

Clean4Shore Program 2014 Report

2014 Foreshore Clean Up Program along the Brisbane Waters and Hawkesbury River Estuaries, New South Wales

Report by Wally Smith & Heidi Taylor - Tangaroa Blue Foundation



Funded through the NSW Environmental Protection Authorities (EPA) *Waste Less, Recycle More initiative* with support from the following organisations





Introduction

The Clean4Shore Program conducts ongoing debris removal activities at various foreshore locations in the Brisbane Waters and Hawkesbury River (1) estuaries which are situated just north of Sydney, New South Wales. The program is managed by a range of partner organisations and delivered by Graham Johnston of Graham Johnston Training Services with the help of volunteers from a variety of community, government and business organisations.

Data from the debris removal activities is forwarded to the Australian Marine Debris Initiative (AMDI) where it is entered into the Australian Marine Debris Database.

This report has been prepared at the request of the Community Environment Network which provides support to individuals and groups working in the environment in the Lake Macquarie, Wyong and Gosford districts. The aim of the report is to present the data collected during 2014 for the various clean-ups in the Brisbane Waters and Hawkesbury River estuaries and to present a statistical summary of that data with a focus on effort, impact of debris, and source reduction.

This report focusses on data and cannot adequately portray the level of effort, working conditions and enthusiasm of participants. The Clean4shore Programs' own clean-up reports and photos are well worth viewing to get a full sense of the task the program is tackling and achieving.



Map 1: Map of Brisbane Waters and Hawkesbury River estuaries (orange indicates main population)





Acknowledgements

The following organisations and individuals are acknowledged for their efforts and support for the Clean4Shore Program.

Logistical Support

Brisbane Waters Fisheries Brisbane Waters National Park Brisbane Waters Oyster Grower, Simon Funnel Broken Bay Oyster Growers, Rob Moxham Community Environment Network Fisheries NSW Gosford City Council Greater Sydney Local Land Services Hornsby Shire Council NSW Environment Protection Authority OceanWatch Australia Tangaroa Blue Foundation

Clean-up Participation

Brisbane Waters Community Brisbane Waters Secondary College, The Croft Brisbane Waters Secondary College, Work Experience Program Brisbane Waters Secondary College, Woy Woy Campus, Bushcraft Brisbane Waters Secondary College, Woy Woy Campus, Support Unit Dimension Data Father Chris O'Reilly's Youth Off The Streets MacMasters Beach SLSC MacMasters Beach Progress Association North Gosford Learning Centre Response Training Gosford Rolland Hassall School Parramatta Telstra The Glen (Aboriginal Men's Health Centre) Umina & Bateau Bay PCYC







Effort

A considerable amount of effort is required to bring the on ground activities of the Clean4shore Program together. Organisational tasks include engagement of volunteers, surveying clean-up sites, arranging land and water based transport, liaising with land managers, developing and carrying out disposal and recycling strategies and maintaining funding for the program, to name but a few. The analysis of effort below is confined to the on ground clean-up activities and should be seen as only part of the overall effort from the program, its supporters and stakeholders.

Effort Statistics

Table 1 shows the program statistics for each estuary with the bulk of the work carried out in the Brisbane Waters estuary.

	Clean-ups	Items	Weight (kilograms)	Length Cleaned (metres)	Volunteers	Total Hours
Brisbane Waters	55	109,519	51,718	10,780	430	1,768
Hawkesbury River	26	22,112	19,775	41,970	261	1,079
Project 2014 Totals	81	131,631	71493	52,750	691	2,847

Table 1. Project statistics

With a slight increase of time spent per clean-up and a decrease in numbers of volunteers per clean-up compared to 2013, the project achieved a 49% increase in weight removed and an 6% increase in the number of items collected (Figures 1 & 2). This in part reflects a concentration of effort in hotspot areas around Brisbane Waters to enable removal of large items including abandoned barges and boats and penetration of areas with very high rubbish concentrations. The program continues to provide an important framework and resource base enabling a range of community organisations to participate in the ongoing clean-up and restoration of the Brisbane Waters and Hawkesbury River estuarine environments (Figure 3).

Figure 1. Average duration and number of volunteers per clean-up









Figure 2. Average count of items and weight (kilograms)

Figure 3. Number of clean-ups by type of attending organisation



Distribution of Effort

Figure 4 represents the distribution of effort in terms of total hours spent at each location and Figure 5 represents the average length of shoreline cleaned at each location. Brisbane Waters estuary is surrounded by built-up areas and hosts an active oyster growing industry. Work in this estuary requires considerable application of effort and during 2014 this was often concentrated in small areas along the foreshore. The Hawkesbury River, in contrast, has less built-up areas and is surrounded mainly by National Parks. Higher inputs of effort in the river were centred in the Brooklyn area. Clean-up sites around the river are more spread out resulting in larger distances being covered per clean-up especially away from the Brooklyn area.







Figure 4. Total hours spent at each clean-up location









Impact

Impact of Debris in Each Estuary

The Brisbane Waters shoreline is dominated by built-up areas, boat moorings and aquaculture facilities. Pockets of remnant mangrove habitat are located throughout, particularly around creek entries and islands. Mangroves are very efficient at capturing debris by virtue of a combination of the tidal penetration into and trapping capacity of the vegetation, whereas built-up shorelines with beaches, walls and other less heavily vegetated layouts are less so. With a release of debris into the estuary over time and its circulation around the estuary, there will be a preferential accumulation of debris in the mangroves. Added to this are inputs from past and present dumping practices and the presence of abandoned and derelict aquaculture gear. This causes a loss of habitable area through the clogging up effect of rubbish. The influx and long term trapping of plastic and foam items also promotes the release of endocrine active and other toxic chemicals. It is reasonable to predict that debris released into the Brisbane Waters estuary has its greatest impact on the ecological communities using these systems. Mangrove systems provide essential habitat, breeding ground and food services for many species. Impacts can be expected to reflect back into the wider estuary system in ways that can be anticipated but are not yet properly studied. The exposure of juveniles of various species to endocrine active chemicals made available from plastic and foam debris trapped in the mangroves is one particularly concerning pathway which impacts on the wider estuarine food web.

The Hawkesbury River estuary has a more open layout with less exposure to debris from towns and a wider variety of shoreline types. Recreational use of this area and dumping practices are noted by the program, especially around the Brooklyn area. Harmful plastic debris may not be trapped as frequently or held for as long as in the Brisbane Waters estuary and the river's debris may be more quickly transported through the marine system to the ocean. The amenity of the area is impacted by dumping and littering.

Figure 6 below represents the difference in item density, measured in items per metre of shoreline, between Brisbane Waters and Hawkesbury River estuaries.



Figure 6. Comparison of item density for each foreshore clean-up location





Distribution of selected items in each estuary

Figures 6 to 9 show the distribution of four items common to the top 10 ranking tables (Tables 2 & 3) for both estuaries. The measure used is average items collected per clean-up for each clean-up location. The four items are foam items, plastic drink bottles, plastic bags and plastic film remnants.

Foam items and plastic drink bottles contain Bisphenol A (BPA), a well-studied endocrine active chemical, and polystyrene foam contains the toxic chemicals styrene and benzene. (2, 3)

Plastic bags and plastic film remnants also contain toxic chemicals such as phthalates but in addition these films present a very high entanglement and ingestion threat to wildlife. (3)

Distribution of foam items and plastic drink bottles

Foam items and plastic drink bottles disperse rapidly due to their high buoyancy and light weight. Their distribution shows higher numbers away from the populated parts of the estuaries and high numbers are found at locations such as Lion Island close to the mouth of the Hawkesbury River and upstream from Brooklyn at Milsons Passage. Wind plays a major role in dispersing foam and plastic bottles. The numbers of each item found at the various locations throughout the estuaries show a similarity in the pattern of dispersion (Figures 6 & 7).



Figure 6. Distribution of foam items







Figure 7. Distribution of plastic drink bottles

Distribution of Plastic Bags and Plastic Film Remnants

Plastic bags are semi-buoyant and tend to sink once sand, grit or water enters them. They are therefore more likely to remain in the area where they are released unless caught up in a strong flowing current. Plastic film remnants have a similar behaviour in water but they are not in a bag form so there is more scope for them to remain drifting on or near the surface and therefore to travel further afield.



Figure 9. Distribution of plastic bags







Figure 10. Distribution of plastic film remnants

Abandoned and Derelict Fishing Gear

Abandoned and derelict fishing gear is distributed throughout the Brisbane Waters and Hawkesbury River systems. The amount in Brisbane Waters remains high. In the clean-up process the program stockpiles larger items at strategic bulk storage locations. When the bulk items are removed they are then accounted for in the data. The map therefore shows high numbers of items at storage sites near Boudi Pony Club and Kincumber Creek. These items originate from various sites around the Brisbane Waters estuary.









Material Percentages for Each Estuary

The proportion of materials for all items removed during 2014 is given in Figure 8. There was 6% more plastic food packaging collected in Brisbane Waters (13%) compared to Hawkesbury River (7%). Likewise, aquaculture items were 4% more in Brisbane Waters (4%) compared to Hawkesbury River (<1%) These two items account for the difference in the plastic percentage.



Figure 8. Material percentages for each estuary

Marine Impacts

The amount of debris that will eventually reach the open ocean from inland waterways and estuaries depends on their geographical layout, the potential of shorelines to impede or trap debris and the degree of enclosure of the waterway. From this perspective debris released in Brisbane Waters estuary has a reduced probability of reaching the ocean. The impacts are concentrated locally in the estuary and it can be anticipated that any species coming from the open sea into the estuary to feed or breed will have some level of exposure to the toxicity from foam and plastic items and then carry this exposure back out into the ocean food web.

Hawkesbury River presents a more open estuarine layout and its shorelines may not trap debris to the extent occurring in Brisbane Waters. Therefore there is a higher probability that debris will be transported more directly to the ocean.





Source Reduction

Top Ranking Items

The two tables below show the top ranking items for each estuary. The last two columns of the tables show the usage category and activity group for each type of item and give an indication that much of the debris consists of food and drink packaging discarded by individuals.

Table 2. Top ranking items Brisbane Waters

Brisbane Waters	Total	Usage category	Activity Group
Plastic drink bottles (water, juice, milk, soft drink)	11544	Packaging	Individual Consumption
Plastic film remnants (bits of plastic bag, wrap etc)	11379	Remnants & Breakage	Plastic Remnant Accumulation
Foam insulation & packaging (whole and remnants)	9652	Packaging	Individual Consumption
Plastic packaging food (wrap, packets, containers)	9573	Packaging	Individual Consumption
Plastic bags supermarket, garbage, dog poo, ice	9059	Packaging	Individual Consumption
Lids & tops, pump spray, flow restrictor & similar	6181	Packaging	Individual Consumption
Plastic bits & pieces hard & solid	4552	Remnants & Breakage	Plastic Remnant Accumulation
Rubber balloons, balls & toys, elastic straps & bands	3976	Consumer Articles	Individual Activities
Aluminium cans	3741	Packaging	Individual Consumption
Remnants burnt plastic	3595	Remnants & Breakage	Plastic Remnant Accumulation

Table 3. Top ranking items Hawkesbury River

Hawkesbury River	Total	Usage category	Activity Group
Foam insulation & packaging (whole and remnants)	2878	Packaging	Individual Consumption
Plastic drink bottles (water, juice, milk, soft drink)	2083	Packaging	Individual Consumption
Plastic film remnants (bits of plastic bag, wrap etc)	1767	Remnants & Breakage	Plastic Remnant Accumulation
Plastic bags supermarket, garbage, dog poo, ice	1395	Packaging	Individual Consumption
Glass or ceramic broken	1262	Remnants & Breakage	Individual Consumption
Glass beer stubbies & pre-mixed alcohol bottles	1149	Packaging	Individual Consumption
Lids & tops, pump spray, flow restrictor & similar	996	Packaging	Individual Consumption
Plastic packaging food (wrap, packets, containers)	894	Packaging	Individual Consumption
Plastic bits & pieces hard & solid	877	Remnants & Breakage	Plastic Remnant Accumulation
Remnants burnt plastic	757	Remnants & Breakage	Plastic Remnant Accumulation

Aquaculture Items

Debris originating from aquaculture activities ranks as the 14th highest item in terms of numbers of items removed from the Brisbane Waters estuary and the 60th in the Hawkesbury River. The weights and volumes involved are considerably greater than most other debris. Removal of the abandoned and derelict gear remains an important step in a source reduction strategy. Once the bulk of historic debris is removed, the monitoring of these items will better reflect any problems related to current day activity and therefore mitigation strategies needed.

The Brisbane Waters Oyster Growers recently launched their Environmental Management System which has been developed by the farmers together with Oceanwatch Australia and the Gosford City Council. The Clean4shore project has developed a strong evidence base on the impact of abandoned and derelict





gear on the estuary and this new forum presents an ideal platform to continue existing and establish new initiatives aimed at preventing gear loss.



Local Source Reduction Strategies

Local source reduction activities engage the broader community and give the community ownership of their endeavours to address local pollution. Daily observations can identify obvious instances of litter and other refuge being released into the local environment and local responses and solutions can be called upon. For various reasons people don't automatically think in terms of source reduction or they are reluctant to act without support or authorisation. Therefore, awareness raising about source reduction involvement and resources available to carry this out at a local level may be needed to help foster a local community response to obvious and preventable sources of debris polluting the estuaries. Some webbased resources are included in the notes section of this report.

Regional Source Reduction Strategies

Source reduction strategies at a regional level are not so straight forward because the whole population of a region plays a role in the release of debris in the process of going about its activities over time. Regional level assessment, planning and integration of effort amongst stakeholders is required.

In large populations of people the probability of discarding rubbish into the environment for any reason can be expected to be about the same for the majority of people (4). People tend to drop or misplace bits of rubbish as they go about their business at home, work, school, shopping and driving. They may only drop one or two items every now and then, but when multiplied by the total number of people the volume of debris being released into the environment is going to be large. Debris on the pavements and streets ends up in the drainage network which conveys it into rivers, estuaries and the ocean. Identifying key locations and the activities conducted at locations around the cities and towns provides an avenue to identify their potential as sources of debris. Mapping and analysing these networks of people's activities and locations can provide insights into the habits and behaviours in various settings and, when coupled





with data on rubbish release from those settings, priority locations can be addressed. This approach is currently being explored by Tangaroa Blue Foundation in partnership with the Hunter Local Land Services for the purposes of developing a regional approach to inland waterway, estuarine and marine debris, and the results will be made available mid-2015.

The stormwater drainage system is an important factor in the transport of debris into waterways and as such, stormwater management plays an important role in the interception of local rubbish. A variety of stormwater improvement devices including gross pollutant traps, pits, ponds and booms are used to filter or capture rubbish. A step that can be taken is to assess the overall effectiveness of the installed stormwater improvement devices in a drainage sector for factors such as maintenance, suitability of device type and additional device requirements. This could be done on a priority basis determined by the expected inputs of litter and refuse from within the sectors catchment area. Expected inputs would be identified in the process described in the preceding paragraph using a weighting system for different kinds of locations in the catchment.

A combination of regional initiatives together with the encouragement of local and individual source reduction activities is the better way to achieve an integrated approach to source reduction. Local initiatives can face factors outside their control and the existence of a regional strategy will offer a next step for them and preserve their willingness to remain engaged in the activity.

The Clean4Shore Program has and continues to be instrumental in providing data which is enabling a better understanding of debris in waterways, potential marine impacts and the development of source reduction strategies. Whilst estuary and river clean-ups have been carried out for many years around Australia, it is only recently that data collection has become more organised and in a form that has a strong focus on the identification of sources of debris. The interest from all levels of government now shown in using this data to tackle the issue promises continued advances in dealing with it.







Notes

- 1. In previous reports The Hawkesbury River clean-up locations were separated into lower and mid sectors as an aid to organising the data and its location details. This separation into lower and mid is no longer used.
- 2. State of the Science of Endocrine Disrupting Chemicals 2012. An assessment of the state of the science of endocrine disruptors prepared by a group of experts for the United Nations Environment Programme and World Health Organization.
- 3. See for example <u>http://worldcentric.org/about-compostables/traditional-plastic/plastic-types</u>
- 4. We suggest here that the number of times individuals release debris into the environment for any reason is expected to follow a normal distribution. A few will release very little, a few will release a lot and the majority will release a number close to the mean for the population. See for example http://www.epa.nsw.gov.au/resources/warr/130800LPKThingsKnow.pdf

Resources

Tangaroa Blue Foundation Source Reduction Plan Forms

http://www.tangaroablue.org/resources/source-reduction-plan.html

NSW EPA Litter Prevention Kit

http://www.epa.nsw.gov.au/resources/litter/130799-lpk-effective-litter-prevent.pdf







Appendix A. Full List of Items Collected During 2014

The mobility rating is a guide to the likelihood of an item drifting out to sea or conversely its likelihood of having come from offshore within the context of a coastal beach. It relates to the relative ease with which an item moves around in the marine environment and takes into account the quick disintegration of items such as paper and cigarette butts in water. The rating holds for most items in an estuarine setting, with the exception of one or two items with a number 6 rating (e.g. light bulbs).

Legend		
. 11	1	Not mobile in water
	2	Low mobility in water
	3	Medium mobility in water
	4	High mobility in water
	5	Very High mobility in water
	6	Comes from water based activities

Item	Total	Mc	bility
Plastic drink bottles (water, juice, milk, soft drink)	13627	.11	5
Plastic film remnants (bits of plastic bag, wrap etc)	13146		3
Foam insulation & packaging (whole and remnants)	12530	.11	5
Plastic packaging food (wrap, packets, containers)	10467		3
Plastic bags supermarket, garbage, dog poo, ice	10454		2
Lids & tops, pump spray, flow restrictor & similar	7177	.0	4
Plastic bits & pieces hard & solid	5429	.0	4
Rubber balloons, balls & toys, elastic straps & bands	4500	.0	4
Remnants burnt plastic	4352	.0	4
Aluminium cans	4282		2
Glass beer stubbies & pre-mixed alcohol bottles	4157		1
Toys, party poppers, ribbons, clips & similar	3507		3
Processed timber, pallets & other wood	3389		3
Glass or ceramic broken	3350		1
Aquaculture items	2732		4
Cigarette lighters	2702	.11	5
Rubber remnants	2628		4
Straws, confection sticks, cups, plates & cutlery	2613	.11	5
Bait & tackle bags & packaging	1921		3
Plastic containers non food (oil, sealant, chemical)	1748	.01	5
Pens, markers & other plastic stationary	1747		3
Foam cups, food packs & trays	1648	.01	5
Rubber footwear & thongs	1223		4
Glass wine, spirit and similar bottles	1186		4
Bleach & cleaner bottles	1167	.11	5





Plastic wrap non food (bubble wrap etc)	1057 🔐	3
Bait containers & lids, bait savers	1032 📊	6
Tins under 4 litres (food, drink tins and similar)	597 🔐	2
Recreation fishing items (lures, floats, rods, reels)	571 📊	4
Cloth, clothing, hats & towels	513 📊	3
Rope & net scraps less than 1 metre	470	6
Aerosol cans	461	5
Glass jars & sauce bottles	424	4
Shoes leather & fabric	397 📊	3
Boat parts, wreckage & remnants	357 📊	6
Toothbrushes, brushes & combs, hair ties etc	311	4
Foil wrappers, packets, bladders & alfoil	276	3
Strapping band scraps	239	6
Foam buoys	218	6
Baskets, crates & trays	215	3
Rope (estimated length in metres)	200	6
Rubber buffers, tyres, seals & similar	156	2
Construction material (brick, cement, pipe)	151	1
Personal care & pharmaceutical packaging	145	5
Plastic sheeting (tarpaulin, woven bags, pallet wrap)	144	3
Metal bottle caps, lids & pull tabs	118	1
Plastic pipe PVC, irrigation & reticulation	108	3
Wire, metal stakes & pipes	99	1
Cigarette butts & filters	91 🔐	2
Newspaper, magazines & brochures	89	2
Brooms, brushes & paint brushes	87 📊	3
Paper & cardboard packaging	84 💵	2
Metal signs and sheeting	81	1
Foam sponge sheeting (mattress & similar)	79 📊	3
Metal outdoor equipment, implements, furniture	79	1
Metal building & trades materials, fixings & fittings	78	1
Wooden confection sticks, pencils, matches etc	77 📊	3
Sanitary (tissues, nappies, condoms, cotton buds)	74	1
Fishing line in metres (Recreation)	71	2
Metal Fishing Items (Sinkers, lures, hooks, traps, pots)	68	2
Plastic bottles, drums, jerrycans & buckets over 4 litre:	65 _{II}	5
Metal marine engine & boat parts & fittings	62 ₁₁	6





Large item	62 🔒	3
Appliances, electronics & batteries	61 미	2
Strapping band whole (record as single item)	59 미	6
Cylume glow sticks	58 💵	6
Binding, thread, string & cord (natural fibre)	53 📊	3
Commercial fishing remnants (float, pot, crate bits)	43 📊	6
Tetra packs & drink cartons	40 🔐	4
Fibreglass fragments	39 🔢	4
Medical waste	38 💵	3
Glassware & ceramic items	21	1
Canvas, sailcloth & hessian materials	18 🔢	3
Metal drums, cans & buckets over 4 litres	16 📊	3
Recreation & outdoor equipment	14 🔐	3
Metal motor vehicle parts & batteries	13	1
Plastic furniture outdoor & camping	11	2
Wooden Fishing Items	10	6
Fluorescent light tubes and bulbs	6	6
Wooden furniture	6	1
Commercial fishing traps, pots & intact parts	4	6
Carpet & lino household, boat deck & padding	4 🔐	3
Metal bicycle, shopping trolley and similar	3	1
Childcare items	3 🔐	3
Synthetic cardboard (corflute) signs & packaging	3 🔐	3
Small machinery & electric motors	3	1
Municipal activities (tree guard, barrier fence etc)	2	3
White goods	2	1
Syringes medical	2	4
Plastic housewares, tablewares, house fittings	2	2
Plastic electrical cable, connectors & fittings	2	3
Dangerous & very hazardous items	2	3
Gas bottles	2	4
Rubber sheeting	1 🔐	3
Metal scrap & remnants	1	2
Building & trades materials, fixings & fittings	1 0	1
	131631	





Appendix B. Table of Clean-ups and Details

Site name						
	Date	ltems	Weight	Site length	Volunteers	Hours
Brisbane Waters Estuary			•	•	•	
Bensville Mangroves	17/02/2014	65	1500	150	2	11
Bensville Mangroves	20/02/2014	2390	280	40	7	28
Bensville Mangroves	19/04/2014	2700	480	400	7	21
Bensville Mangroves	20/05/2014	1	380	0	2	9
Bensville Mangroves	9/10/2014	838	40	600	8	20
Bensville Mangroves	10/10/2014	2	1500	20	20	90
Bensville Mangroves	23/10/2014	779	120	40	6	18
Bouddi Pony Club Bulk Oyster Site	13/07/2014	485	6550	0	10	55
Bouddi Pony Club Bulk Oyster Site	18/08/2014	826	4400	0	2	11
Caroline Bay Mangroves	7/05/2014	1753	120	300	6	24
Caroline Bay Mangroves	9/05/2014	7431	1000	300	13	59
Caroline Bay Mangroves	15/05/2014	4601	380	100	8	32
Caroline Bay Mangroves	10/06/2014	1	790	5	2	5
Caroline Bay Mangroves	11/06/2014	420	120	10	8	32
Cockle Bay	10/02/2014	2	0	0	2	5
Cockle Nature Reserve	6/02/2014	2424	300	300	9	32
Davistown Foreshore	12/05/2014	112	680	5	2	9
Empire Bay Mangroves	7/03/2014	1335	460	400	16	32
Erina Bay & Yattalunga	31/10/2014	1393	310	50	15	53
Erina Bay Mangroves	2/03/2014	11891	800	100	12	48
Erina Bay Mangroves	3/04/2014	10344	560	60	13	59
Erina Bay Mangroves	5/04/2014	1655	60	20	3	8
Erina Bay Mangroves	2/05/2014	6106	360	150	17	68
Erina Bay Mangroves	16/05/2014	7254	1000	300	12	54
Erina Bay Mangroves	9/09/2014	2420	308	40	7	25
Erina Bay Mangroves	12/09/2014	1124	160	400	9	36
Erina Creek & Green Point	21/05/2014	1466	260	300	11	33
Green Point and Yattalunga Mangroves	21/02/2014	2743	1020	600	13	59
Hardys Bay & Bensville	5/02/2014	1332	340	300	17	68





Kincumber Broadwater, Western Foreshore	20/11/2014	1702	320	600	6	18
Kincumber Broadwater, Western Foreshore	15/12/2014	4821	1360	700	14	63
Kincumber Creek	20/05/2014	420	20	60	2	5
Kincumber Creek	18/06/2014	40	790	3	2	9
Kincumber Creek	19/06/2014	454	470	10	13	59
Kincumber Creek	23/06/2014	1346	3190	10	2	17
Kincumber Creek	24/06/2014	100	1640	3	2	11
Kincumber Creek	3/07/2014	1443	2600	3	2	16
Kincumber Creek	24/07/2014	959	380	150	7	21
Kincumber Creek	16/12/2014	9505	380	1000	12	54
Merritts Wharf	6/03/2014	127	1260	5	6	30
Paddys Channel	5/03/2014	28	1700	5	3	15
Pelican Island	19/06/2014	1	970	10	13	59
Pelican Island	7/07/2014	1426	380	100	7	28
Pelican Island	29/07/2014	1776	780	1000	9	49
Pelican Island	30/07/2014	2387	900	600	9	50
Pelican Island	11/09/2014	1559	970	400	9	36
Pelican Island	25/09/2014	1	1980	20	9	41
Pelican Island	30/09/2014	1	1340	40	3	12
Pelican Island	22/10/2014	1780	330	40	7	21
Pelican Island & Merritts Wharf	8/05/2014	155	2000	20	12	54
Rileys Island and Woy Woy Channel	5/11/2014	1519	360	500	7	32
South Kincumber and Empire Bay Channel	19/02/2014	2749	700	350	7	26
Yattalunga	20/01/2014	1169	1000	150	5	20
Yattalunga	11/02/2014	68	860	10	2	13
Yattalunga and Rileys Island	18/02/2014	90	760	1	1	5
Hawkesbury River Estuary						
Bar Island, Milsons Passage, Twin Beaches	9/12/2014	775	60	800	4	16
Berowra Waters	15/05/2014	696	50	2000	7	32
Berowra Waters	12/06/2014	307	80	2000	6	27
Bobbin Head & Apple Tree Bay	26/11/2014	185	20	4000	4	15
Bobbin Head to Smiths Creek	12/11/2014	348	20	6000	7	32
Cogra Bay	31/03/2014	714	4500	40	15	60
Cogra Bay & Mullet Creek	1/04/2014	736	4000	30	12	36





Cowan Creek	11/03/2014	922	400	6000	9	41
Hungry Beach	13/11/2014	1	18	10	6	24
Kangaroo Point	26/03/2014	941	70	2000	8	32
Lion Island	13/11/2014	282	2	20	6	21
Little Wobby	30/10/2014	542	40	2000	9	41
Long Island & Alison Point	17/11/2014	458	85	600	7	32
Long Island Hawkesbury River	17/09/2014	812	160	2000	4	14
Long Island, Kangaroo Point & Milsons Passage	2/04/2014	1255	560	40	12	48
Lower Hawkesbury River	4/02/2014	817	60	400	9	27
Lower Hawkesbury River & Cowan Creek	7/11/2014	604	240	8000	21	93
Milson Island	23/07/2014	855	140	1000	7	32
Milsons Passage	12/03/2014	1474	400	800	9	41
Milsons Passage, Parramatta Wreck	12/02/2014	848	150	1400	7	28
Porto Bay, Hawkesbury River	4/11/2014	502	2500	10	16	56
Sandbrook Channel	1/08/2014	2489	580	1000	20	90
Sandbrook Channel	14/08/2014	2083	1400	1000	10	40
Sandbrook Channel	10/12/2014	2962	240	400	7	25
Spectacle Island	10/10/2014	2	1500	20	20	90
Spectacle Island	24/10/2014	502	2500	400	19	86
	Totals	131631	71493	52750	691	2847

