Plastic not fantastic: an integrated project tackling the issue of marine debris in the Hunter-Central Rivers region of NSW

B Hughes[1], I Berthold[2]
[1]Hunter-Central Rivers Catchment Management Authority, NSW
[2]Ocean & Coastal Care Initiatives Lake Macquarie-Newcastle Arm, NSW

Abstract

Marine debris has a devastating impact on the marine environment with ingestion and entanglement an ever-present threat to species such as seabirds, sea turtles and marine mammals. More than 29 tonnes of marine debris was removed in 2012-13 from over 3000 hectares of coastal waterways and 250 kilometres of coastline between Crowdy Head and Brisbane Water with funding from the Australian Government's Caring For Our Country. The Hunter-Central Rivers CMA Marine Debris Project facilitated a partnership between community groups, schools, local businesses and Aboriginal teams and local and state government to reduce the impact of marine debris across the region. Over 5000 participants were involved in activities such as cleaning up coastal areas, learning about the adverse impacts of marine debris and actions they could take to prevent plastic items ending up in the ocean.

The type and quantity of debris removed was recorded using a standard methodology to collect data and contributed to Tangaroa Blue's Australian Marine Debris Database. Analysis of the data collected from cleanups can help identify the sources of marine debris allowing preventative actions to be developed and implemented locally.

One component of the project engaged Ocean & Coastal Care Initiatives, a local marine & coastal community group, to deliver four short courses for community members to learn more about their coastal environments and the adverse impacts of marine debris. Courses were delivered at Gosford, Newcastle, Port Stephens and Forster and innovative approaches such as the use of social media and digital tools effectively engaged young adults.

This project was not just highly successful in the removal of marine debris but also focussed on preventative actions through education and engagement, strengthening partnerships and building the capacity of a broad range of stakeholders to find innovative and effective ways to tackle the issue.

Introduction

In 2003 the impact of marine debris on vertebrate marine life was listed by the Australian Government as a key threatening process under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The "Threat Abatement Plan for the impacts of marine debris on vertebrate marine life" was released in 2009 and encourages a collaborative and strategic approach to reduce the impacts of harmful marine debris (DEWHA, 2009). Sources of marine debris can be localised but after entering marine environments floating debris such as plastics can undergo long distance transport and concentration by ocean currents or gyres to form ocean scale "garbage patches" (van Sebille et al., 2012). Plastics are the most common type of debris, can contain compounds such as bisphenol-A and phthalates and can also accumulate toxins such as persistent

organic pollutants (POPs) which have entered the ocean via other sources (GEF, 2012). Marine debris impacts have been recorded for over 600 marine species and while the biological impact of plastic-associated toxins is yet to be fully understood (GEF, 2012) ingestion and entanglement is a common cause of injury and fatality for threatened species such as sea turtles (Schuyler et al., 2012).

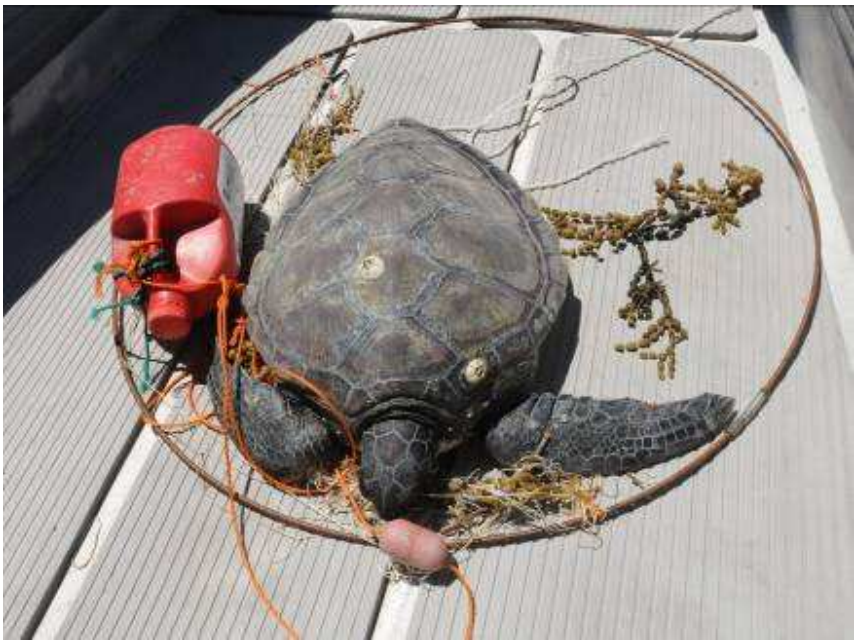

Figure 1. Entanglement in discarded crab traps can be fatal for sea turtles Photo: NSW DPI

Marine debris can have an impact at an ecosystem level and also increases the risk of marine pest invasion by facilitating long-distance transport of marine organisms (GEF, 2012). Plastics do not break down, as a general rule, but they do break up and the resulting microplastics can interfere with processes at the micro-scale. Goldstein et al. (2012) found that increasing microplastic concentrations in the North Pacific Subtropical Gyre increased the reproductive success of some planktonic species due to the increased availability of hard substrate for laying eggs. Global plastic production has increased from 5 million tonnes per annum in the 1960s to around 280 million tonnes per year now with only 13% of US production being recovered (GEF, 2012). While cleanup programs can engage the community the volume, type and location of marine debris means that it is practically impossible to remove it all from our oceans and management actions need to focus on prevention programs such as waste minimisation.

Facilitating an integrated project with a multi-stakeholder partnership

Funded by the Australian Government's Caring For Our Country Program the project was designed to encourage ongoing involvement of stakeholders beyond the life of the grant funding and this was achieved by building a partnership network, supporting community organisations and building capacity of stakeholders and individual participants. The Hunter-Central Rivers Catchment Management Authority (CMA) managed the $294,000 grant and developed the project with the input of stakeholders including NSW Department

of Primary Industries – Fisheries (DPI), local government, local aboriginal land councils (LALCs), schools, businesses and a number of Non-government organisations (NGOs) and community groups. A project "start-up workshop" facilitated cooperation between partner organisations with the integrated projects being mutually beneficial and consistent. A key strength of the project partnership was the availability of Tangaroa Blue's standard data collection methodology (see Appendix 1) and their National Marine Debris Database. Project partners were introduced to the methodology at the start-up workshop and the consistent use of this method contributed to our understanding of marine debris at the national scale and also facilitated the evaluation of project outcomes.

Utilising the experience of the CMA and its partners with previous successful projects the overall project was designed in a holistic way, integrating on-ground/in-water works with education, community engagement, capacity building and monitoring and evaluation. An important part of the project was the creation of employment and capacity building opportunities for Aboriginal people and improving their networks with other stakeholders. For example, Aboriginal Land Management Teams assisted volunteer organisations like the Hunter Bird Observers Group to undertake clean-ups in important shorebird habitats. Project activities were designed to support and sustain community groups and improve the capacity of group members and individuals to understand their local marine environment and collect data on the type and local abundance of marine debris. Land-based and underwater volunteers assisted in the monitoring of threatened species such as black cod and contributed to studies being done at local and national scales. Collaboration between project partners maximised the efficient use of limited resources including funding, staff time and volunteer effort. This approach improved the project outcomes and quality of sub-projects but also ensured that the project was completed on time.

Figure 2. Project partners at the evaluation workshop at Nobbys Beach
Photo: Maree Whelan, HCRCMA

Each sub-project conducted monitoring and evaluation during the implementation phase and an evaluation workshop near the completion of the project sought feedback directly from project partners. Feedback from the workshop was extremely positive and gave project partners a complete picture of the overall project and an improved understanding of the biological impacts of marine debris. Celebrating the success of the project and acknowledging the contribution of volunteers and Aboriginal Land Management Teams was an important outcome of the workshop and highlighted the cultural significance of many cleanup sites to Aboriginal people.

Project outcomes

Marine debris was removed from estuary and marine environments in the Hunter-Central Rivers CMA region which extends from Brisbane Water north to Crowdy Head. The project greatly exceeded the minimum project outputs required under the Caring For Our Country grant, including

- Over 80 groups engaged including schools, community groups, coastcare and landcare groups, business, state and local government
- Over 60 activities undertaken
- Over 5000 participants involved
- Approximately 29.7 tonnes of debris removed
- Over 60,000 items of debris removed
- Over 3000 hectares cleaned up
- Over 225 kilometres of shoreline cleaned up
- Over 1700 hours of Aboriginal employment

Figure 3. Marine debris cleanup locations and approximate weights

The greatest debris loads were found in estuarine areas with Graham Johnston of MacMasters Surf Lifesaving Club (SLSC) spearheading a cleanup in Brisbane Water that removed around 18 700kg of debris in just a few months. Graham also coordinates cleanup work in other parts of the Hawkesbury and has been successful at working with youth-based organisations such as Brisbane Water Secondary College and other stakeholders in the area including National Parks and Wildlife Service, Gosford City Council, Community Environment Network and local oyster farmers (see Figure 4). While the legacy of past practices has led to large volumes of oyster industry waste dumped in estuarine habitats such as mangroves and saltmarsh (see Figure 5) several local oyster farmers have actively assisted in the cleanup program indicating a shift in attitudes and practices.

WOY WOY

Volunteers clean-up island

WILDLIFE SAFER AS HELPERS COLLECT TONNES OF LITTER

Errol Smith

LOCAL wildlife on Pelican Island Nature Reserve at Woy Woy is in safe hands under the care of local community and school groups.

The island is currently a flurry of activity as school students, local community groups, government departments including National Parks and Wildlife Service and Gosford Council work together to improve this little patch of paradise located in Brisbane Water.

Pelican Island Nature Reserve is managed by the national parks service and provides a haven for endangered vegetation communities such as saltmarsh and habitat for the bush stone-curlew.

The Hunter-Central Rivers Catchment Management Authority (CMA), in partnership with the Community Environment Network, national parks service and local waste warrior Graham Johnston, worked alongside high school students from Brisbane Waters Secondary College to remove 4 tonnes of litter at Pelican Island last week.

Graham Johnson, from Macmasters Beach Surf Club, said with the help of the local students and after three trips to Pelican Island, they had managed to remove close to 6 tonnes of rubbish.

"This is part of a marine debris project where we will remove litter from 25km of coastline in Brisbane Water over nine months," he said.

"The students from Brisbane Water Secondary College who are involved in the challenging and sometimes back-breaking clean-up also complete data sheets that show they are collecting items such as plastic, glass and aluminium drink containers and an alarming amount of items such as trays, plastic mesh and other dangerous debris."

National parks has also joined forces with the CMA to ensure native vegetation such as a swamp oak forest is protected by removing weeds such as lantana and asparagus fern.

HOW TO JOIN IN

National parks will concuct a Clean Up Australia activity on the island on March 3

Volunteers should meet at the public wharf at the northern end of North Burge Road at 9am

Graham Johnson with Vicki Elliott (NPWS), Warren Brown (Gosford Council), Nicole Heta (CEN) and Rob Carrero (CMA) along with students from Brisbane Water College set off to help clean-up Pelican Island. Picture: MARK SCOTT

GREAT COOPERATION

The CMA's catchment officer coast and marine, Hayley Leczkowski said the works taking place on Pelican Island Nature Reserve were a great example of various groups working together

Projects are funded by the CMA through the Australian Government's Caring for our Country program

Figure 4. Central Coast Advocate article (13/02/2013) on the Brisbane Water Cleanup Program

Figure 5. Oyster industry waste found in the Brisbane Water estuary (Photo: Graham Johnson, October 2013)

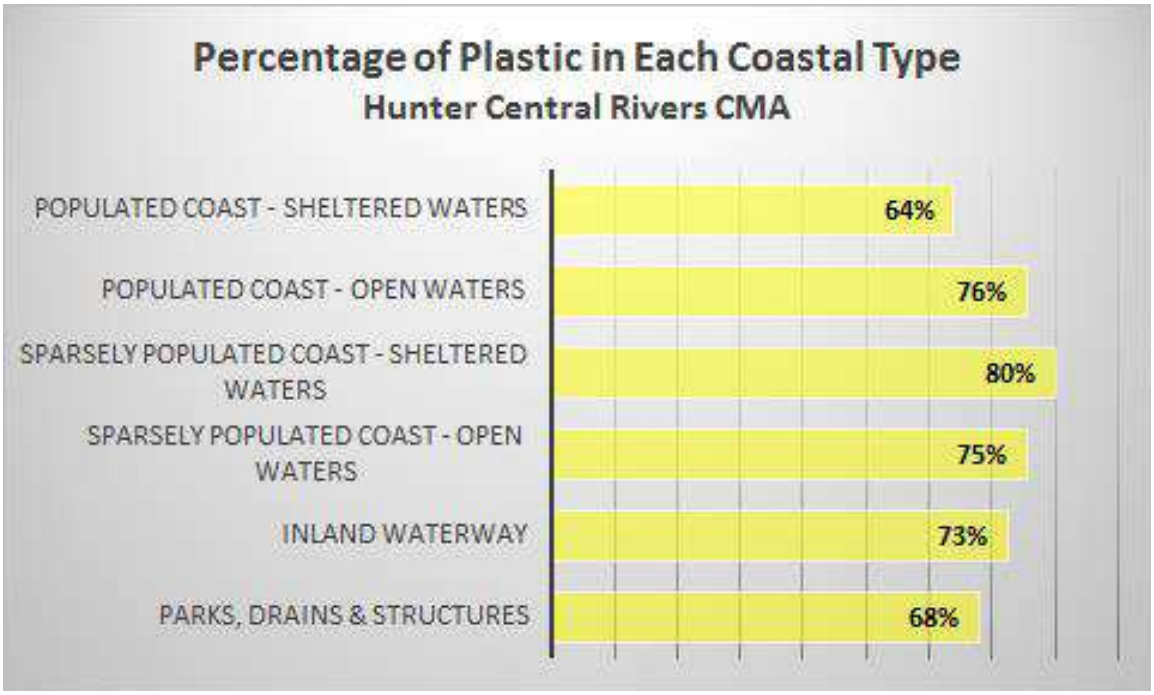

Figure 6. Plastic as a percentage of total marine debris removed at cleanups (Source: Tangaroa Blue, June 2013)

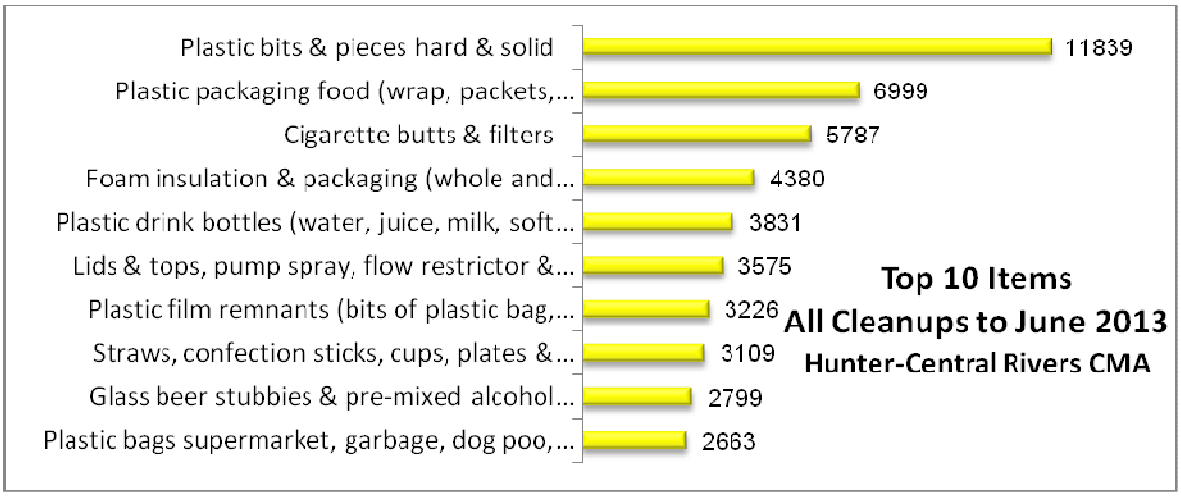

Figure 7. Composition of debris from all cleanup sites (Source: Tangaroa Blue)

A number of Underwater Volunteer Groups were involved in the project including Terrigal Underwater Group (TUG), Combined Hunter Underwater Group (CHUG) and Great Lakes Underwater Group (GLUG). GLUG had a concurrent grant to do marine debris surveys and together with the other 2 groups surveyed over 30 locations using a standard methodology developed by Underwater Volunteers NSW (UVNSW) and Southern Cross University. Marine debris loads at offshore sites was much lower than estuary or rivermouth locations but had a high proportion of fishing gear (Smith and Edgar, 2013). Southern Cross University researchers manage a database on behalf of UVNSW and will

undertake further analysis comparing the results from the Hunter-Central Rivers region with other parts of the state.

Figure 8 CHUG divers undertaking marine debris surveys (l) and cleanup (r) Photo: CHUG

Prevention is better than the cure

Analysis of cleanup data showed that up to 80% of debris was plastic and that packaging materials made up over half of all debris (see Figures 5 and 6). This data confirmed that focussing the educational aspects of the project on plastics was a sound strategy. Raising awareness of the impacts of plastics in the ocean and promoting positive actions through cleanup activities, public talks, marine awareness courses and school education programs exceeded expectations with over 5000 people attending talks and engaging in activities. Take 3, an NGO focused on the issue of marine debris, played a key role in engaging with over 2500 students and Take 3 founder Tim Silverwood was effective at inspiring students of different ages and backgrounds. Since 2006 the CMA's Marine Discovery Series has operated throughout the region with the help of many partners and raises awareness about marine environments and marine management issues. This series was a great platform to run a number of talks by Tangaroa Blue founder Heidi Taylor and Tim Silverwood introduced several screenings of the Bag It film to provide an entertaining way to engage and inspire people on the issue of marine debris.

Effective facilitation and communication encouraged the development of new educational resources and highlights the benefits of a broad group of stakeholders working together. For example, a presentation by DPI scientist David Harasti on the impact of crab traps on sea turtles at the start-up project workshop led to the development of a brochure on responsible crab trapping by Port Stephens Council. The project made the best use of this in-kind contribution by adapting the brochure for the Manning-Great Lakes region with the input of local stakeholders. Many community members educated about the issue then made submissions to a NSW Government review of recreational fishing rules, highlighting the impact of crab traps on non-target species. This outcome highlights the benefits of engaging people in cleanup actions and empowering those people to take preventative actions that will be more effective than cleanups in the long term. Community participation and action to address the issue of marine debris was a significant outcome of the project

with over 3 times as many volunteers involved in clean-ups and monitoring and over 5 times the amount of debris removed compared to previous data reported to the National Marine Debris Database (Tangaroa Blue, 2013).

Figure 9. Crab trap brochure for the Manning Great Lakes

Innovation

While most of the project was built on the experience with previous similar projects there was also a focus on improvement of successful models as well as new and innovative projects encouraging the participation of "new" stakeholders. These projects included marine debris art workshops, canoeing surveys and cleanups, early childhood centre

education programs and collaboration with waste management agencies on plastic reduction programs. Importantly, project partners such as Great Lakes Council are now undertaking proactive preventative activities with business, tourists and the local community. A pilot project, “Pacific Palms – as plastic free as we can be”, is working with local businesses to reduce plastic consumption, increase adoption of a voluntary plastic bag ban and encourage locals and visitors to avoid bottled water through the installation of water refill stations in strategic locations.

Figure 10. Artwork from Newcastle Museum’s *Marinus Plasticus* Exhibition (Photo: Ken O’Regan)

Collaboration with Take 3 on a surf movie night associated with the Surfest surfing competition and festival in Newcastle included the surf movie *Sally* featuring local surfers. This event successfully engaged with a different demographic to those participating in traditional NRM projects and a similar event held at Pacific Palms was also well attended. Overall, the project used a range of techniques to successfully engage with sections of the community often difficult to engage by using a combination of outdoor activities and creative use of digital and social media. An example of this approach is outlined next in a case study of the community engagement projects run by Ocean and Coastal Care Initiatives.

Case study – Project Aware on the Coast

Ocean and Coastal Care Initiatives (OCCI) is a volunteer organisation, aiming to raise the awareness of coastal and marine issues in their local communities from the Central Coast to Taree, with four ‘arms’ or sub-regions – Central Coast, Lake Macquarie-Newcastle, Port Stephens and Lower North Coast (Taree & Great Lakes areas). OCCI engages the local community through a range of activities, including rock pool walks, seagrass dip-netting,

displays at local events and interactive school holiday activities discussing the fragility of these ecosystems and the need to protect them. Another core part of OCCI has been delivering free courses called Project Aware on the Coast (PAOC) for community members to participate in and learn about marine and coastal ecology, and conservation in their local area. Participants are then required to pass their learnt information on to their local community through small community projects (their 'payment' for the course). PAOC is also a key to recruiting volunteers to OCCI, with participants completing the course receiving free membership for one year.

Due to the success of previous courses across the region and working previously with the CMA, OCCI was contracted by the CMA to deliver four PAOC courses along the coast from Harrington to Central Coast. Courses were delivered at Gosford, Newcastle, Port Stephens and Forster from February to April 2013. A requirement of the CMA funding was to incorporate marine debris education and clean up events into each course in order to meet the objectives of the overall project. Each PAOC course consists of 3-4 lectures with local specialist/expert speakers covering a range of locally relevant topics such as the ecology of coast and marine ecosystems; intertidal rock platforms; aboriginal culture & heritage; workplace health & safety; seagrass; saltmarsh and mangroves; climate change; marine conservation and marine debris. Field trips included rock pool walks, seagrass dip-netting, and training in the Tangaroa Blue data collection methodology. Support was provided by course coordinators and other volunteers from OCCI LMN throughout the course and participants were required to organise and run marine debris clean ups in their local area.

Figure 11. Field trips: Seagrass at Pelican (l); rock pools at Swansea Heads (r)

Photos: Ingrid Berthold

A slightly different approach was taken with advertising and recruitment for the course for the Lake Macquarie-Newcastle course in 2013. Course coordinators advertised PAOC through fliers via existing local coastal and environmental community email networks, Green Living section in the Newcastle Herald, in cafes, restaurants and shops around Newcastle. However, coordinators also spent some significant time advertising to groups online via social media, in particular Facebook – by searching for other groups and organisations through Facebook in the area and posting the flier on their page, or messaging them. This proved extremely successful for attracting younger members of the community, particularly through the Newcastle University's Student Environment Collective (NUSEC) and OdysSea community group. In total, 34 participants came to the information night, and 30 signed up to do the course with 65% of those university students - a new record for a PAOC course! Tim Silverwood from Take3 presented at the PAOC information

night about marine debris and his experiences crossing the Great Pacific Gyre certainly also helped to inspire participants to be involved in the course.

OCCI LMN volunteers accommodated university and family commitments of participants by recording the audio from presenters on lecture nights, and made the audio and PDFs of PowerPoint presentations available on GoogleDocs, so participants could catch-up at a convenient time later during the course. This use of technology helped with retaining the number of participants throughout the course, which has previously had a 30-40% drop out rate due to the month long commitment of the course. Overall, the four courses across the CMA region were very successful and a total of 65 participants completed the course. The combined outcomes of the four PAOC course as part of the Marine Debris Project included

- A total of 35 sites were surveyed for marine debris and five of those sites have been set-up as regular data collection sites.
- All data collected was provided to Tangaroa Blue, and ongoing cleanup data will continue to be added to the online database.
- A total of 839kg of marine debris was removed from our coastline.
- 81.9km of coastline surveyed.
- Volume and distance surveyed for each area survey region were:
    - Central Coast – 185kg – 41.7km
    - Lake Macquarie-Newcastle – 552.8kg – 6.6km
    - Port Stephens – 28.3kg – 10.3km
    - Lower North Coast – 72.9kg – 23.3km
- Several participants set up marine debris information displays at local events and some held talks in their local schools, to inform people about marine debris and what the community can do to help.

Figure 12. Marine debris clean ups at Redhead (left, middle) and Horseshoe Beach training session (right)

Photos: Ingrid Berthold

Overall, the opportunity to work in partnership the CMA through the delivery of PAOC courses enabled OCCI to strengthen that relationship and connect with a wide range of other organisations and local professionals, particularly through engaging experts as guest speakers at lecture nights and field trips. Word of mouth from participants to friends, colleagues and family has helped attract others to OCCI events and raise interest in attending future PAOC courses. Having a focus on marine debris for PAOC courses assisted in raising awareness throughout the CMA region through 35 clean up activities.

Using Tangaroa Blue's existing resources and contributing data to their National Marine Debris Database gave participants a sense that they were taking action on marine debris both locally and nationally through their activities.

OCCI members and course graduates are continuing to deliver marine debris clean ups in local areas, and educate their community through a range of activities with their local OCCI arm. OCCI members and community contacts are kept informed via email and Facebook and of what all the OCCI arms are doing so they can join in with the events (www.facebook.com/oceanandcoastalcareintitiatives). More PAOC courses are planned for the future, although they will be delivered under the name Coastal Habitat Awareness Project to avoid confusion with PADI's Project AWARE program.

Conclusion

The Marine Debris Project delivered significant outcomes for the community and environment in the Hunter-Central Rivers region of NSW. The project implemented a holistic project framework and employed innovative techniques that could be utilised in other regions and could be adapted for use in other areas of Natural Resource Management. Funded by the Australian Government's Caring For Our Country, the Hunter-Central Rivers CMA demonstrated an outstanding ability to engage partners effectively from project conception to completion. Many project partners are now committed to ongoing actions such as continued cleanup and monitoring activities, including uploading data to Tangaroa Blue's National Marine Debris Database. Additionally, stakeholders have been inspired to develop their own projects and seek funding for those initiatives.

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Appendix 1. Tangaroa Blue Foundation Data Collection Sheet (example)

Data Collection Sheet

Tangaroa Blue Foundation
PO Box 1176 Margaret River WA 6285 www.tangaroablue.org

AUSTRALIAN MARINE DEBRIS INITIATIVE

Name of Cleanup Location (Beach) Saltwater Point – Wallabi Beach			
Cleanup Locality Saltwater Point			**Locality Postcode** 2430
Nearest Town Wallabi Point		**Nearest Road or Landmark** Saltwater Point	
Date 5/5/13	**Start time** 11:50 AM	**Finish time** 12:50	**Number Volunteers** 2
Contact Name Brian Hughes		**Phone or email**	0428293021
Organisation/School (if applicable) Saltwater Boardriders			
Total Filled Bags 1	**Total Weight Kg** 10		**Length of Beach Cleaned (m)** 200
Average Width of Beach (m) 20	**Type of Adjoining land** National Park		

Please enter items not listed below in the additional items section or on an attached sheet.
Country of origin and barcode information from intact labels can be entered in the tally and note section against the particular item or on a separate sheet. A secondary data sheet is also available to record this and other information.

	Plastic Items	Total	Tally and Note
Consumer Items	Cigarette butts & filters		
	Cigarette lighters		
	Pens, markers & other plastic stationary		
	Straws, confection sticks, cups, plates & cutlery	2	
	Toothbrushes, brushes & combs, hair ties etc		
	Toys, party poppers, ribbons, clips & similar	2	
Packaging Items	Bleach & cleaner bottles		
	Lids & tops, pump spray, flow restrictor & similar	4	
	Personal care & pharmaceutical packaging		
	Plastic bags supermarket, garbage, dog poo, ice	1	
	Plastic containers non food (oil, sealant, chemical)		
	Plastic drink bottles (water, juice, milk, soft drink)	6	
	Plastic packaging food (wrap, packets, containers)	8	
	Plastic wrap non food (bubble wrap etc)		
	Strapping band scraps	5	
	Strapping band whole (record as single item)		
Fishing Items	Bait & tackle bags & packaging		
	Bait containers & lids, bait savers		
	Commercial fishing remnants (float, pot, crate bits)	4	
	Cylume glow sticks		
	Fishing line in metres (recreational)	45	
	Recreational fishing items (lures, floats, rods, reels)		
	Rope & net scraps less than 1 metre	14	
	Rope (estimated length in metres)	1	
Remnants	Plastic bits & pieces hard & solid	27	
	Plastic film remnants (bits of plastic bag, wrap etc)		
	Remnants burnt plastic		
Foamed Plastic (Polystyrene) Items		**Total**	**Tally and Note**
Foam buoys			
Foam cups, food packs & trays		1	
Foam insulation & packaging (whole and remnants)		7	
Other Materials		**Total**	**Tally and Note**
Oil globules & tar-balls			
Sanitary (tissues, nappies, Condoms, cotton buds)			
Shoes leather & fabric			

Data Collection Sheet

Tangaroa Blue Foundation
PO Box 1176 Margaret River WA 6285 www.tangaroablue.org

AUSTRALIAN MARINE DEBRIS INITIATIVE

Glass & Ceramic Items	Total	Tally and Note
Fluorescent light tubes and bulbs		
Glass beer stubbies & pre-mixed alcohol bottles	1	
Glass jars & sauce bottles		
Glass or ceramic broken		
Glass wine, spirit and similar bottles		
Cloth Items	**Total**	**Tally and Note**
Binding, thread, string & cord natural	8	
Cloth, clothing, hats & towels	2	
Metal Items	**Total**	**Tally and Note**
Aerosol cans		
Aluminium cans	7	
Foil wrappers, packets, bladders & alfoil		
Metal bottle caps, lids & pull tabs	2	
Metal fishing items (sinkers, lures, hooks, traps, pots)		
Tins under 4 litres (food, drink tins and similar)		
Paper & Cardboard Items	**Total**	**Tally and Note**
Newspaper, magazines & brochures		
Paper & cardboard packaging	8	
Tetra packs & drink cartons		
Rubber Items	**Total**	**Tally and Note**
Rubber balloons, balls & toys, elastic straps & bands	1	
Rubber footwear & thongs		
Rubber remnants	5	
Wood Items	**Total**	**Tally and Note**
Brooms, brushes & paint brushes		
Processed timber, pallets & other wood	1	
Wooden confection sticks, pencils, matches etc		
Additional Items	**Total**	**Notes**
Tape	2	
Fibreglass	1	
Bullet casings (plastic)	2	
NPWS sign (Little tern nesting area) corflute	1	
Pot	1	
Silage wrap	1	
Bucket	1	
Rubber surfboard deck grip	1	
Textile	1	
Nylon thread/padding	1	
Additional Information	(Circle)	**Comments**
Did you observe any **plastic resin pellets**?	**Y N**	
Did you observe any dead/injured **animals or birds**?	**Y N**	
Did you observe any highly unusual **beach conditions**?	**Y N**	
Other comments and feedback		

V06-2012