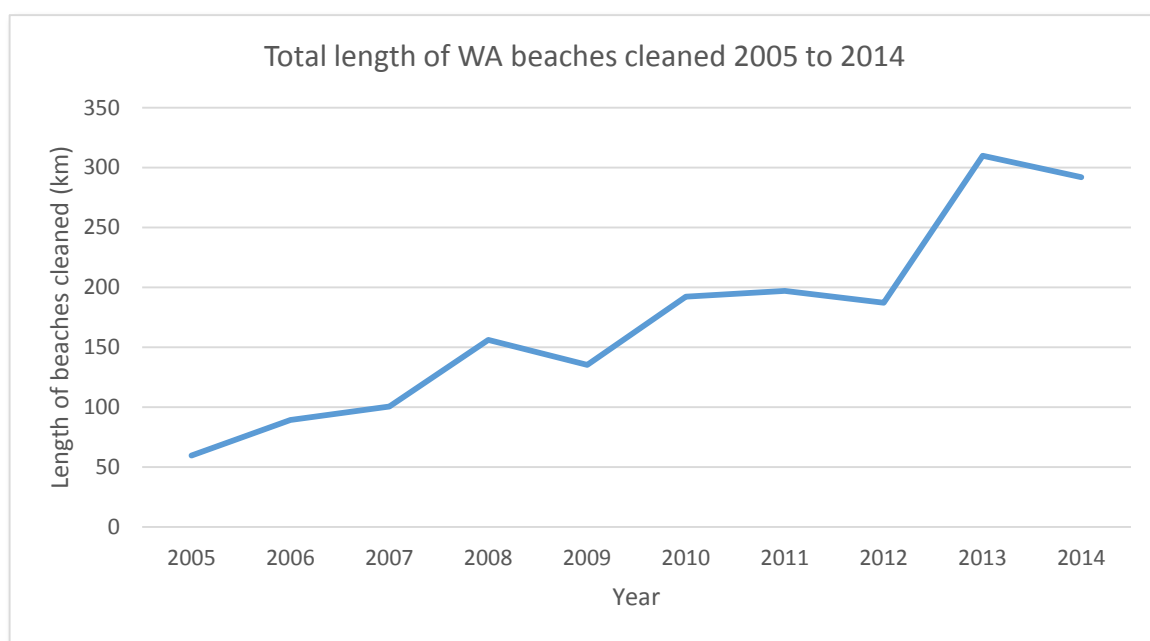


Figure 2: Total length of beaches cleaned 2005 to 2014

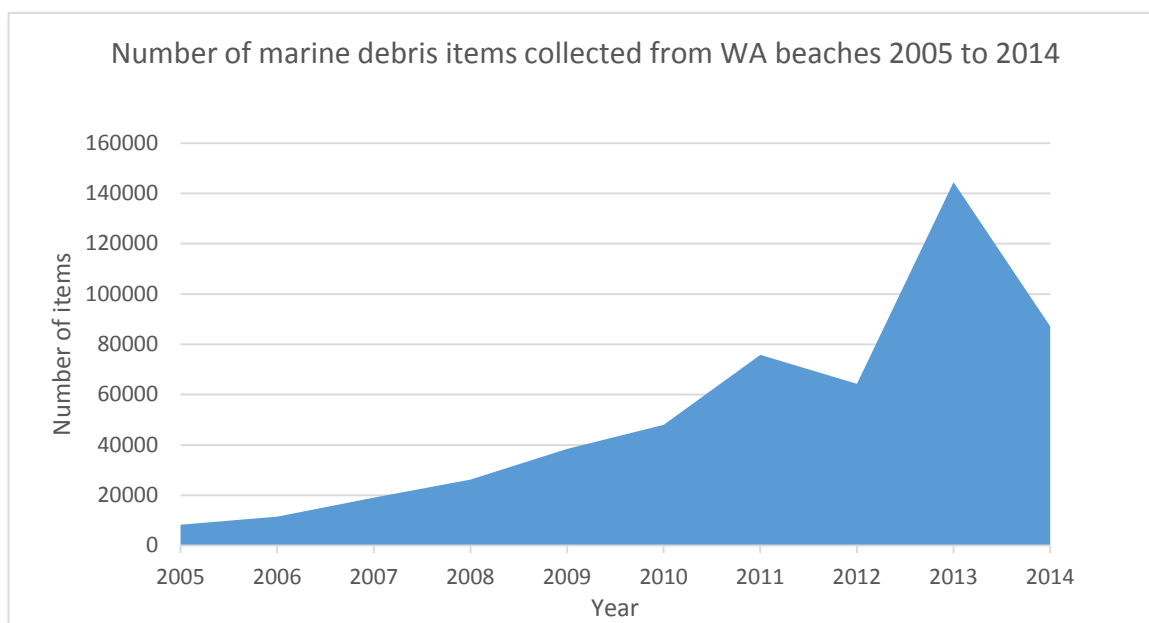


Figure 3: Number of marine debris items collected from WA beaches 2005 to 2014

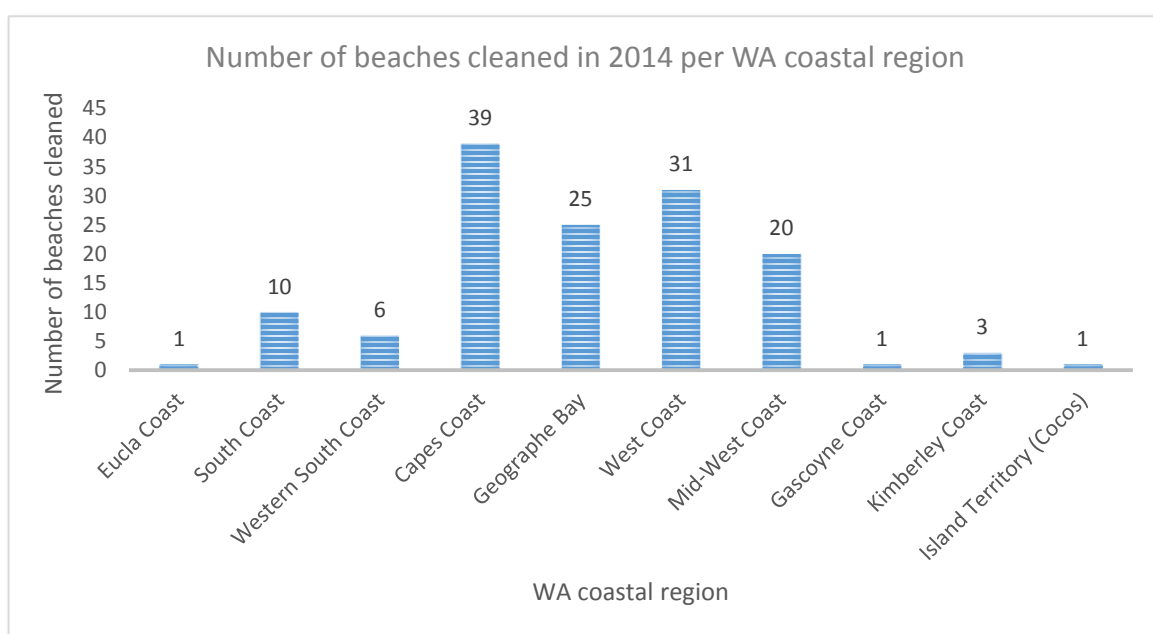


Figure 4: Number of beaches cleaned in 2014 per WA coastal region

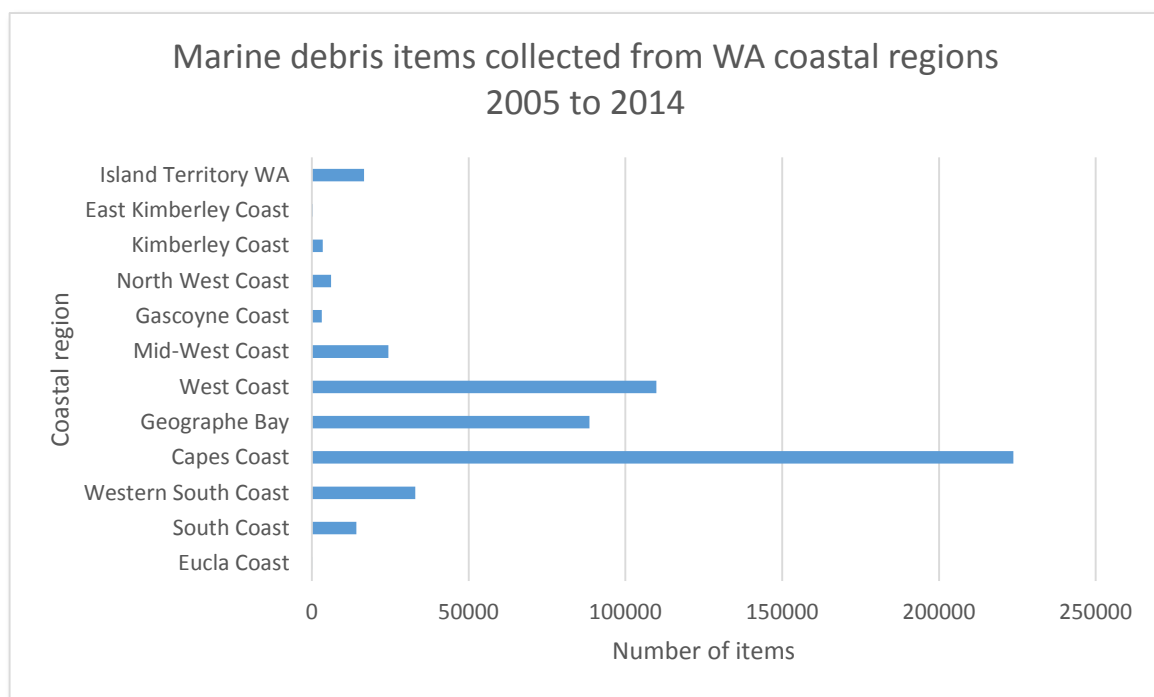
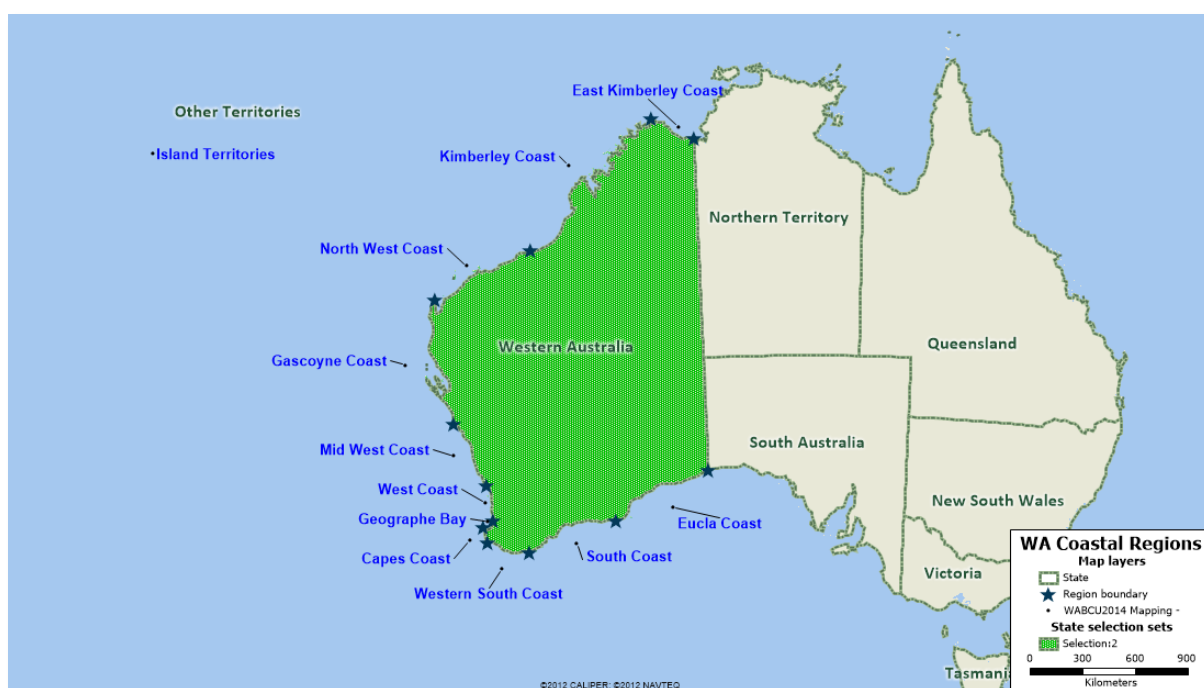


Figure 5: Marine debris items collected from WA coastal regions 2005 to 2014



Map 1: Coastal regions in Western Australia (as referred to in this report for the purposes of assigning marine debris data to spatial areas)

Marine debris materials

'78 percent of all marine debris items collected in WA during the last ten years to 2014 were plastic'

The analysis of marine debris material collected from all regions of WA from 2005 to 2014 reveals overwhelmingly that plastic comprises the vast majority of collected debris (Figure 6). *78 percent of all items collected in those ten years were plastic.* This data is consistent with information about marine debris from around Australia. On a global level plastic pollution is now widely recognised as a major issue threatening the health of our oceans. All other materials comprised between one and three percent or less with the exception of glass / ceramic and metal at seven and four percent respectively. These latter two items are dominated by commonly collected items such as glass and aluminium drink containers and are representative of a beach littering issue, rather than a marine debris issue.

Analysis of the materials comprised in marine debris across the different coastal regions clearly shows a high level of variability (Figure 7). While plastic dominates the materials collected from all regions, the individual percentages vary from 89 percent in the Eucla to 45 percent in the Kimberley. Being remote from settlement areas and with a low level of beach usage, the Eucla data reflect the composition of debris that has been almost entirely washed ashore from the ocean. The persistent nature of plastic within the ocean environment is highlighted by these results. In comparison, the particular beaches that have been cleaned in the Kimberley are close to town sites and are frequented by beach users. The data in these locations show a wider spread of materials and the common inclusion of items such as aluminium cans and glass bottles indicating beach littering in these locations. A similar pattern is also evident in the East Kimberley, Gascoyne and north-west coast. The island territory of Christmas Island has a high percentage of foam at 34 percent, just marginally behind the plastic for this region which was 46 percent. These foam items are a combination of buoys, cups and trays together with a large quantity of foam packaging. Some of the spikes in foam data relate to a jetty at Flying Fish Cove on Christmas Island where ships anchor and unload. It is possible that unpacking occurs there with a release of foam. The high variability in the types of materials being washed ashore along the WA coast highlights the need to take a regional approach to the management of marine debris sources. Programs analysing marine debris data over large areas need to be wary of drawing management conclusions from aggregated data that is spatially dispersed or drawn from beaches that are both remote and close to metropolitan areas or regional towns.



Left: Items collected from Deepdene Beach on the Capes coast showing a high prevalence of plastic material

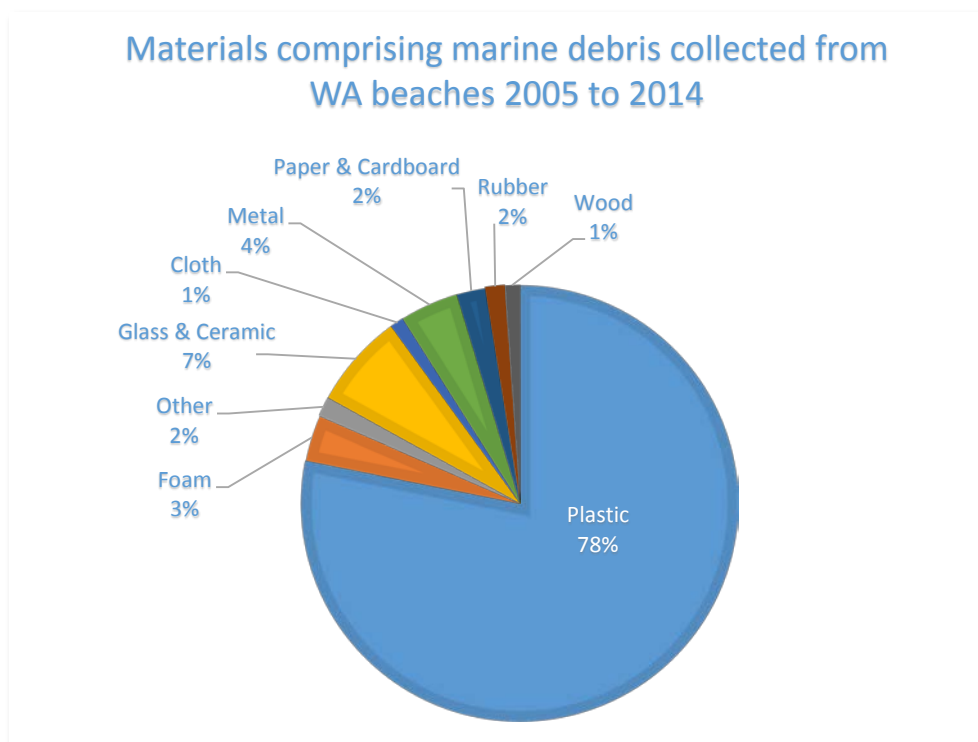


Figure 6: Materials comprising marine debris collected from WA beaches 2005 to 2014

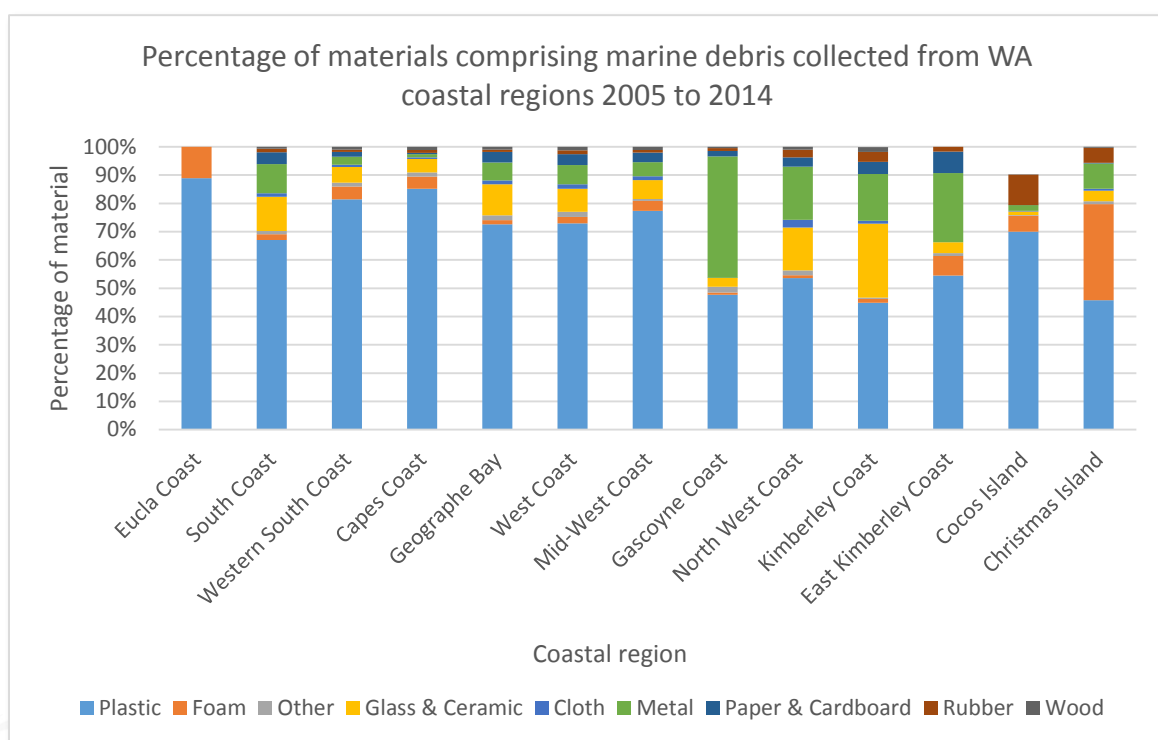


Figure 7: Percentage of materials comprising marine debris collected from WA coastal regions 2005 to 2014

Marine debris sources

The greatest sources of marine debris collected from beaches across WA from 2005 to 2014 were plastic remnants that have been washed ashore (26 percent), beach litter (24 percent) and garbage washed ashore from elsewhere (23 percent) (Table 1, Figure 8). Commercial fishing and recreational fishing contribute similar amounts at 13 and 12 percent respectively while marine debris from passing ships contribute about two percent of the state-wide marine debris load. It is important to note that only three of these six categories can easily be managed at a local level: commercial fishing, recreational fishing and beach litter. The other three categories require a much broader approach to management involving state, national or global strategies and partners. Tangaroa Blue Foundation is currently involved in addressing marine debris at all these levels.

From a management perspective, the coastal regional data provides a more meaningful perspective about sources of marine debris as they are highly variable across the state (Figure 9). One particularly interesting comparison is between the Capes coast and Geographe Bay. These two coastal regions adjoin each other but have vastly different sources and categories of debris. Geographe Bay is the only coastal region that was dominated by recreational fishing sources (43 percent), reflecting the popularity of this location for recreational fishing and a strong shore / jetty based level of fishing. It should also be noted that the underwater clean-up effort that occurred in this region, for example at the Busselton Jetty, would also have contributed to this statistic. Recreational fishing contributed only marginally to marine debris in all other regions (zero to six percent). Bait bags and fishing line were among the most common items collected in Geographe Bay. The high percentage of beach litter items (26 percent) also implies that beach users are contributing substantially to marine debris in this area. Plastic remnants and garbage washed ashore were both much smaller in this region than most other WA areas (both 12 percent), and this could be explained by the sheltered nature of Geographe Bay potentially minimising the amount of ocean derived debris. Source reduction planning in Geographe Bay should focus on this key use since education and awareness programs and improved recreational/visitor facilities in strategic locations may help to reduce the overall quantity of debris from recreational fishers in this area. The Busselton Jetty would be a strategic location to focus effort.

In contrast to Geographe Bay, the Capes coast was dominated by items that have washed to shore with plastic remnants, garbage washed ashore and commercial fishing being the major sources at 52, 21 and 17 percent respectively. Many of the commercial fishing items collected were related to the Western Rock Lobster industry. This industry has only a few commercial fishers that regularly operate in the Capes region with the majority of fishers working around the mid-west coast of WA. Such data confirm that exposed coasts that are subject to high swells can regularly receive marine debris from sources that are very remote from their location.

Commercial fishing was a key source of debris in the Eucla, mid-west coast and western south coast (33, 31 and 26 percent) and a moderate source in the Capes, west coast and Kimberley (17, 12 and 12 percent). Fine tuning of on-board equipment management procedures has the potential to minimise losses of gear and therefore reduce the quantity of marine debris from these activities.

Debris from ships was low across the board but was elevated compared to other locations in the Kimberley (seven percent) and in the Capes coast (four percent). It should be noted that many items from the garbage washed ashore category may in fact also be derived from ships, therefore there has been some unavoidable blending of these two categories so that the overall impact of passing shipping traffic may in fact be higher. Many ships have been observed cutting the corner close to the coast as they round Cape Leeuwin near Augusta, and foreign items that have no other possible source other than cargo ships are regularly found in this area. Improved management of debris from shipping may be required to ensure that existing MARPOL regulations that include a complete prohibition of dumping of any litter at sea are upheld.

Management of these individual sources will require differing spatial scales of effort depending on the issue. While many sources of marine debris can be addressed at a local level there are some sources that require an expansion of local effort to national or global level action. Table 2 provides a summary of some key priority areas of action for each region. Sources highlighted are contributing greater than 10 percent to the region's marine debris load while those also in bold are contributing more than 30 percent. It is suggested that local level community action focus on the blue highlights. Further guidance is provided in the next section as to the most common items collected from each of these categories. Those sources highlighted in red are identified as requiring management at wider spatial scales (local through to global).





Left: Debris items from Geraldton are dominated by commercial fishing items



Left: Debris items from Geographe Bay showing a high proportion of beach litter (cans, bottles, food packaging) and mixed commercial / recreational fishing items



Left: Debris items from the Capes coast showing a mix of commercial fishing items, plastic remnants and garbage washed ashore

Table 1: Sources of marine debris collected from West Australian beaches

Source category	% of source	Source description
Commercial fishing	13%	These items can be directly related to general commercial fishing sources. For example floats, pieces of commercial cray pots, long lengths of rope
Recreational fishing	12%	These items can be directly related to general recreational fishing sources. For example fishing lures, fishing line, bait bags
Beach litter	24%	Items are mainly consumer items that are likely to have been sourced locally. For example litter from beach users such as food wrappers and drink containers; pieces of surf board deck grip etc.
Garbage washed ashore	23%	Items are mainly consumer items that have been washed ashore and are rubbish that has clearly been at sea for a period of time before arriving on the beach. This includes plastic resin pellets, boat bungs, litter from vessels such as bleach bottles, toothbrushes etc.
Plastic remnants	26%	Most of these items are no longer attributable to any particular source as they have broken up into very small pieces. They come from offshore or longshore processes, but can also come from land sources, especially in areas with high rainfall.
Ships	2%	There is reasonable confidence that this set of items relate to shipping especially when found on remote beaches. Packaging, medical waste and water bottles with foreign labels (based mainly on observations from the Capes coast).

Table 2: Sources of marine debris in each region and priorities for management at the local / regional or national / global scale

	Commercial fishing	Recreational fishing	Ships	Plastic remnants	Garbage washed ashore	Beach litter
Eucla Coast	33%	0%	0%	22%	44%	1%
South Coast	11%	2%	1%	22%	31%	33%
Western South Coast	26%	6%	2%	24%	24%	18%
Capes Coast	17%	3%	4%	52%	21%	3%
Geographe Bay	6%	43%	1%	12%	12%	26%
West Coast	12%	5%	2%	18%	23%	40%
Mid-West Coast	31%	2%	3%	17%	25%	22%
Kimberley Coast	12%	2%	7%	8%	41%	30%
Island Territory	3%	0%	0%	36%	54%	7%
Shading in blue denotes local / regional or state source reduction management is suggested as a priority to reduce marine debris in this area (source is > 10% for region; bold text is > 30% for region)			Shading in red denotes that wider national or global management strategies, encompassing local action, is suggested as a priority to reduce marine debris from this area (source is > 10% for region; bold text is > 30% for region)			

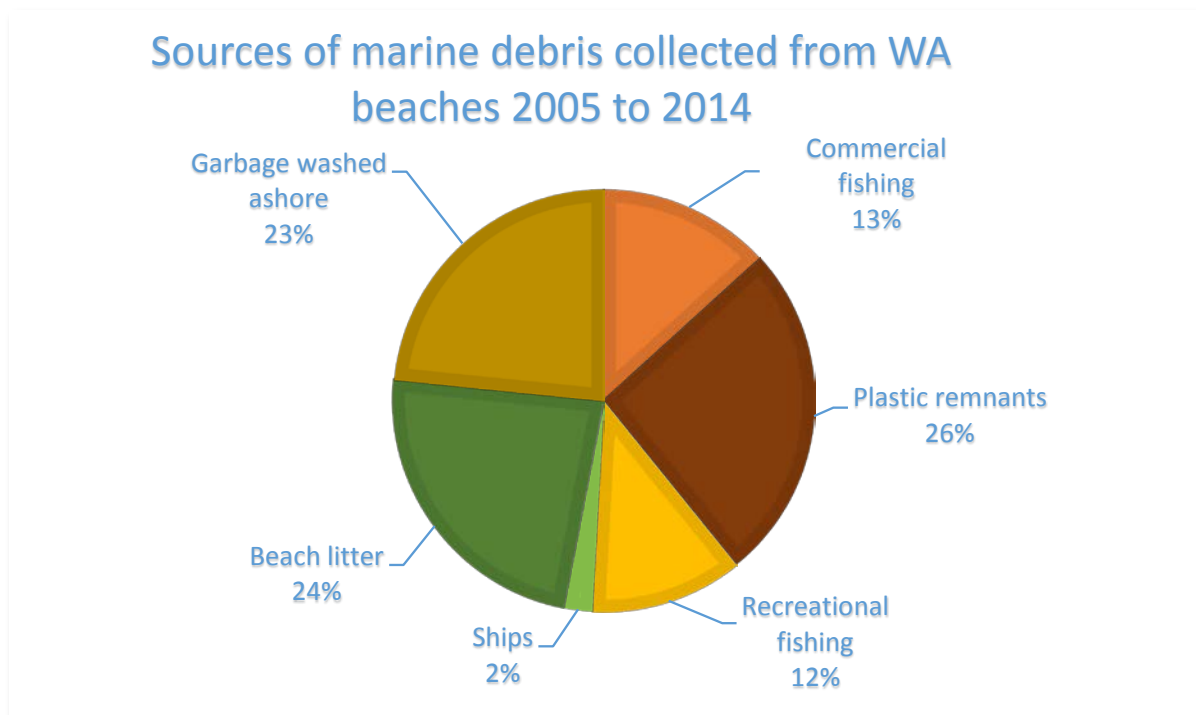


Figure 8: Sources of marine debris collected from WA beaches 2005 to 2014

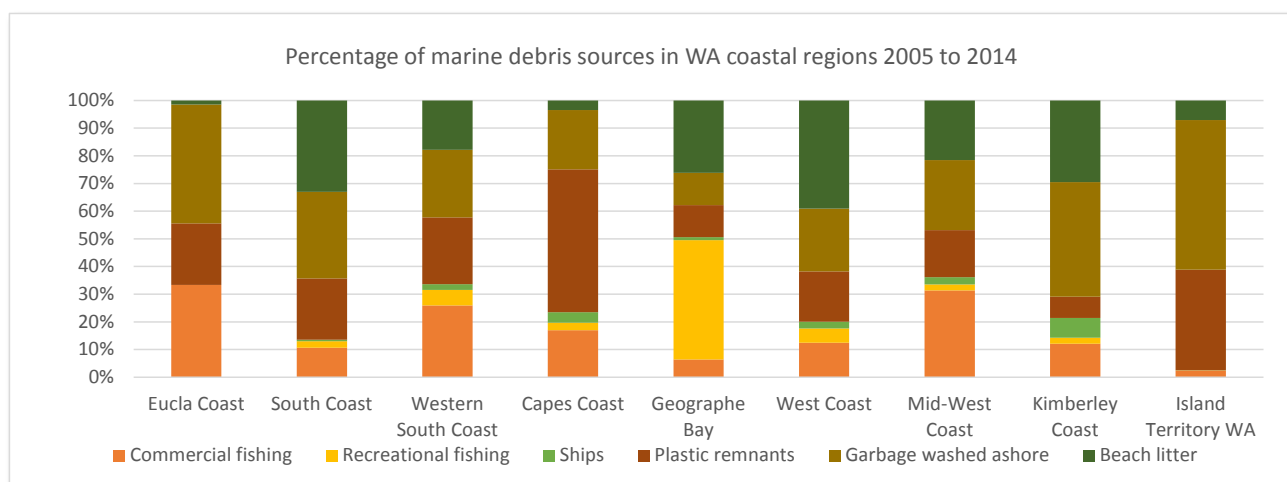


Figure 9: Percentage of marine debris sources in WA coastal regions 2005 to 2014

Common items collected

Data collated from the Australian Marine Debris Initiative Database will provide a strategic foundation for local Natural Resource Managers, land managers and community groups as they develop, implement and monitor Source Reduction Plans to reduce marine debris. Groups working in individual regions will need to work with more detailed summaries of their region than are presented in this report. However, there are some items that are common to a range of areas that may be a focus for a wide range of groups. Some of these have been highlighted in Table 3 below, and examples of potential solutions have been provided to assist with guiding the source reduction planning process. In some cases there may be benefit from a joint or coordinated approach to management. For example, strapping bands have already been managed at a state level by new legislation introduced in 2011 requiring bands to be removed from bait boxes before being loaded onto commercial and recreational fishing vessels. The band scraps that are being collected today are probably remnant scraps that are residual in sand dunes or the ocean and may still be mobilised or washed ashore each year.

Table 3: Common items collected for sources that require local or regional action, with suggestions for potential solutions

Source	Common items collected	Potential solutions (examples)
Recreational fishing items	Fishing line Bait, tackle bags & packaging	Targeted education / awareness to recreational fishers to reduce loss of gear Where loss is deemed accidental, assess whether product design is resulting in increased debris (can changes be made in materials or design to reduce potential for loss or the impact of loss)
Commercial fishing	Rope (includes scraps and lengths of rope) Strapping band scraps Commercial fishing remnants (float, pot, crate bits)	Monitoring of compliance with regard to strapping band legislation Liaison with industry to identify opportunities to reduce loss of gear (including rope, pots, crates etc.) Trialling new systems of management
Beach litter	Cigarette butts & filters Glass or ceramic broken Aluminium cans Plastic packaging food (wrap, packets, containers) Glass beer stubbies & pre-mixed alcohol bottles	Community awareness programs Improved facilities where appropriate (e.g. cigarette butt bins in problem areas) Improved management of events at beaches to reduce litter and use of plastic while also raising awareness of the impact of marine debris.

Key achievements 2005 to 2014

Reducing the marine debris load

Beaches that have been cleaned regularly since the inception of the AMDI program are now showing a significantly lower load of marine debris compared to the start of the program. This implies that the backlog of stored debris items in sand dunes has been removed at these locations so that what is being collected at each clean-up is now new material washed up, rather than items that have been buried for some time, then remobilised from the sand dunes during winter storms. This is a national trend and the ten year data of the majority of our monitoring clean-up sites have confirmed these patterns.

Linking marine debris collection with source reduction

Tangaroa Blue Foundation is the only organisation that has linked debris removal with data collection and source reduction. The data being gathered is proving to be an invaluable tool for evaluating management priorities and for spatially exploring where debris items may be coming from. Local communities can choose to develop Source Reduction Plans based on individual beaches or on a wider regional area as suitable for the item they are seeking to mitigate. The powerful database of information managed by Tangaroa Blue Foundation is also ensuring that ongoing clean-ups are a measuring tool of the success/failure of source reduction, thereby proving to be a clear example of true adaptive management.

Removal of logistically difficult items

In 2014 the removal of over 1.3 tonne of rope from a beach near Yallingup was a major achievement in tackling difficult logistics through community and government partnerships. The rope, a discarded commercial fishing longline, washed ashore in October 2013 during big storms and ended up on a section of rocky coastline between Canal Rocks and Wyadup. The volume and difficult location of the rope left Tangaroa Blue Foundation and government agencies perplexed as to how best remove this threat to the marine environment. The answer in the end was to forge a partnership with logistical experts: The Royal Australian Navy. A team of 20 Royal Australian Navy personnel from HMAS Stirling took on the challenge as a training exercise and within two days had removed the bulk of the estimated 6km of rope. They approached the problem by cutting it into manageable sections using both hand and power tools, and bagging it up to be carried out to an awaiting vehicle. In total 106 bags of rope were carried out, weighing a combined 1,329 kilograms.

The effort to remove the rope was a true testament to what can be achieved through determination, great team work and collaborative effort, when government agencies work in conjunction with non-government organisations. A big thank you goes out to Bunnings for their kind donation of a generator, cutting tools and gloves, all used in the removal of the rope, to Big Valley Caravan Park for accommodating the Royal Australian Navy personnel free of charge and to the Department of Parks and Wildlife for assisting with the coordination.





Above and above right: The rope discovered at Wyadup beach as found in October 2013



Above and above right: personnel from the Royal Australian Navy – HMAS Stirling busy at work cutting the rope into sections and bagging it for removal

Strapping band source reduction

The reduction of strapping bands as a marine debris item is an example of a Source Reduction Plan facilitated by Tangaroa Blue Foundation involving volunteer data and state government legislation. These strapping bands are hard plastic tapes used to secure boxes on-board commercial and recreational fishing vessels. They have been common items collected on the southern half of the West Australian coastline and can cause injury to marine animals and birds if entanglement occurs, as well as adding to the overall plastic load in the ocean. A targeted Source Reduction Plan was developed, and in 2011 the Western Australian Fish Resources Management Regulations (1995) updated legislation that aimed to curb the use of plastic strapping bands used to secure bait boxes on vessels operating in west coast fisheries. Since that time strapping bands are required to be removed from bait boxes prior to boxes being loaded on-board vessels.

Strapping band data across the ten years is presented below as the number of bands per kilometre of beach cleaned (Figure 10). The number and length of strapping bands collected can be a function of collection effort since larger areas of beach clean-ups increases the likelihood of bands being found. Since the overall collection effort has increased over time, the 'per kilometre' approach is one way of assessing the impact of the new legislation while reducing the influence of the additional clean-ups. While this approach is a simplification of the data, there is a clear downward trend in the number of strapping bands found per kilometre post 2011 when the new legislation was introduced.

Despite these efforts, certain exemptions are permissible under the law, allowing loopholes to be exploited and certain vessels operating within specific fisheries are still permitted to carry these straps on-board. Recent anecdotal evidence of new strapping bands being found on beaches in close proximity of commercial fishing vessel moorings suggests that not all vessel operators that are permitted to carry the bands are managing them responsibly. Tangaroa Blue Foundation recommends the Minister of Fisheries review the current strapping band legislation, and removes the exemption allowing bands to be brought onto vessels within 800 m of the shore. Long term monitoring of strapping bands is suggested to maintain a watching brief on this item. Further information on this is available in the Tangaroa Blue Foundation report 'Plastic loops and loopholes: is bait band legislation in Western Australia actually working?' (O'Shea 2013).

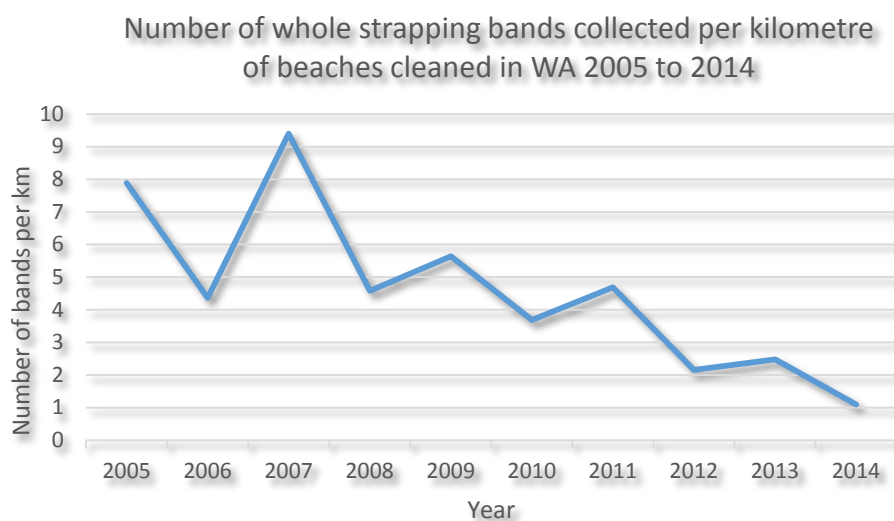


Figure 10: Number of strapping bands collected per kilometre of beach cleaned in WA 2005 to 2014

Source reduction of plastic resin pellets

The source reduction management of plastic resin pellets in Western Australia is another key action achieved by Tangaroa Blue Foundation in recent years. Plastic resin pellets are the raw material form for the fabrication of plastic articles. They are also known as pre-production plastic and as nurdles. Pellets range from barrel shaped to disc shaped and measure 2 to 5mm. They are usually opaque but accumulate a yellow to brown stain over time in the ocean, and can also be found in a variety of colours. They are largely out of sight or buried during summer but become very mobile and more visible during winter onshore conditions. They are found in every ocean and on the coasts of every continent. Plastic resin pellets resemble fish eggs and when stained can also resemble krill. Their ingestion can cause internal blockages in smaller sea and bird life. New research is showing that the most serious threat posed by plastic resin pellets (and generally by all plastic) is that they act as a conduit for Persistent Organic Pollutants (POPs) into the marine food web.

Tangaroa Blue Foundation first detected plastic resin pellets while conducting a survey of small plastic fragments at Quarry Bay (Capes coast) in early 2007. Since then they have been found on all beaches we survey from Cape Naturaliste to Cape Leeuwin. Their observed distribution has ranged from being lightly scattered along strand lines on open sandy beaches to a concentration greater than 6,000 per square metre at a site which traps debris moving along the coast. During 2013, Tangaroa Blue Foundation collected evidence of plastic resin pellet pollution from factories in the Perth metropolitan area. These pellets were leaching out of factories into stormwater drains and wetlands which led into the Swan River and ultimately the ocean. This evidence was provided to both Keep Australia Beautiful Council – WA and the Department of Environmental Regulation (DER) for further investigation. By the end of 2013, two factories had been issued environmental field notices by DER Pollution Response Officers. The notices directed the companies to cease, prevent

and clean-up all plastic material under the Litter Act 1979. Within seven days infrastructure was installed proving that easy solutions are available that will prevent this type of industrial pollution from occurring. It is recommended that local and state government authorities utilise evidence and successful solutions trialled in the above case to ensure zero plastic resin pellet loss from the industry throughout the state.

School education program

Over the past ten years 71 Western Australian schools have joined schools around Australia to help Tangaroa Blue Foundation's fight against marine debris by adopting their local beaches and conducting clean-ups and data collection. Twelve schools participated during 2014 alone. Tangaroa Blue Foundation staff and volunteers have facilitated the involvement of students to submit data, reports and photos on their findings which are then uploaded onto their own marine debris webpage. Students are also able to compare their findings with other students from schools participating in the Australian Marine Debris Initiative helping each other find practical projects and solutions that reduce marine debris in their own areas.

In 2013, with the support of the Johnson Ohana Charitable Foundation, the Tangaroa Blue Foundation Marine Debris Education Kit was released. Aligned to the Australian National Curriculum: Science, and Cross Curricular Priority Areas, the kit enables the complete set of unit plans ranging from Early Years to Senior Years to be easily delivered as individual lessons or as a whole unit.

Searches for items from Malaysian Airways flight MH370

In March 2014 Malaysian Airways flight MH370 went missing and the search for the plane eventually came to concentrate on a possible route taking it south through the eastern part of the Indian Ocean. The various search locations were all in excess of 1000 km off the WA coast with the possible route curving toward the centre of the Indian Ocean as it progressed southward. Tangaroa Blue Foundation requested volunteers look out for any debris items found on the beach that might be linked to the missing flight. Two items were sent to us and these were reported to the authorities. Whilst the items were unusual for this coast there was nothing concrete to link them to the flight and no feedback has been received from the authorities at this stage. Tangaroa Blue Foundation's approach to this matter is to continue recording and reporting unusual items which cannot be ruled out as being debris from the plane. Any debris from the plane will now be widely scattered and apart from something washing ashore which can be definitely linked to the plane, the remaining avenue is to continue recording unusual items with the aim of identifying any unusual pattern in their presence on the coast. Tangaroa Blue Foundation is very mindful of the circumstances of those who have lost loved ones in the tragedy and also of the complexity of the search. Our role in this event is simply to ensure that any evidence that does happen to wash ashore is quickly identified, properly recorded and assessed and then passed on to the relevant authorities.



Next stages

While the management of marine debris in Western Australia has progressed in leaps and bounds over the past ten years, there is still much work to be done in clearly addressing long-term sources of debris. The following actions are highlighted as clear priorities to address marine debris on these shores:

1. **Remove historical marine debris load.** Some beaches in Western Australia still have a significant amount of old debris retained within sand dunes that is likely to be mobilised each year. These will typically be beaches that have not been regularly cleaned or have only recently started being cleaned. Regular clean-ups are the best way to address historical debris loads and get to a fresh starting point of managing the debris that is washed ashore each year. Regular clean-ups require continued community momentum to stay involved in actions that address marine debris.
2. **Reduce the use of single-use plastic.** There is a global need to reduce single-use plastic across the board. Communities can start locally on small actions that are easy to achieve and build up momentum as each success is recognised. There are many examples from all over the country to serve as inspiration and guidance.
3. **Seek alternative materials or designs in packaging.** Manufacturers should ideally be encouraged to be responsible for the packaging waste they are creating and to seek more sustainable materials and / or designs to reduce loss of their packaging to the ocean. Priorities for alternatives are items that are considered to be 'high risk' for loss to the ocean environment. For example, recreational fishing bait bags that are carried on-board vessels are frequently lost overboard accidentally or left at beach fishing hotspots as litter.
4. **Develop working groups to address difficult marine debris items.** Local working groups including government, community and industry representatives can develop and share skills and provide examples of how to address large items and clean-ups in remote areas. Sharing knowledge, skills and ideas will ensure that each new challenge that is presented can be tackled with a 'can do' approach.
5. **Management of plastic resin pellets using an 'Operation Clean Sweep' model.** A capacity building program for the plastics industry is currently being researched by Tangaroa Blue Foundation and local partners in Melbourne. An 'Operation Clean Sweep' model will create resources for use in factories and during transport in order to reduce the loss of plastic resin pellets into the environment, and ultimately the ocean. Extension of this program to Western Australia would be a natural next step given the extent of resin pellet pollution that has been found on Capes beaches.
6. **Extend marine debris management to river foreshores.** Addressing land based debris and reducing the flow of debris via rivers should form part of the wider management approach for all marine debris.
7. **Monitoring of international shipping regulation.** While MARPOL regulations are in place, monitoring of international shipping regulations is needed as there is clearly an ongoing compliance issue at certain locations.

Acknowledgements

The incredible work and achievements showcased in this report would not have been possible without help from the thousands of volunteers that have contributed to the West Australian Beach Clean-Up event over the past ten years. A big thank you is extended to all these people that have worked towards achieving a cleaner ocean and a clearer understanding of our marine debris issue.

Tangaroa Blue Foundation would also like to acknowledge that when the Cape to Cape Beach Clean-Up started in 2004/2005 there were several government agencies, non-government agencies and individuals that became involved in this small local project. All of these partners are still involved showing the strength of the program. This long term commitment from partners has resulted in substantial growth such that it is now a national program. Without this initial core group this project would have remained a local community effort. These long standing partners include:

- South West Catchments Council
- Coastwest
- Keep Australia Beautiful Council - WA
- Department of Fisheries WA
- Department of Parks and Wildlife
- Heidi Taylor, Wally Smith, Renee Mouritz, Liz McGuire, Alison Dorn, Margaret & David Leggott, and Kirrily Hastings.

Today Tangaroa Blue Foundation is also proud to acknowledge the 161 additional partners that have helped forge the Australian Marine Debris Initiative across the Western Australian coastline over the past ten years, including the 66 organisations that participated during 2014. They include:

Abbey Beach Resort
 ACTIV Foundation Albany
 Alcoa
 Alkimos Progress Association
 Allseas
 Australian Federal Police
 Australind Senior High School
 Baldivis Primary School
 Batavia Coast Maritime Institute
 BHP Billiton
 Binningup Coastcare and
 Environment Group
 Binningup Surf Lifesaving Club
 Boatshed BBQ Group
 Boranup Board Riders
 Broome Bushrangers

Bunbury Cathedral Grammar
 Bush Ranger Cadets
 Busselton Senior High School
 Busselton Surf Lifesaving Club
 Butler College
 Cape Conservation Group Exmouth
 Cape to Cape Catchment Group
 Volunteers
 Cape to Cape Explorer Tours
 Capel Shire
 CARE (Karratha)
 Care for Hedland Environmental
 Association
 Carine Senior High School
 Central Institute of Technology
 Cervantes Primary School



CFT E Central TAFE
 Christian Fellowship Exmouth
 Christmas Island District High School
 Church of God International
 City of Fremantle
 City of Greater Geraldton
 City of Mandurah
 Cocos Island Youth Council Community
 First Ability Arts
 Conservation Council of WA
 Conservation Volunteers Australia - Earth Assist
 Conservation Volunteers Australia WA (CVA)
 Coogee Primary School
 Cottesloe Coastcare
 CSIRO
 Curtin University
 Dalyellup Surf Lifesaving Club
 Decmil Australia
 Denmark Environment Centre
 D' Entrecasteaux Coastcare Group (DACG)
 Department of Environment & Conservation WA (DEC)
 Department of Fisheries - WA
 Department of Parks & Wildlife (DPaW) WA
 Dolphin Discovery Centre
 Dunsborough Bay Yacht Club
 Dunsborough Coast & Landcare (Inc) (DCALC)
 Dunsborough District Progress Association (DDPA)
 Dunsborough Primary School
 Durack Institute of Technology
 Eco Faeries
 Edith Cowan University
 Emmanuel Catholic College
 Falcon Coastcare Group
 First Margaret River Scouts
 Frederick Irwin Anglican School
 Fremantle City Council
 Friends of Marmion Marine Park
 Friends of South Beach
 Functionality Focus Personal Training
 Geocatch
 Geraldton Grammar
 Gracetown Progress Association (Inc)
 Gypsea Warriors
 Halidon Primary School
 Harvey Shire
 Hillcrest Primary School
 Iluka Resources
 John Septimus Roe Anglican Community School
 Joondalup Rotary Club
 Jurien Bay Coastcare Group
 Jurien Bay Progress Association
 Kalbarri District High School
 Kalbarri Offshore and Angling Club Inc
 Karajarri Rangers
 Keep Australia Beautiful Council (KABC) - WA
 Kennedy Bay Coastcare
 Kimberley Land Council
 Ledge Point Coastcare
 Little Grove Primary School
 MacKillop Catholic College
 Mandurah City Council
 Mandurah Senior High School
 Manjimup Senior High School
 Margaret River Independent School
 Margaret River Regional Environment Centre
 Margaret River Rotary Club
 Margaret River Senior High School

Marmion Beach Guardians
 Meelup Regional Park Management
 Committee
 Mitsubishi 4WD Club Perth
 Mount Lockyer Primary School
 Margaret River Coastal Residents
 Association
 Murdoch University Divers Club
 Myalup Community Association
 Newton Moore Senior High School
 North Metro Coastcare
 Northern Agricultural Catchments Council
 (NACC)
 Nyul Nyul Rangers
 Ocean Reef Senior High School
 Orelia Primary School
 Outward Bound Australia
 Parklands School Albany
 Parry Beach Voluntary Management
 Group
 Peel-Harvey Catchment Council
 Pemberton Discovery Tours
 Perth Advocates for the Earth
 Perth Region NRM - Coastcare in the KIA
 Perth Scuba
 Prevelly Penguins
 Project Shorelines
 Quobba Station Management
 Responsible Runners WA
 Rio Tinto Earth Assist
 Rottnest Island Authority (RIA)
 Scuba2
 Sea Shepherd WA
 Seabird Caravan Park
 Shire of Capel
 Shire of Cocos Islands
 Shire of Harvey
 Singleton Coastcare

Smiths Beach Surf Lifesaving Club
 South Coast NRM
 South West Aboriginal Land and Sea
 Council
 South West Catchments Council
 (SWCC)
 St Patricks Fremantle
 Stocker Preston, Margaret River
 Surfrider Foundation Australia WA
 Tangaroa Blue Foundation
 The Church of Jesus Christ of Latter Day
 Saints, Busselton Branch
 The Dive Shed Busselton
 Thornlie Christian College Perth
 Town of Cottesloe
 Turner and Townsend
 Two Hands Project
 Underwater Explorers Club of WA
 VM Ware
 Waalbiirninny Wildlife Shelter
 Walpole Nornalup National Parks
 Association
 Wellstead Community Resource Centre
 West Australian Museum - Albany
 West Australian Museum - Geraldton
 West Australian Underwater
 Photographic Society (WAUPS)
 Wilderness Society of WA
 William Bay National Parks Association
 Wongutha Caps
 Woodside
 Wyndham District High School Bush
 Ranger Cadets
 Yallingup Boardriders
 Yallingup Steiner School
 Yeagarup Coastcare Group
 Young Naturalists Club - Albany Museum
 Youth Hostels Australia

