



# 2013 West Australian Beach Clean-up Report

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Tangaroa Blue Foundation

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## Executive Summary

Storms, swells and erosion delivered large quantities of plastic debris onto Western Australian beaches during 2013. The message is clear – there is a large quantity of plastic polluting the oceans and there is a large quantity of plastic buried and embedded within the coastal system. Most of this plastic is fragmented. The long term average proportion of plastic remnants in WA clean-ups is 46%. Fishing items follow with 9%. Plastic fragments are therefore the main legacy of growing levels of plastics entering the ocean over the decades since mid-last century. Every day plastic items together with fishing items continue to be discharged into the system. Curbing this discharge is not hard in the practical sense, but it is hard in the realm of changing behaviour and overcoming complacency and inertia in ourselves, and in our governance and business structures. In this year's report we begin with an update on several source reduction issues where these challenges are evident. The WA Beach Clean-up data summary looks at the levels of plastic fragments entering the system this year together with clean-up data from all sites. Following this in the section on the South West Marine Debris Project, data from monitoring sites is compared to data from less frequently cleaned sites along the Capes coast to explore the impact of long term clean-ups on local sites.

We would like to acknowledge our major project partners Coastwest, Keep Australia Beautiful Council – WA, The Department of Fisheries and the South West Catchments Council for their continued support of this event. Finally a big thanks to all involved for your enthusiasm, generosity and persistence.

## Source Identification and Reduction Activities Update

### Plastic Resin Pellets



Photo 1. PRPs found in Perth / O.  
O'Shea - TBF

During 2013, Tangaroa Blue Foundation (TBF) collected evidence of plastic resin pellet (PRP) 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 Environment 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 7 days infrastructure was installed proving



that easy solutions are available that will prevent this type of industrial pollution from occurring.

TBF recommends 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.

### Strapping Bands (Packaging Tape)

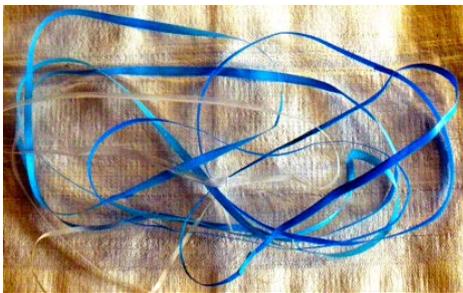


Photo 2. Strapping bands / W. Smith - TBF

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. This was done in an attempt to reduce their prevalence as marine debris in the oceans. 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.

Strapping band data from the Capes coast (Figure 1) shows that at clean-up sites where there is regular removal, band numbers are trending downward whereas sites where occasional removal occurs are trending upward. Regular removal over the past seven years has limited the accumulation of bands at the regularly cleaned sites. The downward trend is therefore more likely to reflect the trend in strapping band numbers arriving from offshore which in turn suggests the at sea disposal of strapping bands may be reducing in adjacent fishing grounds in line with the aims of the legislation. The Capes coast, however, is not the main centre of activity for the industry.

The greater part of commercial fishing activity occurs in the Mid-West region. There is no effective long term and detailed strapping band data available here.

There is, however, recent anecdotal evidence of new strapping bands being found on beaches in close proximity of commercial fishing vessel moorings. This highlights the issue of bands being allowed to be taken onto a vessel, and then having to be removed again before the vessel leaves its mooring and the potential for the bands to be irresponsibly disposed of over the side.

TBF recommends the Minister of Fisheries review the current strapping band legislation, and removes the exemption allowing bands to be brought onto vessels within 800m of the shore. Further information on this is available in the TBF report "Plastic loops and loopholes: is bait band legislation in Western Australia actually working?" (O'Shea 2013).

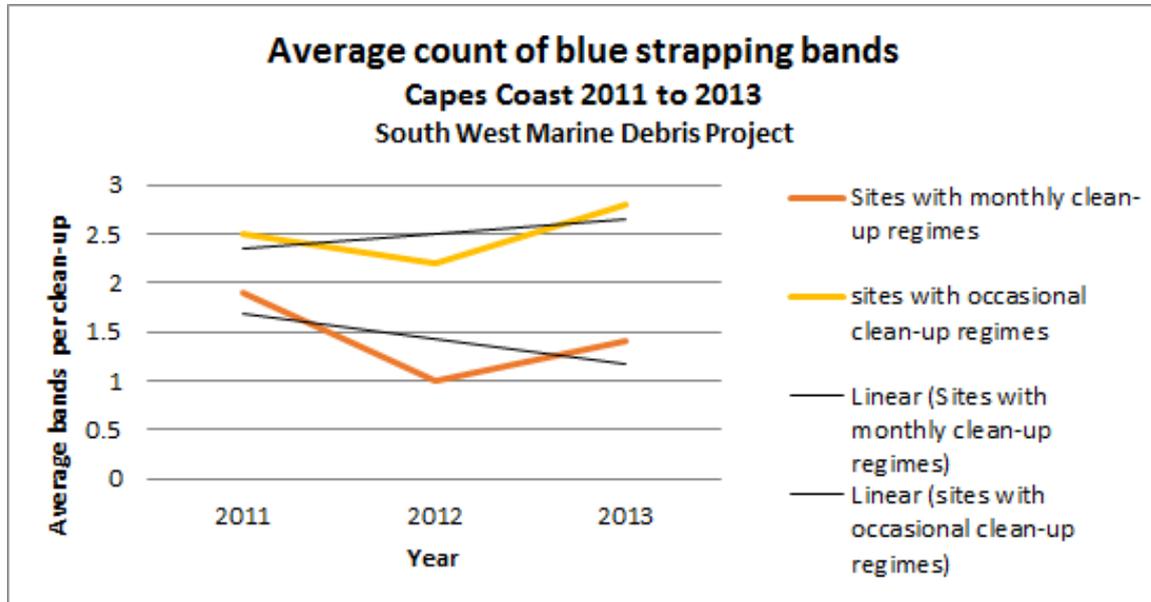


Fig. 1. Average count of blue strapping bands. "Linear" in the legend refers to the linear trend (simple linear regression) over the 3 years.

### Blasting Items

During 2013, construction of a boat harbour was carried out at Augusta. The operation involved on-site blasting and transporting boulders and rubble to construct the breakwater. As this operation proceeded, a community member noticed and began cleaning up large quantities of detonator cord accumulating on the local beaches and made several approaches to the parties involved. As a result of these approaches the parties also undertook some clean-up measures at the nearby beaches. In March, TBF conducted a survey to assess the extent of pollution. Table 1 shows the results and Figure 2 gives the locations surveyed in March and also during the WA Beach Clean-up event. The overall quantity of blasting items removed from the area during 2013 is not known.

Table 1. Blasting items recovered from Flinders Bay during 2013

	When collected	Total
Milyeannup Beach	WABCU Oct 2013	61
Flinders Bay to Storm Bay	WABCU Oct 2013	8
Flinders Bay to Dead Finish	March Survey	265
Jays Beach		206
Lookout to Leeuwin Lighthouse	March Survey	7
<b>Total Collected</b>		<b>478</b>



Fig. 2. Map of Flinders Bay showing survey locations and quantity found. N = quantity of blasting items found.



Photo 3. Scraps of detonator cord on the beach at Grannies Pool / W. Smith - TBF



Photo 4. The various blasting item components collected from Jays Beach during the March survey / W. Smith - TBF



Coastal infrastructure projects over the past several years on the West coast have resulted in a similar release. The core problem is the spent detonator cord mixed up in the rocks and rubble. Whilst removal of the spent cord is unlikely due to safety considerations, containment of the items using booms around the construction site should be an option. Alternatives to plastic detonator cord could also be explored. And finally, an assessment of legislation and regulations needs to occur.

## Swell, Storms, Erosion and Rope

### Erosion

In the weeks leading up to the 2013 WA Beach Clean-up event the coastline was severely impacted by storms; the end of September brought 146km/h winds to Perth and the South-West. During the beach clean-up event there were reports of severe erosion recorded at multiple sites between Port Beach in Fremantle and Observatory Beach in Esperance.

The erosion uncovered items that were hidden deep in dune systems. At a beach near the Cape Naturaliste Lighthouse the 'plastic bag graveyard' was found; an old dune had been eroded to reveal 889 embedded plastic film remnants. At this same site 1,938 small pieces of hard plastic were also found. At Boranup Beach a CSIRO drift tag was found; it had been in the environment for 36 years. When it is buried plastic breaks down at a much slower rate due to lack of sunlight.

The big swells associated with the storms also deposited a lot of small debris on beaches that could have been held in the water column for a long time. The top item collected during the 2011, 2012 and 2013 WA Beach Clean-up events has been broken bits and pieces of hard plastic. On average, in 2011 per clean-up, 211 pieces of plastic were found, in 2012 119 pieces were found but in 2013 that increased significantly to 686. Many of these would also have been exposed during the erosion events.



Photo 5. This image was taken after a wave event in 2011 at Hillview Beach near Augusta and shows an impact into the foredunes / W. Smith - TBF



Photo 6. This image is the same area taken at a distance during this year's clean-up and shows the same area of foredunes completely removed / W. Smith - TBF



Photo 7. This year's erosion at Hamelin Bay which has been eroding over the last several years. 11,862 items were removed from this Cape's beach during 4 clean-ups / R. Mouritz – TBF



Photo 8. The scale of the erosion at Injidup Beach on the Capes coast / R. Mouritz - TBF



Photo 9. The scale of the erosion at Injidup Beach on the Capes coast / R. Mouritz - TBF



Photo 10. Eroded pavement at Wonnerup, North of Busselton / Waalbiirninny Wildlife Shelter



Photo 11. Binningup Beach, taken in September 2013 / Chris Gibbs - SWCC



These processes show that counts of marine debris on beaches are likely to be vastly underestimated due to the quantity of buried items in the dynamic systems.

## Rope

During the 2013 WA Beach Clean-up there were reports of unusually large pieces of rope being found washed up on beaches. One of the biggest pieces was observed at Wyadup, Injidup caught amongst the rocks, it was approximately 5km long. A smaller section about 10m long was also found at this location and was able to be removed from the site. Due to the inaccessibility and unstable, rocky surface of the shoreline the remaining 5km needs to be removed by industrial methods, e.g. helicopter. Nearby at Injidup, a 30m fishing net was also retrieved two weeks later.

Large quantities of rope were found at other locations near Margaret River during the WA Beach Clean-up including Windmills (30m), Gas Bay (200m) and Prevelly (400m). All rope appeared to have been in the environment for a long time; likely to have been submerged in the deep sea and brought in by the big winter swells. The average amount of rope and net scraps (less than 1m in length) also doubled per clean-up in 2013 compared to data from 2011 and 2012. In 2011 this number was 56, in 2012 it was 41 and in 2013 it reached 105. At Minninup Beach, Bunbury 1,074 rope and net scraps were found in a single clean-up.

If these rope masses were not removed from the coastline they would have been taken back out to sea with the next swells, posing a serious entanglement threat to a multitude of marine organisms.



Photo 12. Rope at Wyadup / R. Mouritz – TBF



Photo 13. An estimated 5km of rope washed up at Wyadup near Injidup. The rope will need heavily lifting equipment to be removed / R. Mouritz - TBF



## West Australian Beach Clean-up

### Roundup

This year's WA Beach Clean-up saw over 1,350 volunteers assist in cleaning up the Western Australian coastline. Held over the weekend of the 12th and 13th of October, this state-wide event saw beaches from North of Broome right through to Esperance and as far out as the Cocos Islands given a good spring cleaning.

The event couldn't have been better timed, particularly in the South-West where storms and nine metre swells resulted in the erosion and deposition.

Some interesting finds included:

- A 'Summer Roll' wrapper that had a 'use by date' of March 1990 found at Cape Naturaliste;
- Two messages in a bottle - one a "help" note found inside a tiny glass bottle at Albany, and another at Smiths Beach, left by some children, explaining about the monument they had built on the beach, which had been subsequently washed away by the big storms;
- A sheep carcass was found washed up at Quinns Beach in the metropolitan area;
- And rather scarily, a "Kidnappers Bag" complete with tape, cord, a knife and sheets was found on the Busselton Foreshore.

### Data Summary

Table 2. Comparison of WA Beach Clean Up Summary Data 2012 and 2013

	WABCU 2013	WABCU 2012
Number of clean-ups	117	121
Items	144,481	64,305
Weight	5,304	4,229
Volunteers	1,512	1,358
Hours	2,991	2,643
Site length kilometres	310	191

Table 3. Comparison of volunteer effort for WA Beach Clean Up 2012 and 2013

	WABCU 2013	WABCU 2012	Long term WA average
Average hours per volunteer	2.0	1.9	2.2
Items collected per hour spent	48.3	24.3	34.8
Items collected per volunteer engaged	95.6	47.4	77.3



**Main Points**

*Quantity of debris*

With a similar effort to 2012 (Table 3), volunteers removed twice as much debris from beaches this year compared to last year. The total count of items more than doubled while the estimated weight increased by 25%. The weight increase is less dramatic because much of the debris increase consisted of small plastic fragments which heavily covered many South-West beaches following the effects of the storms and erosion releasing stored debris from dunes, especially in the month prior to the clean-up.

Figure 3 compares the average count of items for this year's clean-up with the long term average calculated from all clean-ups in the database for WA since 2004.

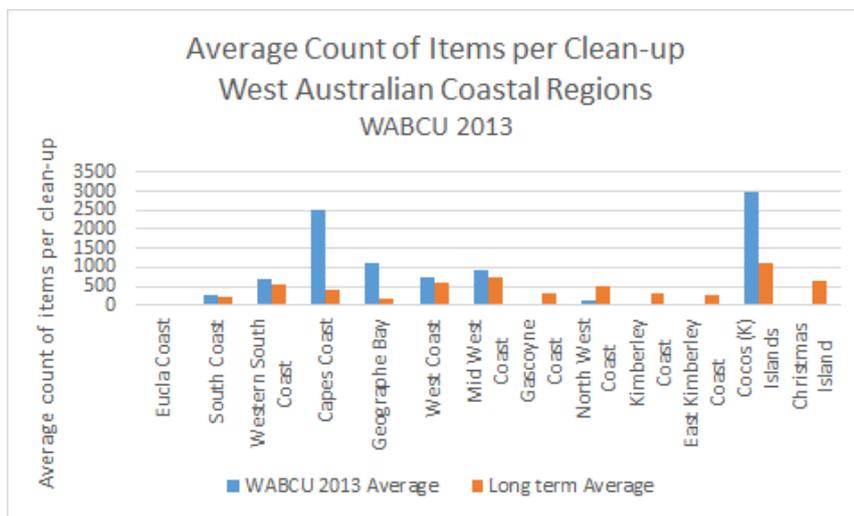


Fig. 3. Average count of items per clean-up 2013

Figure 4 shows the regions where very high counts of plastic remnants occurred. The results for Figure 4 include both hard plastic fragments and plastic film remnants. The clean-up at Cocos Island involved one new site and this is thought to be the reason for the above average results for the island.

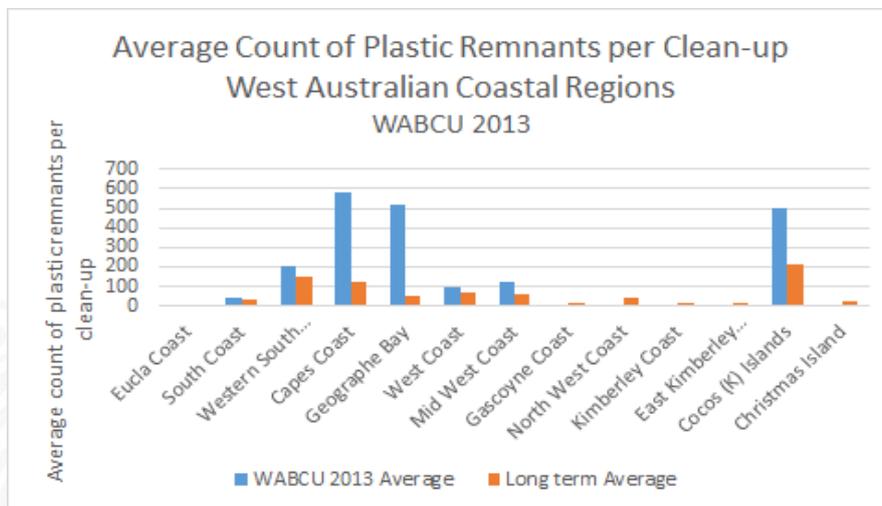


Fig. 4. Average count of plastic remnants per clean-up



## Data Tables by Coastal Region

*About the data tables*

### Maps

Maps show the location of clean-up sites marked by a blue star. The number in black can be used to find the details of that site on the table for the coastal region by looking in the map reference column.

### Top 10 Items

The top 10 items are for the region as a whole and individual sites will vary. Top 10s for individual sites can be checked on the Tangaroa Blue Foundation website [www.tangaroablue.org](http://www.tangaroablue.org) under the Database tab.

### Land and Sea Source Index

The land and sea source index provides a guide to the proportion of debris coming from littering or other sources at or near the clean-up site as opposed to debris coming from offshore. Buoyancy, material, shape and other factors are taken into consideration for calculating the index. The index cannot be calculated without a list of items and totals. Where this data is missing the graphs below will show a blank position for the site.

### Data Tables

The number in the "map reference" column is used to locate the clean-up site on the map. The figure in the "coastal type" column can be used to look up a general description of the site as contained in the following list.

1. In or near a built up area but not directly exposed to the open ocean
2. In or near a built up area and directly exposed to the open ocean
3. Away from built up areas but not directly exposed to the open ocean
4. Away from built up areas and directly exposed to the open ocean
5. An island with a built up area and or high visitation rate
6. An island with no built up area and low visitation rate
7. Inland waterway (creeks, rivers, lakes and swamps)
8. Parks, drains and structures

These descriptions can assist with interpreting the clean-up data.

### South Coast



Fig. 5a. Esperance Area

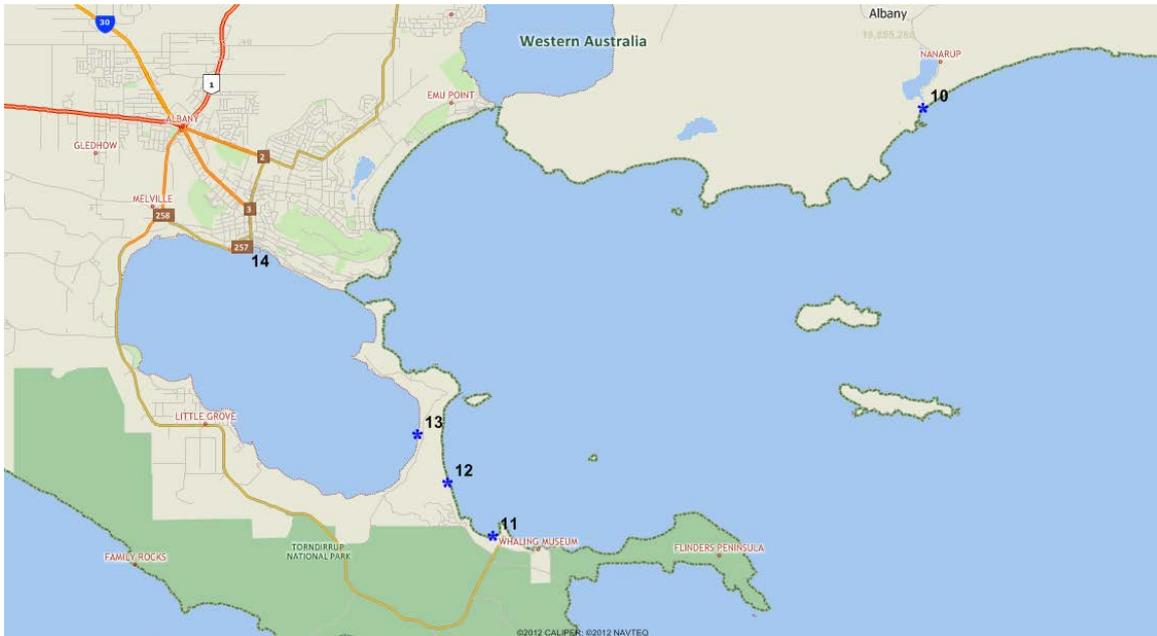


Fig. 5b. Albany Area

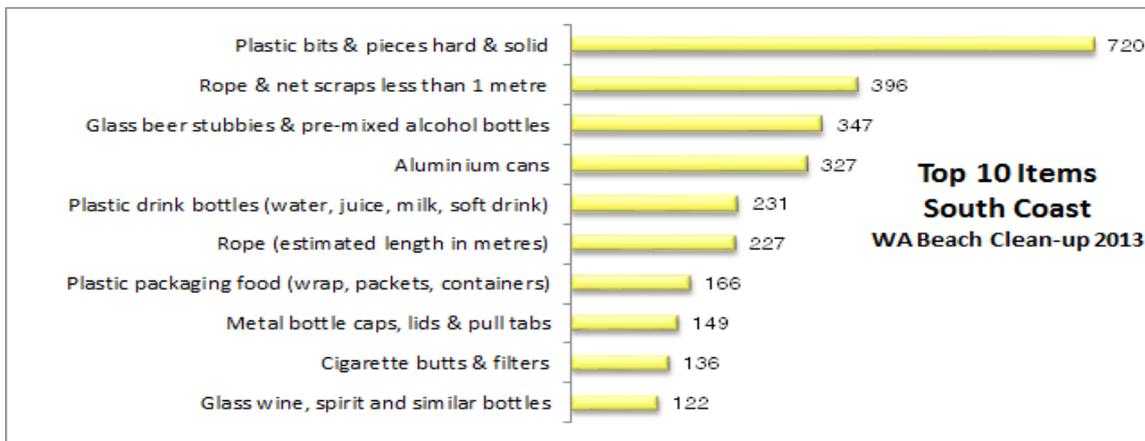


Fig. 6. Top 10 items found along the South coast

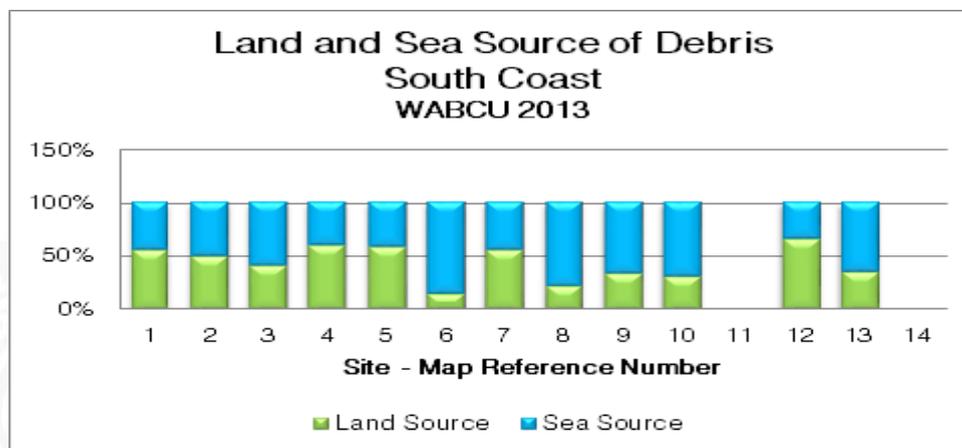


Fig. 7. Land and sea source of debris South coast



Table 4. South coast data summary

Map Reference	South Coast	Date	Items	Weight	Volunteers	Hours	Site length metres	Percentage of plastic	Debris from the land	Debris from the sea	Coastal type
1	Wylie Bay, Bandy Creek to Stockyards	13/10/2013	1,245	50	2	6	3,000	46%	54%	46%	2
2	Bandy Creek	13/10/2013	69	2	2	1	500	96%	50%	50%	1
3	Castletown to Bandy Creek	13/10/2013	125	7.6	3	3	2,000	82%	40%	60%	2
4	Bluehaven Beach	13/10/2013	150	15	1	2	600	50%	60%	40%	2
5	Salmon Beach, West Beach	13/10/2013	537	30	1	2	600	52%	57%	43%	2
6	Observatory Beach	13/10/2013	366	0.5	1	1	500	99%	14%	86%	2
7	Observatory Beach West	13/10/2013	24	2	2	2	300	100%	54%	46%	4
8	Eleven Mile Beach	13/10/2013	256	15	4	6	2,000	86%	21%	79%	4
9	Torradup & Margaret Cove	12/10/2013	93	5	3	3	800	86%	33%	67%	4
10	Nanarup Beach West	13/10/2013	247	3	18	2	600	79%	31%	69%	4
11	Frenchmans Bay Beach	13/10/2013	0	3	5	10	800				1
12	Goode Beach Albany	13/10/2013	407	118	9	18	3,000	62%	65%	35%	1
13	Shoal Bay Albany	13/10/2013	561	56	14	32	1,500	63%	35%	65%	3
14	Albany Town Jetty Foreshore	13/10/2013	0	3	2	4	400				1
		<b>14</b>	<b>4,080</b>	<b>310.1</b>	<b>67</b>	<b>92</b>	<b>16,600</b>	<b>75%</b>	<b>43%</b>	<b>57%</b>	

## Western South Coast

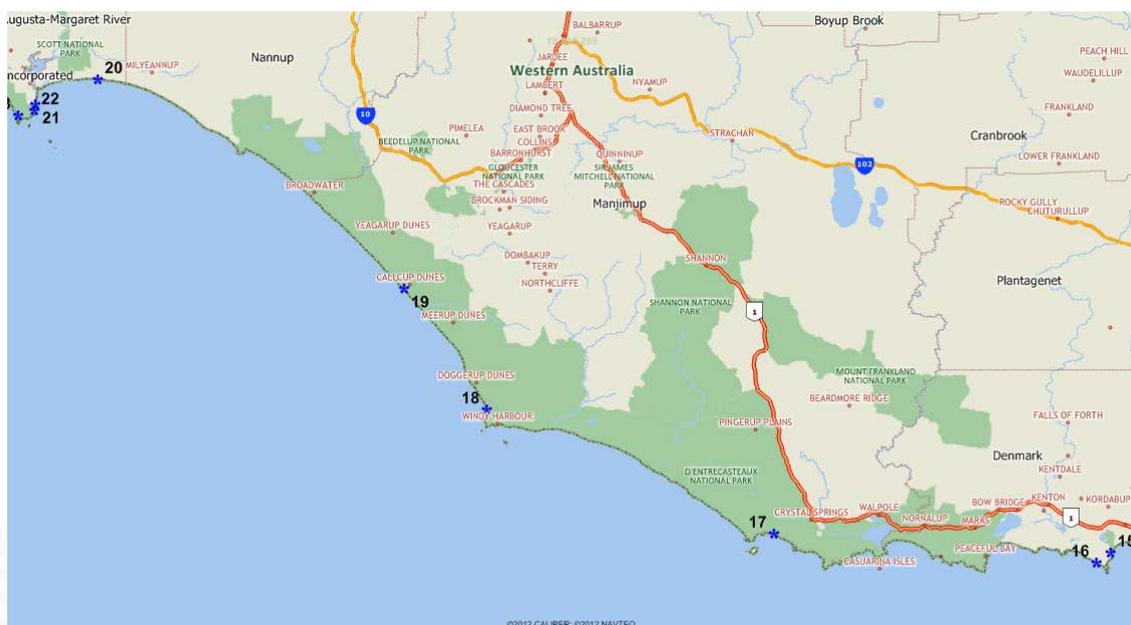


Fig. 8. Western South Coast Sites

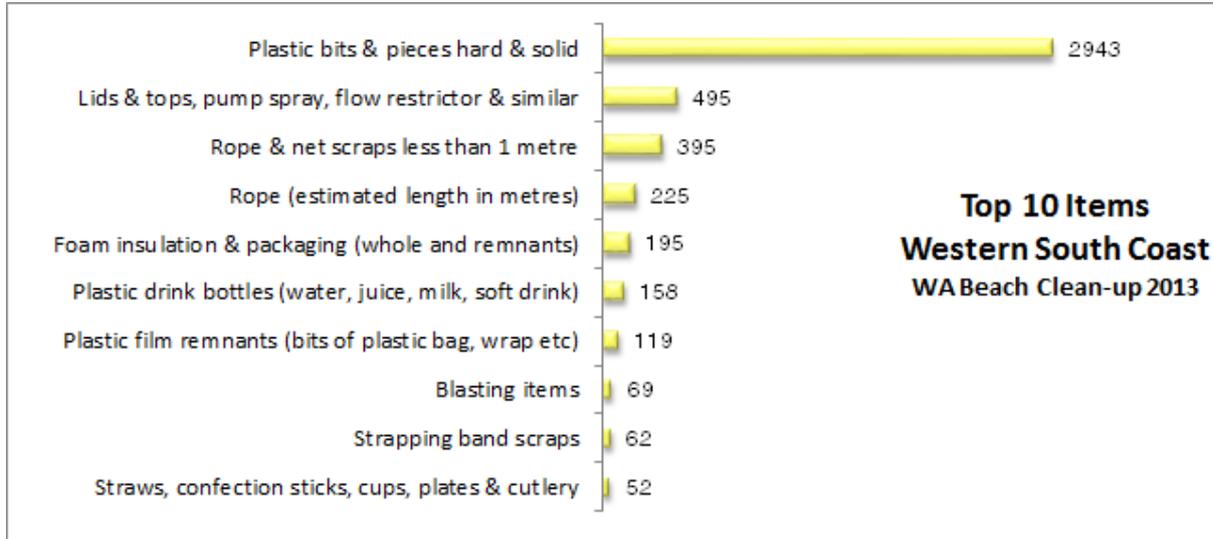


Fig. 9. Top 10 items found on the Western South coast

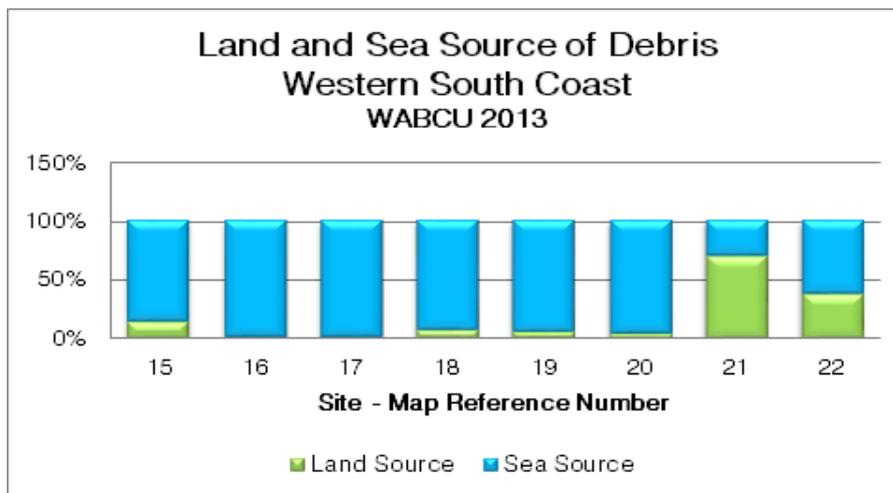


Fig. 10. Land and sea source of debris Western South coast



Table 5. Western South coast data summary

Map Reference	Western South Coast	Date	Items	Weight	Volunteers	Hours	Site length metres	Percentage of plastic	Debris from the land	Debris from the sea	Coastal type
15	Parry Beach South of Inlet	13/10/2013	38	1	4	8	1,000	87%	13%	87%	4
16	Eagles Nest Beach & Sharp Rocks	13/10/2013	2,452	38	5	25	1,000	98%	1%	99%	4
17	Mandalay Beach	12/10/2013	609	5.1	2	4	1,500	100 %	0%	100 %	4
18	Salmon Beach	13/10/2013	1,047	50	5	10	1,000	92%	7%	93%	4
19	Yeagarup Beach	14/10/2013	496	40	2	10	3,000	91%	5%	95%	4
20	Milyeannup	21/10/2013	664	8	1	4	10,000	89%	4%	96%	4
21	Flinders Bay to Storm Bay	6/10/2013	17	1	2	1	290	82%	69%	31%	1
22	Augusta boat Harbour & Surrounds	6/10/2013	32	1	2	1	200	88%	37%	63%	1
		<b>8</b>	<b>5,355</b>	<b>144.1</b>	<b>23</b>	<b>63</b>	<b>17,990</b>	<b>91%</b>	<b>17%</b>	<b>83%</b>	

## Capes Coast

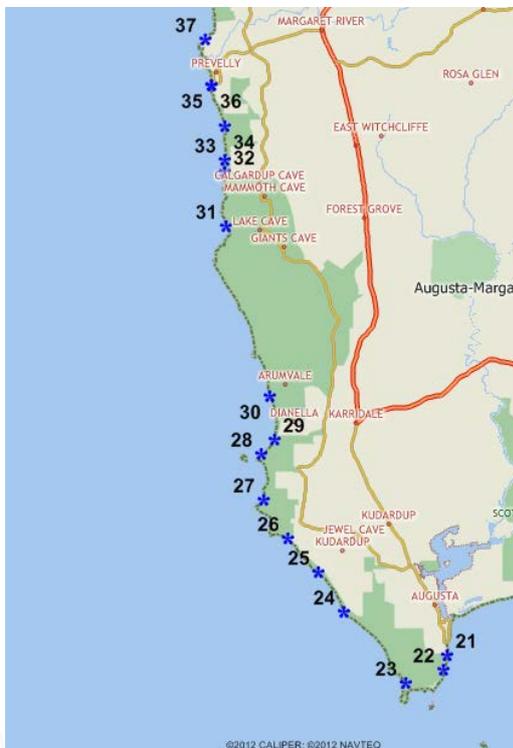


Fig. 11a. Cape Leeuwin to Prevelly



Fig. 11b. Prevelly to Cape Naturaliste



Fig. 12. Top 10 items Capes coast

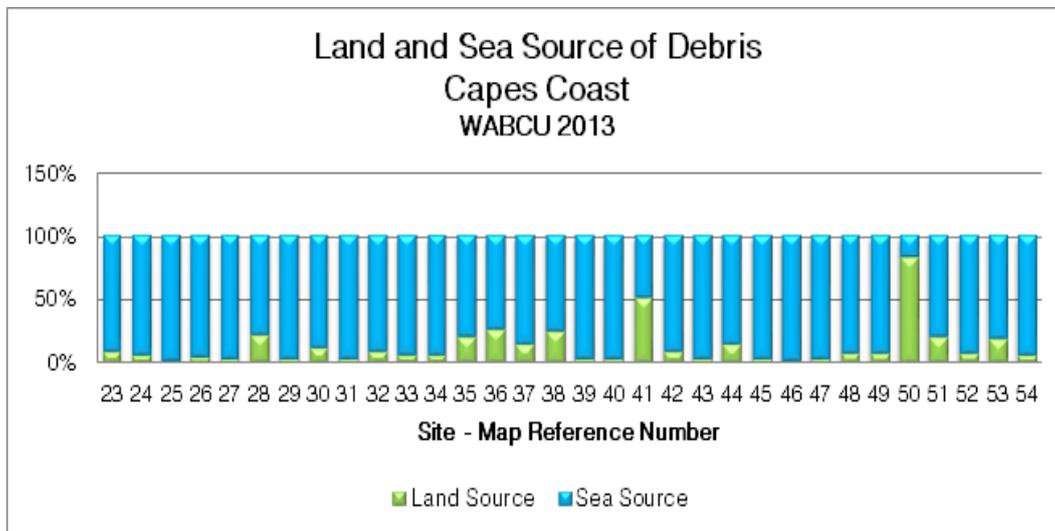


Fig. 13. Land and sea source of debris Capes coast



Table 6. Capes coast data summary

Map Reference	Capes Coast	Date	Items	Weight	Volunteers	Hours	Site length metres	Percentage of plastic	Debris from the land	Debris from the sea	Coastal type
23	Quarry Bay	31/10/2013	680	5	1	3	500	98%	8%	92%	3
24	Hillview	31/10/2013	126	4	1	3	1,000	98%	6%	94%	4
25	Deepdene South	11/10/2013	1,283	65	2	14	2,300	91%	1%	99%	4
26	Deepdene North	6/10/2013	779	10	2	3	2,200	92%	4%	96%	4
27	Foul Bay	24/10/2013	588	9	1	3	1,000	98%	2%	98%	4
28	Hamelin Bay	8/10/2013	2,859	26	10	20	300	97%	21%	79%	2
29	Boranup Beach South	10/10/2013	5,869	60	7	25	2,100	98%	2%	98%	4
30	Boranup Beach	13/10/2013	2,000	68	6	24	2,500	87%	11%	89%	4
31	Conto Spring	13/10/2013	867	20	3	5	850	96%	2%	98%	4
32	Redgate Beach	1/11/2013	672	22	17	51	800	94%	8%	92%	4
33	Redgate North	3/11/2013	608	2	1	1	300	94%	5%	95%	4
34	Boodjidup to Gas Bay	13/10/2013	2,336	5	8	20	350	99%	5%	95%	4
35	Prevelly	7/10/2013	2,148	60	2	7	1,500	93%	20%	80%	2
36	Boodjidup Creek to Margaret Rivermouth	12/10/2013	949	45	20	60	6,400	84%	25%	75%	2
37	Margaret Rivermouth to Joey's Nose	13/10/2013	601	33	8	24	3,500	83%	14%	86%	4
38	Kilcarnup to Ellensbrook	12/10/2013	515	50	4	17	6,500	83%	24%	76%	4
39	Joey's Nose to Gnoocardup	12/10/2013	6,307	105	5	38	1,000	97%	3%	97%	4
40	Ellensbrook to Lefties	5/10/2013	5,347	90	30	90	2,700	95%	2%	98%	4
41	Cowaramup Bay	12/10/2013	1,380	60.5	19	57	2,000	77%	50%	50%	1
42	Gracetown North Point to Veryiuca Creek	20/10/2013	377	45	4	8	1,000	90%	8%	92%	4
43	Gallows	12/10/2013	6,126	31	15	15	1,750	98%	2%	98%	4
44	Willyabrup	13/10/2013	163	7.5	2	4	500	97%	14%	86%	3
45	Quinninup Beach	12/10/2013	2,236	33	12	30	1,000	98%	2%	98%	4
46	Injidup Point	29/09/2013	13,816	30	10	45	750	99%	1%	99%	4
47	Injidup Carpark to Mitchell Rocks	30/10/2013	1,836	7	1	3	1,000	94%	2%	98%	4
48	Mitchell Rocks to Wyadup	24/10/2013	2,572	20	1	4	750	97%	6%	94%	3
49	Wyadup	13/10/2013	1,335	97.5	1	5	750	97%	7%	93%	4
50	Canal Rocks	13/10/2013	1,814	20.6	3	10	900	19%	83%	17%	3
51	Yallingup	4/10/2013	3,161	6.5	5	10	50	97%	20%	80%	2
52	3 Bears	13/10/2013	4,771	22.8	2	4	1,000	94%	7%	93%	3
53	Windmills	13/10/2013	1,514	65	1	1	1,600	90%	18%	82%	3
54	Other Side of the Moon	1/11/2013	4,239	24	10	10	100	97%	5%	95%	4
		<b>32</b>	<b>79,874</b>	<b>1,149.4</b>	<b>214</b>	<b>614</b>	<b>48,950</b>	<b>91%</b>	<b>12%</b>	<b>88%</b>	



Geographe Bay



Fig. 14a. Cape Naturaliste to Peppermint Grove Beach

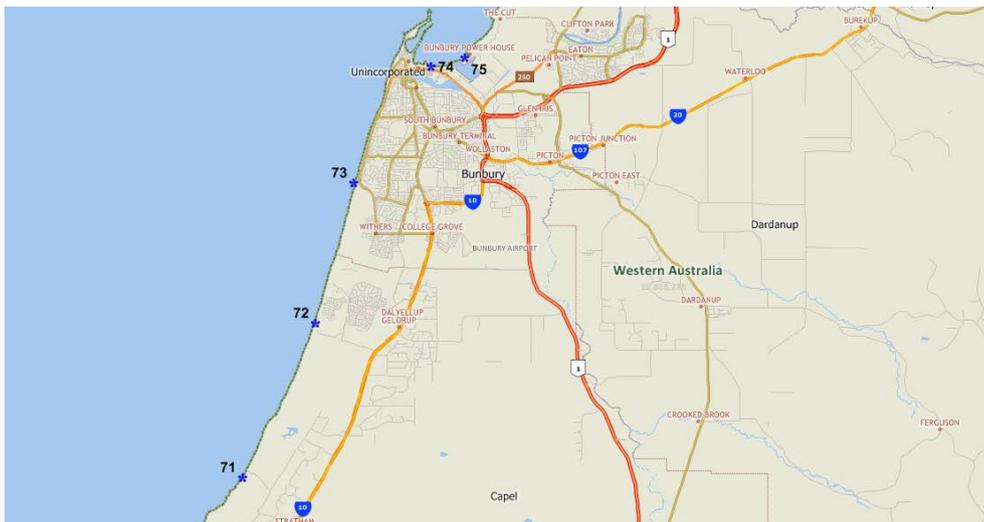


Fig. 14b. Peppermint Grove Beach to Bunbury

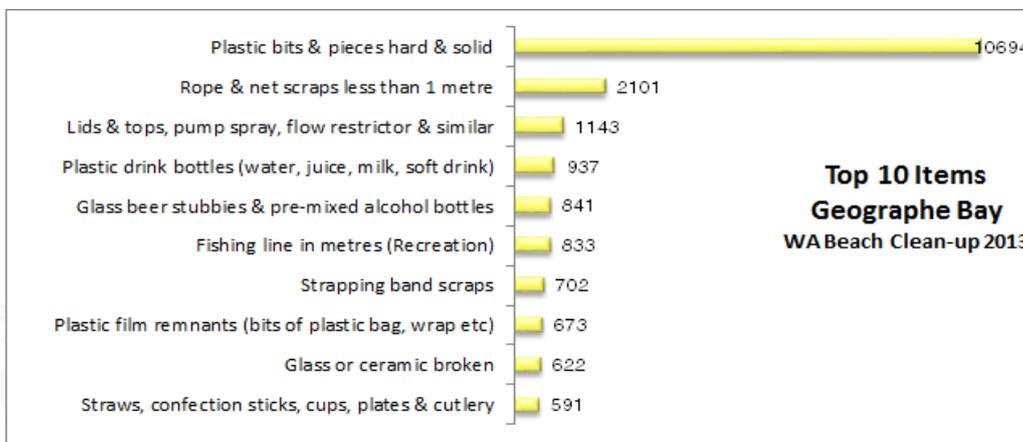


Fig. 15. Top 10 items Geographe Bay

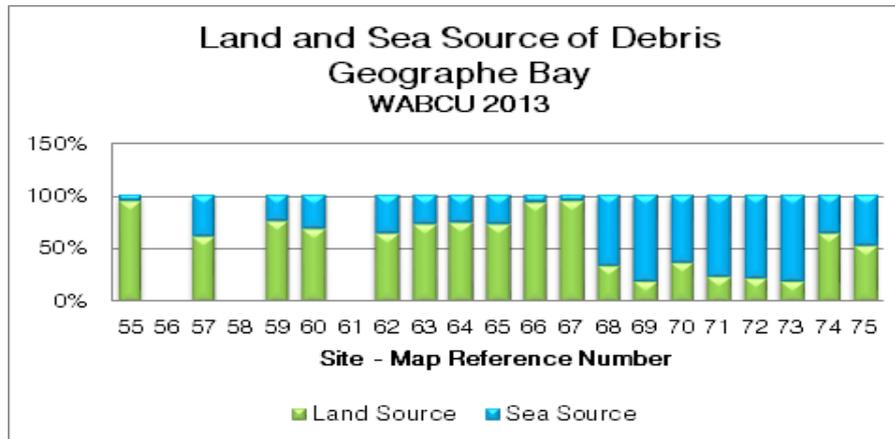


Fig. 16. Land and sea source of debris Geographe Bay

Table 7. Geographe Bay data summary

Map Reference	Geographe Bay	Date	Items	Weight	Volunteers	Hours	Site length metres	Percentage of plastic	Debris from the land	Debris from the sea	Coastal type
55	Shelly Cove	13/10/2013	548	4.5	8	8	100	22%	95%	5%	1
56	Bunker Bay	22/10/2013		3	16	32	2,000				1
57	Eagle Bay	13/10/2013	410	25	3	6	3,000	92%	60%	40%	1
58	Point Picquet	13/10/2013		26	4	20	2,000				1
59	Meelup Beach	13/10/2013	854	47.9	11	31	300	65%	76%	24%	1
60	Castle Rock	12/10/2013	281	1	4	15	1,000	62%	69%	31%	1
61	Old Dunsborough	13/10/2013		22	4	20	4,000				1
62	Quindalup West	13/10/2013	76	1	3	6	1,575	49%	64%	36%	1
63	Quindalup West	16/10/2013	11	1	1	1	1,500	64%	72%	28%	1
64	Abbey Beach	13/10/2013	173	11	9	23	1,000	75%	74%	26%	1
65	West Busselton Foreshore	12/10/2013	109	37	15	30	4,130	25%	72%	28%	1
66	Busselton Jetty Underwater C/U	13/10/2013	975	50	13	65	1,700	71%	93%	7%	1
67	East Busselton Foreshore	15/10/2013	296		1	8	2,500	10%	94%	6%	1
68	Wonnerup Beach	12/10/2013	116	1	3	3	3,000	66%	34%	66%	4
69	Capel Forrest Beach	11/10/2013	3,308	450	28	112	4,800	81%	18%	82%	4
70	Capel Peppermint Grove Beach	12/10/2013	905	50	17	51	4,000	84%	36%	64%	2
71	Capel Stirling Beach	10/10/2013	6,340	600	19	76	7,000	94%	23%	77%	2
72	Dalyellup Beach	13/10/2013	1,246	1	24	36	1,000	86%	21%	79%	2
73	Minninup Beach	8/10/2013	7,093	206	16	80	2,250	97%	18%	82%	2
74	Bunbury Koombana Bay	13/10/2013	739	17	20	30	1,000	73%	63%	37%	1
75	Bunbury Power Station Beach	13/10/2013	111	2	2	2	600	84%	52%	48%	1
		<b>21</b>	<b>23,591</b>	<b>1,556.4</b>	<b>221</b>	<b>655</b>	<b>48,455</b>	<b>67%</b>	<b>57%</b>	<b>43%</b>	



## West Coast

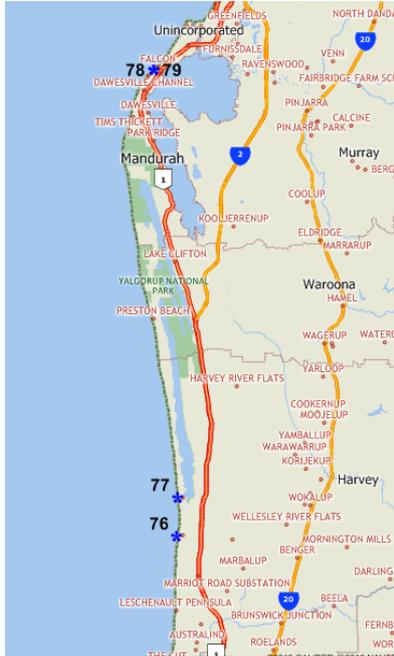


Fig. 17a.  
Bunbury to Mandurah

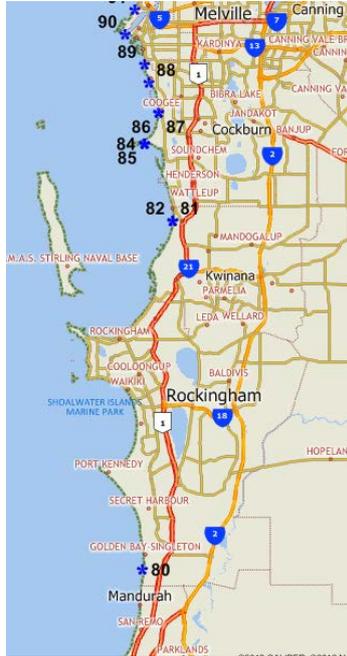


Fig. 17b.  
Perth Southern Suburbs

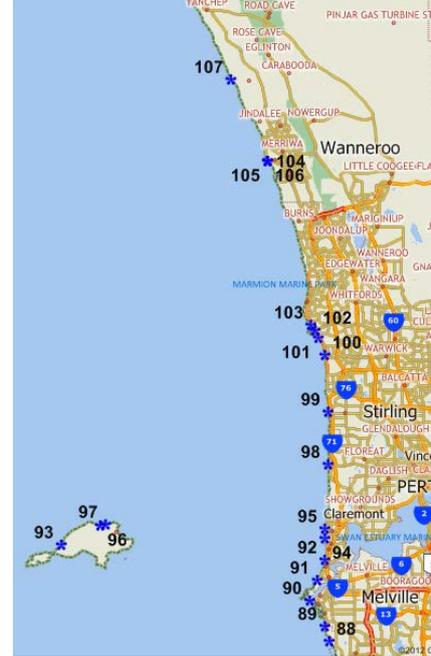


Fig. 17c.  
Perth Northern Suburbs

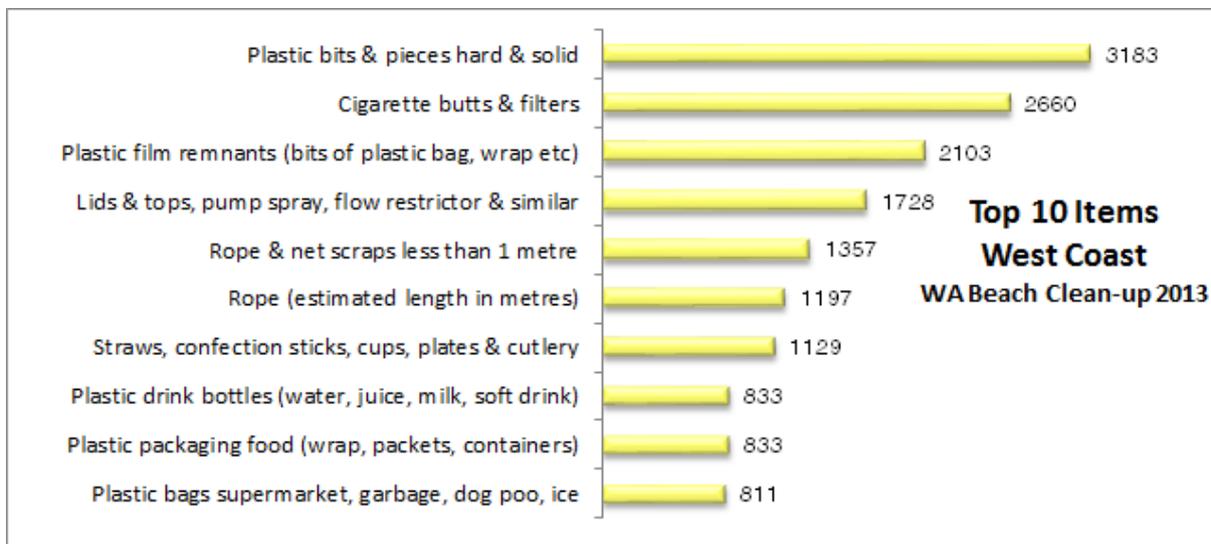


Fig. 18. Top 10 items West coast

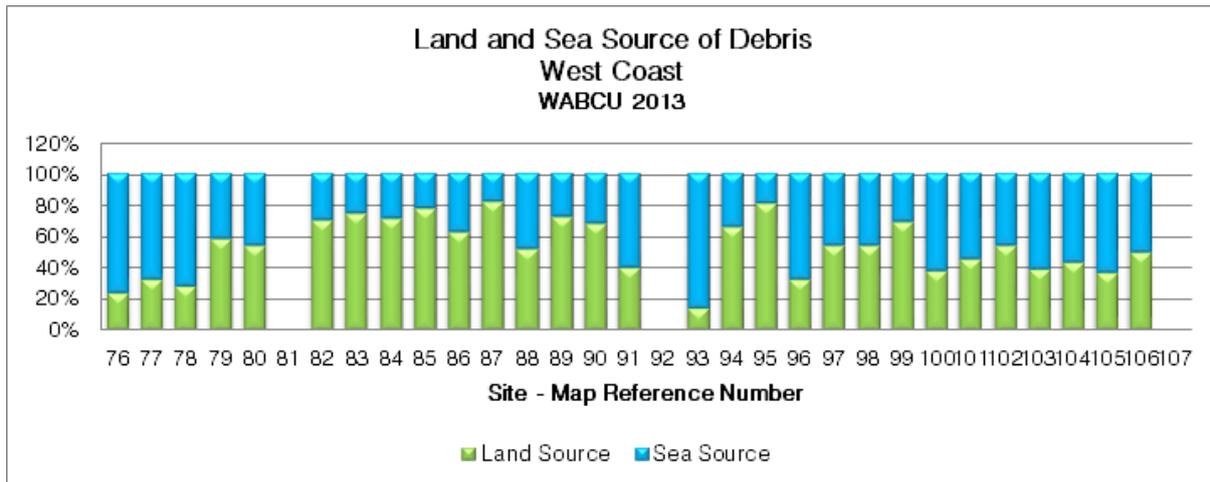


Fig. 19. Land and sea source of debris West coast

Table 8. West coast data summary

Map Reference	West Coast	Date	Items	Weight	Volunteers	Hours	Site length metres	Percentage of plastic	Debris from the land	Debris from the sea	Coastal type
76	Binningup Beach	20/10/2013	6,163	1	52	79	5,500	96%	23%	77%	2
77	Myalup Beach	19/10/2013	1,778	60	14	42	11,000	83%	32%	68%	2
78	Mandurah Falcon Bay Foreshore	12/10/2013	115	1	5	5	1,000	82%	28%	72%	2
79	Mandurah Falcon Bay Foreshore	20/10/2013	152	60	13	26	1,400	66%	57%	43%	2
80	Singleton Beach	13/10/2013	955	60	25	50	2,000	56%	54%	46%	2
81	Challenger Beach Kwinana	9/10/2013		563	25	75	1,100				1
82	Challenger Beach Kwinana	30/10/2013	81	5	24	18	400	58%	70%	30%	1
83	Woodman Point	12/10/2013	252	60	14	56	1,000	66%	75%	25%	1
84	Woodman Point	22/10/2013	146	25	28	28	750	52%	71%	29%	1
85	Woodman Point	13/10/2013	84	10	21	53	2,000	33%	78%	22%	1
86	Coogee Beach	21/10/2013	131	7	48	48	450	68%	62%	38%	1
87	Coogee Beach	1/11/2013	436	7	6	4	1,000	63%	82%	18%	1
88	CY O'Connor Beach	13/10/2013	451	9	3	6	1,000	81%	51%	49%	1
89	South Beach Fremantle	13/10/2013	548	75	5	10	1,000	52%	72%	28%	1
90	South Mole UW	13/10/2013	296	40	25	2	400	58%	68%	32%	2
91	Port Beach	13/10/2013	2,125	90	12	42	800	70%	40%	60%	2
92	Leighton Beach	12/10/2013		40	10	30	1,000				2
93	Rottnest island Stark Bay	16/10/2013	399	50	8	24	300	91%	13%	87%	5
94	Cottesloe South	26/10/2013	2,380	60	35	35	800	75%	65%	35%	2



95	Cottesloe Beach	13/10/2013	1,214	12.5	10	20	1,100	79%	81%	19%	2
96	Rottneest Island Geordie Bay	29/10/2013	157	20	13	7	1,000	77%	32%	68%	5
97	Rottneest Island Longreach Bay	29/10/2013	56	5	13	10	1,000	61%	53%	47%	5
98	City Beach	13/10/2013	349	8	9	18	200	87%	54%	46%	2
99	Scarborough Beach	12/10/2013	1,877	1	300	300	2,000	86%	69%	31%	2
100	Lennard Pool	13/10/2013	207	0	1	1	500	76%	38%	62%	2
101	Sorrento Beach	12/10/2013	295	30	6	9	700	83%	45%	55%	2
102	Hillarys Boat Harbour	12/10/2013	910	25	22	77	150	93%	53%	47%	1
103	Hillarys	11/10/2013	1,422	30	11	22	100	77%	39%	61%	2
104	Quinns Beach	21/11/2013	128	9.93	26	26	300	72%	43%	57%	2
105	Quinns Beach	14/11/2013	153	8	26	26	300	74%	37%	63%	2
106	Quinns Beach	13/10/2013	523	75	2	4	200	63%	49%	51%	2
107	Alkimos	13/10/2013			12	24					2
			<b>32</b>	<b>23,783</b>	<b>1,447.43</b>	<b>824</b>	<b>1,177</b>	<b>72%</b>	<b>53%</b>	<b>47%</b>	

## Mid-West Coast

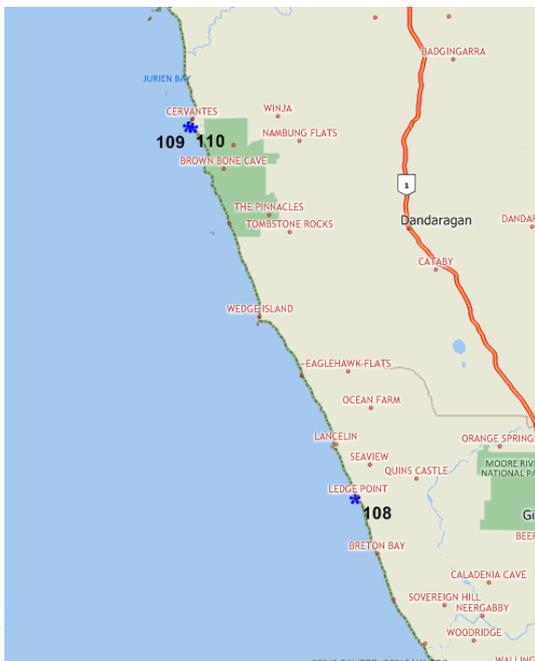


Fig. 20a. Yancheep to Cervantes

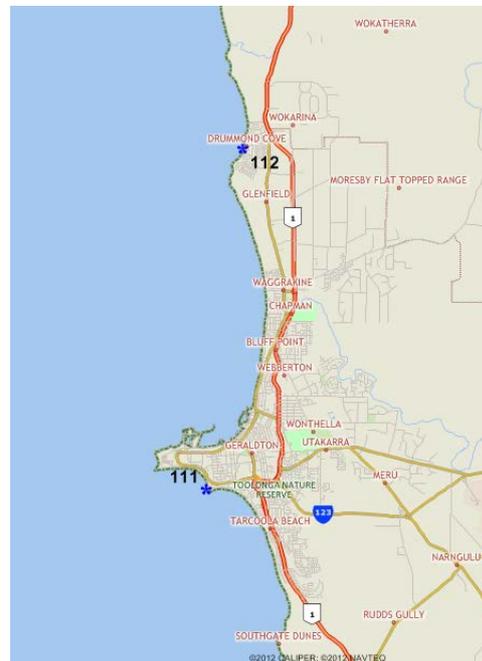


Fig. 20b. Geraldton area

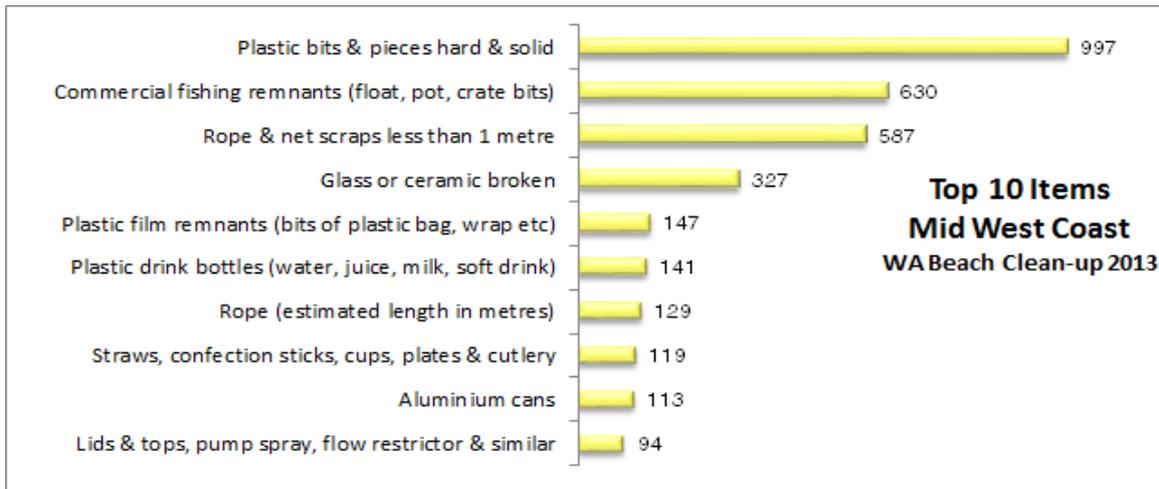


Fig. 21. Top 10 items Mid-West coast

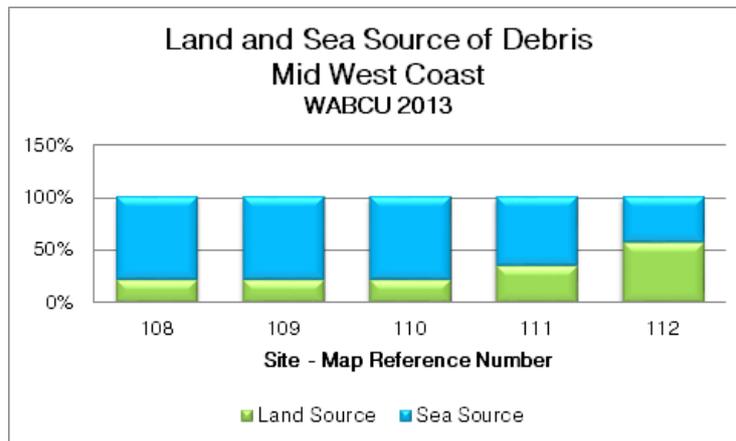


Fig. 22. Land and sea source of debris Mid-West coast

Table 9. Mid-West coast data summary

Map Reference	Mid West Coast	Date	Items	Weight	Volunteers	Hours	Site length metres	Percentage of plastic	Debris from the land	Debris from the sea	Coastal type
108	Ledge Point Beach	13/10/2013	1,561	68.5	6	21	1,000	92%	21%	79%	2
109	Cervantes Back Beach	19/10/2013	509		3	8	600	93%	21%	79%	2
110	Thirsty Point	18/10/2013	766	80	40	120	1,500	80%	22%	78%	2
111	Separation Point to Point St	13/10/2013	1,145	39	30	60	2,300	73%	34%	66%	2
112	Drummond Cove	12/10/2013	562	200	7	28		49%	56%	44%	2
		5	4,543	387.5	86	237	5,400	77%	31%	69%	



Gascoyne Coast

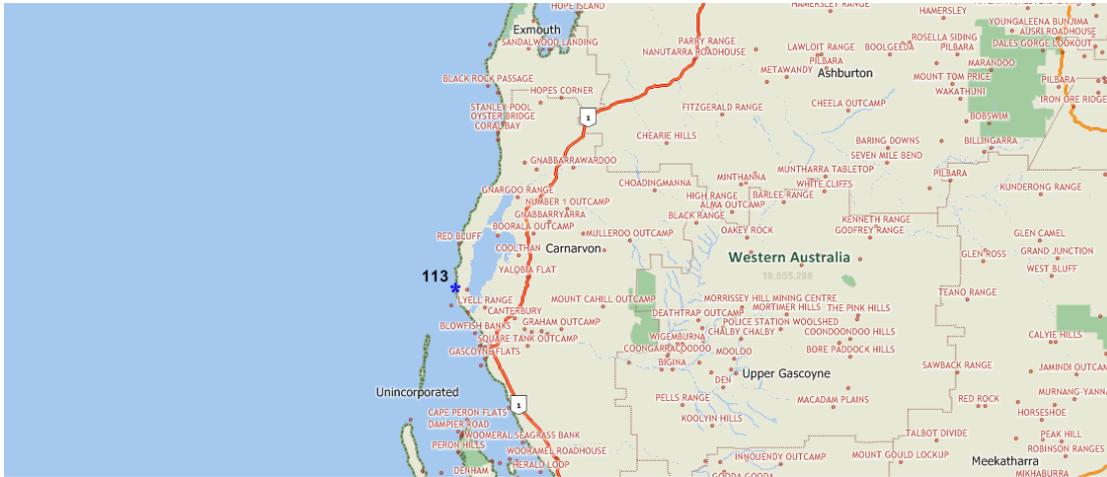


Fig. 23. Gascoyne Coast

Table 10. Gascoyne coast data summary

Map Reference	Gascoyne Coast	Date	Items	Weight	Volunteers	Hours	Site length metres	Percentage of plastic	Debris from the land	Debris from the sea	Coastal type
113	Quobba Station	13/10/2013		100	10	40	3,000				4

North West Coast

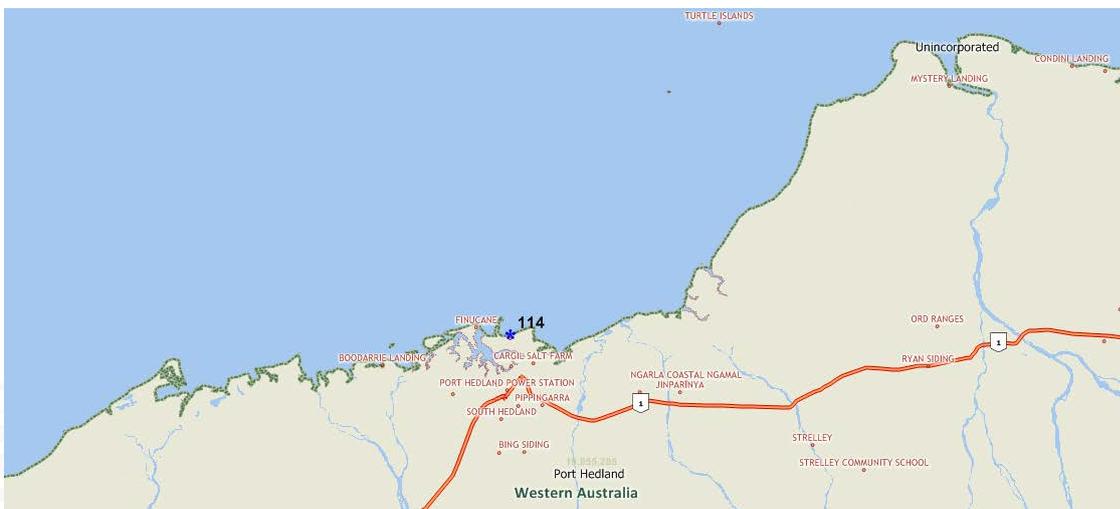


Fig. 24. North West Coast

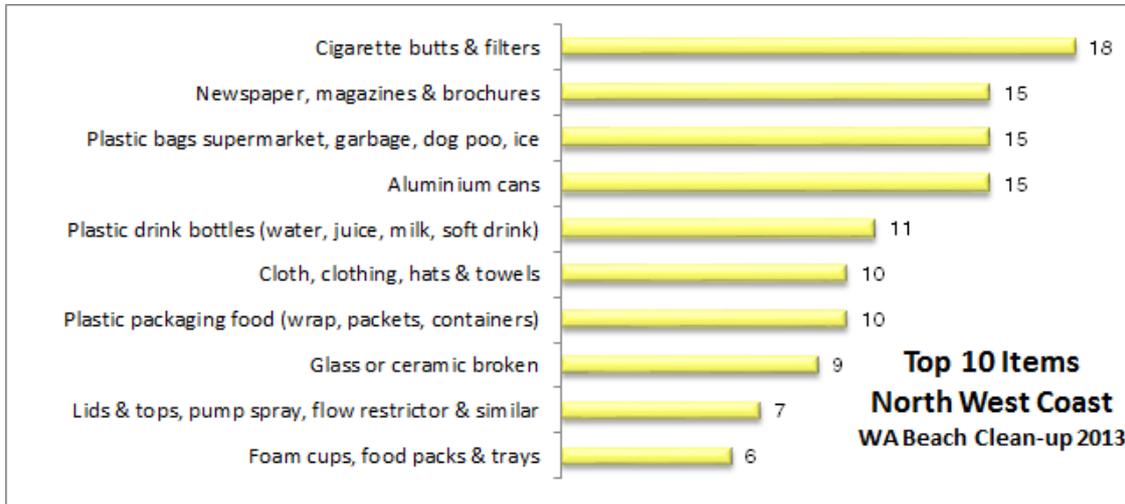


Fig. 25. Top 10 items North West coast

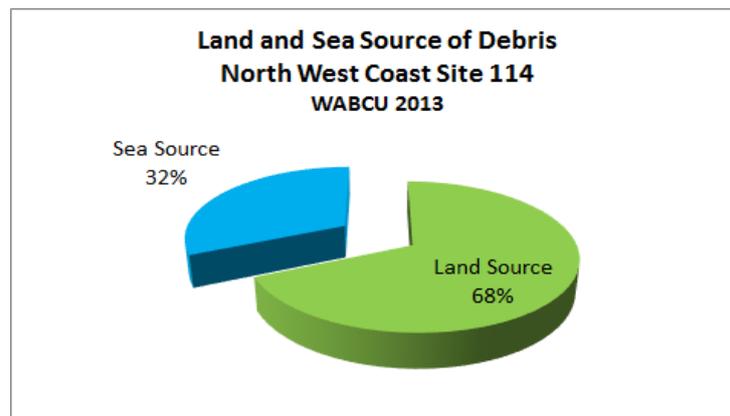


Fig. 26. Land and sea source of debris North West coast

Table 11. North West coast data summary

Map Reference	North West Coast	Date	Items	Weight	Volunteers	Hours	Site length metres	Percentage of plastic	Debris from the land	Debris from the sea	Coastal type
114	Cemetery Beach, Pretty Pool, Cooke Point & 6 Mile Beach	23/11/2013	148	29	25	50	1,500	53%	68%	32%	2



Kimberley Coast



Fig. 27. Kimberley Coast

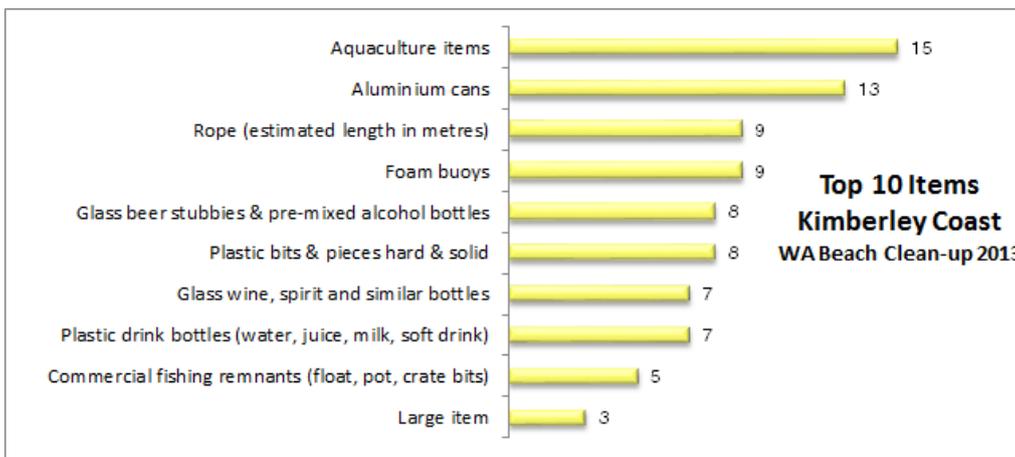


Fig. 28. Top 10 items Kimberley coast

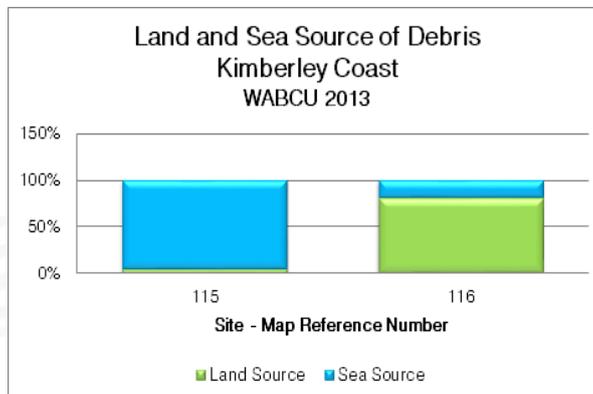


Fig. 29. Land and sea source of debris Kimberley coast



Table 12. Kimberley coast data summary

Map Reference	Kimberley Coast	Date	Items	Weight	Volunteers	Hours	Site length metres	Percentage of plastic	Debris from the land	Debris from the sea	Coastal type
115	80 Mile Beach Caravan park to Cape Missiessy	12/10/2013	76	100	2	8	120,000	76%	5%	95%	4
116	Sandy Point	13/10/2013	37	15.2	5	20	7,400	14%	80%	20%	3
		2	113	115.2	7	28	127,400	45%	42%	58%	

*Cocos (K) Islands*



Fig. 30. Map of Cocos (K) Islands

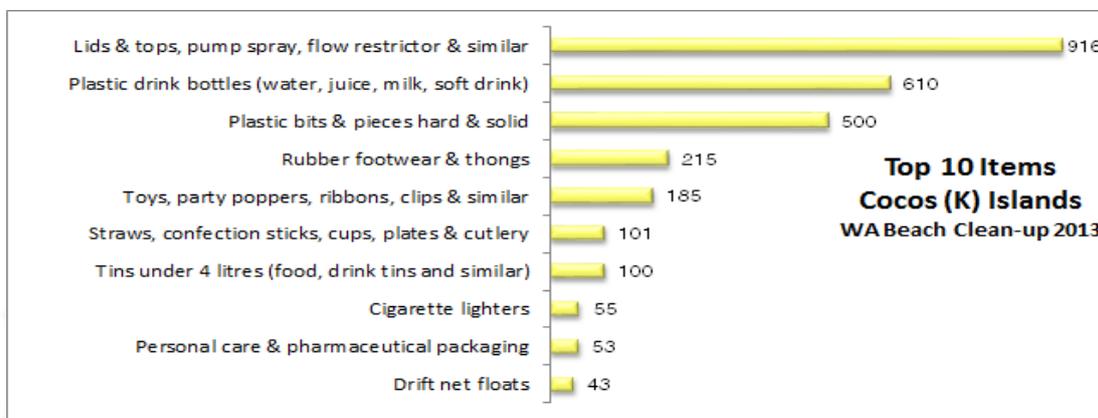


Fig. 31. Top 10 items Cocos (K) Islands

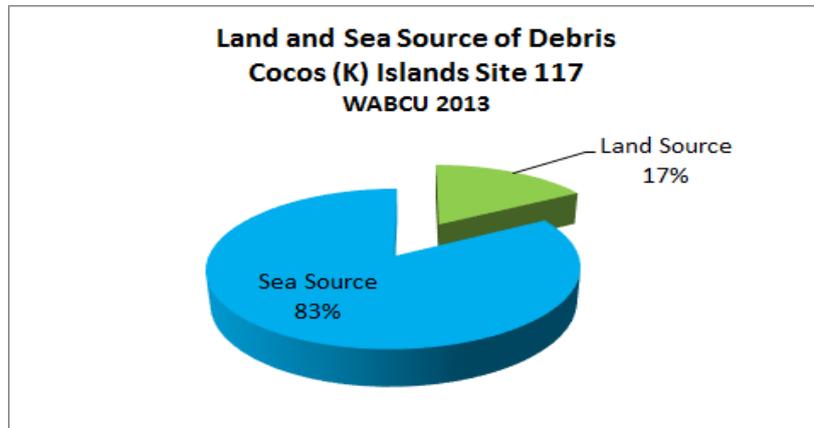


Fig. 32. Land and sea source of debris Cocos (K) Islands

Table 13. Cocos (K) Islands data summary

Map Reference	Island Territory WA	Date	Items	Weight	Volunteers	Hours	Site length metres	Percentage of plastic	Debris from the land	Debris from the sea	Coastal type
117	Gun Club, West Island	13/10/2013	2,994	65	35	35	100	88%	17%	83%	5



## South-West Marine Debris Monitoring Project

Regular monitoring continued at sites along the Capes coast and Western South coast during the year. The longest running sites include Yallingup, Injidup, Ellensbrook, Foul Bay and Quarry Bay. With a massive influx of debris this year on to South-West beaches it is worth posing the following question. Does longer term regular clean-up activity have an impact on levels of plastic debris at a given site? The Australian Marine Debris Initiative Database currently contains data for 83 sites along the Capes coast. Subtracting our 5 long term monitoring sites leaves 78 sites with clean-up regimes ranging from monthly (but begun more recently) to very occasional. These two datasets give the following clues to answering the question.

Figure 33 gives a comparison between the two sets of sites for intact, non-fishing items. The comparison shows a downward trend in the average count of these items for the regularly cleaned sites. The average count of items per clean-up for all other sites is trending upwards. The peaks and troughs correspond in large measure to the strength and frequency of winter frontal activity. This supports the argument that longer term regular activity can reduce debris levels in the locality of the activity. The reduction is achieved by preventing a build-up of debris within the site resulting from seasonal burial and re-circulation and longer term burial in the dunes.

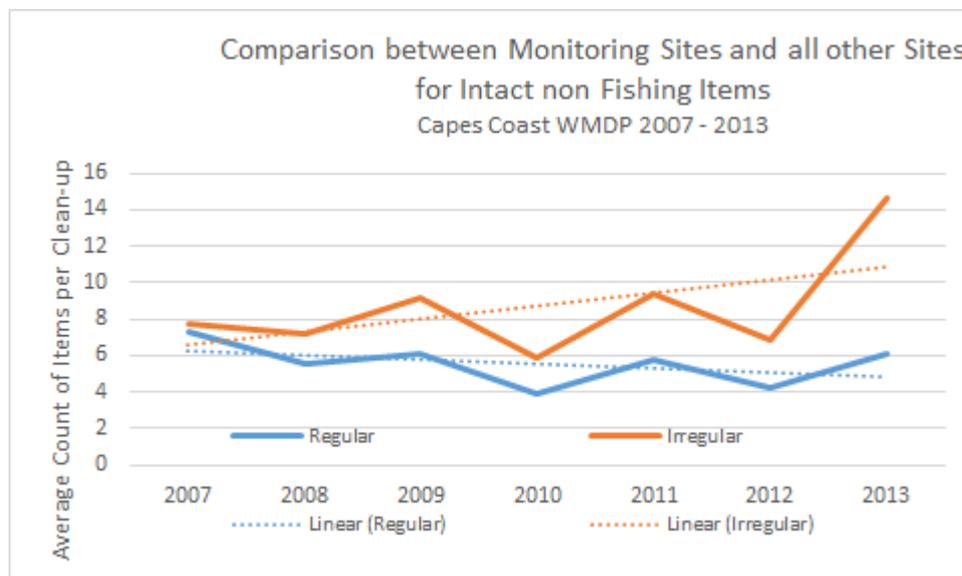


Fig. 33. Comparison between monitoring sites and all other sites for intact non-fishing items. "Linear" in the legend refers to the linear trend (simple linear regression) over the 7 years.

The predominant group of items on the Capes coast are plastic remnants. Comparing the two sets of sites for this category of items gives a similar result to the intact non-fishing items and is shown in Figure 34.

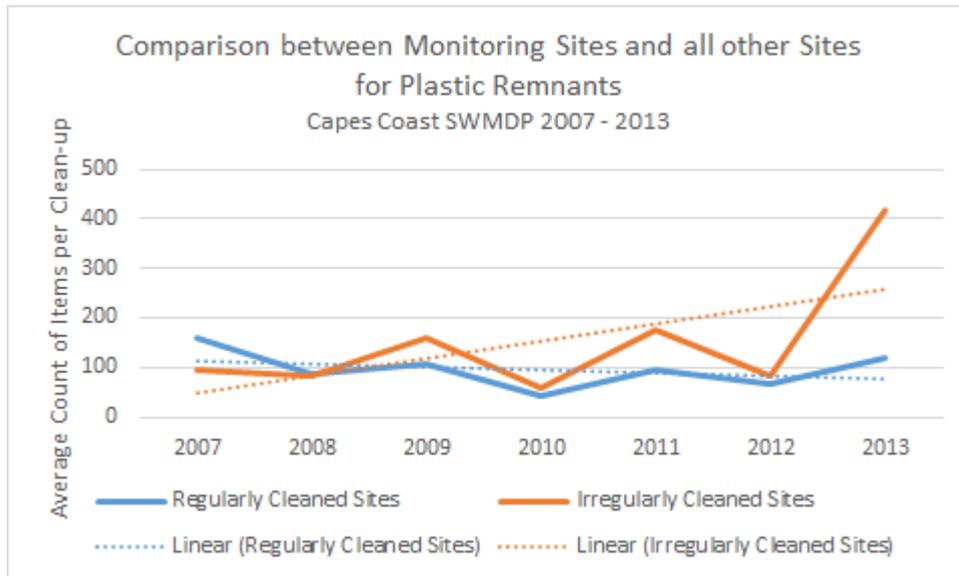


Fig. 34. Comparison between monitoring sites and all other sites for plastic remnants. "Linear" in the legend refers to the linear trend (simple linear regression) over the 7 years.

The reduction of debris levels over time at regularly cleaned sites is a positive incentive for undertaking regular long term debris removal. However, debris removal only addresses one side of the problem. When coupled with data collection aimed at debris source identification and backed up with source reduction strategies the benefits can be amplified substantially.



## Volunteers and Supporters

Thank you goes to all the volunteers, partners and supporters involved in the 2013 West Australian Beach Clean-up and Australian Marine Debris Initiative!

Activ Foundation Albany	Marmion Beach Guardians
Albany WA Museum	Murdoch University Dive Club
Alkimos Progress Association	Myalup Community Association
Boranup Boardriders	Northern Agricultural Catchments Council (NACC)
Cape to Cape Catchment Group Volunteers	Ningaloo Station
Care for Hedland Environment Association (Inc)	Nyul Nyul Indigenous Rangers
Cervantes Primary School	Ocean Reef Senior High School
Church of God International	Pemberton Discovery Tours
City of Bunbury	Perth Advocates for the Earth
City of Busselton	Perth Region NRM - Coastcare in the KIA
City of Fremantle	Perth Scuba
City of Geraldton-Greenough	Prevelly Penguins
Coastwest	Quobba Station
Cocos (K) Islands Youth Council	Rottneet Island Authority (RIA)
Community First Ability Arts	Sea Shepherd WA
Cottesloe Coastcare	Shire of Augusta Margaret River
Cott Helpers	Shire of Capel
Dunsborough Coast & Landcare (Inc) (DCALC)	Shire of Harvey
D'Entrecasteaux Coastcare Group	Singleton Coastcare
Dolphin Discovery Centre Volunteers	South Coast NRM
Department of Fisheries WA	South West Catchments Council (SWCC)
Department of Parks and Wildlife (DPaW)	Surfrider Foundation Australia – Perth
DPaW Broome	Surfrider Foundation Australia – Margaret River
Eli Lilly	St Patricks
Falcon Coastcare Group	Tarcoola Beach/ART
	The Church of Jesus Christ of Latter Day Saints, Busselton Branch
Geocatch	The Jaffas
Geographe Bush Ranger Cadets	The Wilderness Society WA
Gracetown Progress Association	Underwater Explorers Club - Perth
Gypsea Warriors	Volunteer Fisheries Liaison Officers
Hopetoun Progress Association	Waalbiirninny Wildlife Shelter
Iluka Resources	Walpole Nornalup Parks Association
Jumping on the Clouds	Wellstead Progress Association/Wellstead Tidy Towns Committee
	Williams Bay National Parks Association
Keep Australia Beautiful Council WA	
Kimberley Land Council	
Ledge Point Coastcare	
Margaret River Environment Centre	
Margaret River Independent School	