Marine Debris

An interim report on baseline levels of beached marine debris at the Falkland Islands.

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Summary

This report represents an initial assessment of marine debris at the Falkland Islands to deliver baseline data on the type and quantities currently on the shoreline. A complete report will be published after further data have been collected over the next year. This is the first study that has attempted to quantify marine debris across the whole of the Falkland Islands.

A total of 122 beaches (32.5 km) were surveyed across the Falkland archipelago, with the majority conducted over the austral summer 2013 / 2014. Surveys were conducted based on guidelines developed by the United Nations Environmental Programme (UNEP) and the Commission for the Conservation of the Antarctic Marine Living Resources (CCAMLR). Items were categorised by their material component, form and within broad level categories: Containers, Packaging, Fishing & Boating, Clothes & Shoes, Hygiene, Other.

A total number of 9,197 items were recorded, equating to an average of 283 items km^{-1}. However, quantities on beaches vary according to the geographic region and other factors which include the proximity to sources of debris entering the system.

- The most frequent debris items recorded were clear plastic beverage bottles (water, fizzy/soft drinks) with 2,010 items, accounting for 22 %.
- The main material component of marine debris was plastic (94 %).
- Containers (e.g. bottles, cans, aerosol cans) accounted for 37 % of all debris.
- Packaging (e.g. strapping bands, plastic film, plastic bags) accounted for 22 % of all debris.
- Fishing & Boating items (e.g. nets, rope, buoys) accounted for 19 % of all debris.
- Clothing & Shoes (e.g. rags, clothing, boots, hard hats, rubber gloves) accounted for 3 % of all debris.
- Hygiene items (e.g. sanitary pads, toothbrushes, cotton ear buds) accounted for 1 % of all debris.
- Items within the category Other (e.g. broken and miscellaneous items, plumbing pipes, appliances, toys) accounted for 18 % of all debris.

The nearest continental landmass is South America to the west of the Falklands and prevailing winds are typically from the west.

Fisheries account for the largest number of vessels and days present within the Falkland waters, however there are a number of other user groups including container and cargo ships, cruise ships, private yachts, military ships and

hydrocarbon drilling rigs with support vessels. In addition, the regional marine activity in the neighbouring seas, including a significant fishery, is high, particularly on the Patagonian Shelf to the west and north of the Falklands.

Initial analysis of the data suggests marine debris items are beaching in larger quantities in the westerly region of the Falklands.

From wording on items, the origin of marine debris could be traced to Asian countries including Taiwan and Korea; South American countries including Argentina, Chile, Brazil, Peru and Uruguay; Spain, France, USA, UK and the Falkland Islands.

Although no other qualitative or quantitative studies have been carried out on an island-wide scale, anecdotal evidence would suggest that over time (last two decades) the type of marine debris has shifted with a decline in fishing and boating gear to an increase in plastic disposable items such as bottles and packaging.

Introduction

Marine debris is one of the world's most pervasive pollution problems affecting the oceans. Oceans cover more than 80 % of the Southern Hemisphere and even remote locations such as Antarctica and sub-Antarctic islands accumulate some degree of marine debris (Gregory *et al.* 1984; Eriksson & Burton 2003; Barnes & Milner 2005), including floating marine debris, such as plastic, that can be transported for thousands of miles on ocean currents (Derraik 2002; UNEP 2005; Barnes *et al.* 2009).

Plastic – a growing problem

Inevitably, the common use of plastic, estimated to have grown by 500 % in the last 30 years (Plastinum 2009), has contributed to a growing problem with marine pollution. Plastic packaging for food and products has become so cheap and ubiquitous in our daily activities that it is seen as disposable, even after a single use. Plastic materials and synthetics have replaced natural fibres over the past 35 years. For example, in the fishing industry their widespread use has resulted in substantial amounts of derelict fishing debris in ocean waters and on beaches.

Plastic has been designed to be lightweight with resistant properties and plastic items can travel on currents for thousands of miles and may persist for centuries before degradation. Consequently, plastic has become widely dispersed and, in the Southern Ocean and South Atlantic region, studies indicate that plastics increasingly account for the main component of marine debris items (Fig. 1).

Location	Survey	Plastic component %	Source
Gough Island, South-east Atlantic	Beach	84	Ryan 1987
Prince Edward Island	Beach	88	Ryan 1987
Tristan Island, South-east Atlantic	Beach	58	Ryan 1987
Inaccessible Island, South-east Atlantic	Beach	78	Ryan 1987
Argentina, South-west Atlantic	Beach	37-72	Gregory & Ryan 1997
9 sub-Antarctic islands, Southern Ocean	Beach	51-88	Gregory & Ryan 1997
Bird Is, South Georgia, Southern Ocean	Beach	88	Walker *et al.* 1997
Macquarie Island	Beach	95	Eriksson *et al.* 2013
Heard Island	Beach	94	Eriksson *et al.* 2013
At-sea survey South-east Atlantic coastal	Sea	98	Ryan 2013
At-sea survey South-east Atlantic ocean	Sea	97	Ryan 2013
Falkland Islands, South-west Atlantic	**Beach**	**94**	**This study**

Figure 1. Plastic component of marine debris in the Southern Ocean and South Atlantic regions.

Dispersion of marine debris

Dispersal of marine debris is influenced largely by ocean currents, however, strong and persistent winds can also influence distribution (Merrell 1984). Buoyant debris, such as lightweight plastics, in near surface waters are capable of being transported in a direction opposed to the general currents (Swanson and Zimmer 1990; Astudillo *et al.* 2009). Wind factors (e.g. speed, direction, fetch distance and frequency), as well as the orientation of the beach to prevailing winds, influence the total number of debris items collected and the accumulation rates (Walker *et al.* 2006). Storm conditions also influence accumulation rates, Williams & Tudor (2001) found that higher wave energies between debris surveys coincided with higher levels of previously unseen debris on the shore.

Sources and ocean gyre systems

Marine litter comes from two main sources: at sea (vessel flotsam and jetsam) and land-based inputs (rivers, landfills and urban areas) (Ryan *et al.* 2009). Proximity to urban areas, heavy shipping lanes and proximity to fishing grounds can influence accumulation rates (Chalmers *et al.* 1991). Recent studies found evidence to suggest a South Atlantic "garbage patch" between South Africa and Tristan da Cunha with 60–80 % of land-based litter originating from South America and the remainder coming from Africa (Lebreton *et al.* 2012). Surveys of stranded litter at Tristan da Cunha and Gough Island, in the central South Atlantic, suggest that most land-based litter also derives from South America (Ryan 1987; Ryan and Watkins 1988; Ryan 2013).

Fishing operations in the Southern Oceans were identified as a major source of marine debris in the Antarctic environment but, depending on the type of debris reported, plastics from lower latitudes were also suggested to cross the Polar Front. Possible links between Antarctica and South America, the closest intercontinental connection, in relation to plastic marine debris pollution were highlighted (Ivar do Sol 2011).

Impacts on wildlife

Over the past four or five decades, there have been numerous accounts in variety of marine taxa including seabirds, marine mammals, whales, fish and crustaceans impacted by entanglements and ingestion of marine debris (see Laist 1987; BirdLife 2008). Seabirds and marine taxa can mistake plastic floating on the ocean's surface for prey and ingest it (Petry *et al.* 2007). Most adult birds regurgitate ingested debris, which means they can pass it on to their chicks while feeding them (Derraik 2002; Allsopp *et al.* 2006). Toxic chemicals released from ingested plastics can build up in body tissues and have serious detrimental effects on reproductive ability, immune system and hormone balance (Derraik 2002) and subsequently be passed through the food-chain.

Transport of invasive species

Marine debris can act as a raft to carry invasive species from one body of water to another and have the potential to reach the most remote environments. At-sea surveys in the South East Atlantic observed encrusting biota on very few litter items in coastal waters (1%), but were common in oceanic waters, where goose barnacles *Lepas* spp. and other large organisms were seen on at least 27 % of debris items, and more than half of all litter items (58 %) had a yellow-brown biofilm of algae (Ryan 2013). Studies found invasive invertebrate species attached to plastic strapping bands at Adelaide Island, Antarctic

Peninsula (Barnes & Fraser 2003). This type of invasion exemplifies a developing problem for endemic species that have been long isolated and are adapted and restricted to local cold-water environments. Barnes and Milner (2005) found from a beach survey at the Falkland Islands (2002) 0.43 items per metre and 4.4 % colonised with annelida (worms), bryozoa and cnidaria (corals, polyps).

Study area – the Falkland Islands

The Falkland Islands are situated in the South Atlantic at the southern end of the Patagonian Shelf. The archipelago consists of some 700 islands of varying sizes and subsequently the length of the coastline is large compared to the landmass. The coastline is heavily indented with many sheltered harbours and bays, sandy beaches and exposed stretches of cliff and rocky coastline. The major oceanographic influence is an equatorial extension of the Antarctic Circumpolar Current, which divides into the Patagonian Current to the west of the Falklands, and the Falkland Current which flows to the east of the islands in a northerly direction (Fig. 2). The prevailing wind is westerly and local features influence the currents at inshore locations.

The Falkland Islands are sparsely populated with 2,653 residents (Falkland Islands Government census 2013). The two largest settlements are Stanley (capital) and Mount Pleasant Complex (British military base), both are located on East Falkland. Waste management procedures at settlements on both East and West Falklands and offshore islands are largely through landfill and burning, with some materials shipped to the UK.

Users of the Falkland marine environment

Users of the waters surrounding the Falklands include fishing vessels, patrol vessels, cruise ships, private yachts, tankers, cargo and military vessels as well as vessels and rigs associated with hydrocarbon exploration. The main harbours and ports for vessels are Berkeley Sound and Port William for at-sea transhipments, with Stanley Harbour and Mare Harbour providing berthing facilities. All are located in the east of the Falklands. Vessels using the Falkland waters are, in principle, obliged to abide by the Protocol to the International Convention for the Prevention of Pollution from Ships (MARPOL) which sets regulations for discarding waste at sea.

Falkland fishing fleet

Since the mid-1970's multinational squid and finfish fisheries have become established in the South-west Atlantic sector. The Falkland fishery was regulated in 1987 with the creation of the Falkland Islands Conservation Zone (FICZ) (250 km economic zone). Fishing vessels account for the highest number of vessels and total days present in the Falkland waters (Fig. 3). The total average annual catch in the Falkland fisheries for the last decade was 191,500 tonnes (FIG 2013). *Illex* squid compromises the highest component of catches with *Loligo* squid of secondary importance. Approximately 250 licences are granted by the Falkland Islands Government (FIG) each year to a range of nationalities. Jigging vessels targeting *Illex* squid *Illex argentinus* account for around 100 licences each year with the majority registered to Korea and Taiwan. These vessels operate to the north of the Falklands and on the high seas between the Falklands and Argentina in February and May. The second largest fishery (~16 trawlers) is the *Loligo* squid *Dorytheuthis gahi* fishery mainly operated by Spanish

and Falkland Islands registered trawlers. *Loligo* fishing grounds occur to the east of the Falklands and in the vicinity of Beauchêne Island to the south. The remaining fishing vessels target finfish and operate across the zone throughout the year.

Approximately 70 reefers, of varying nationalities, are present through fishing periods to tranship and transport catches from fishing vessels in the Falkland waters. Fishing vessels are required through FIG licence conditions to incinerate non-organic waste on board whilst at sea or dispose of items not suitable for incineration at a port with appropriate facilities.

Exploratory hydrocarbon industry

Licensed hydrocarbon exploration has taken place in the Falkland waters; most recently since 2010. Typically, operations involve seismic vessels and / or a drilling rig with 2 – 3 support vessels at any one time. Waste management is adhered to through stringent Environmental Impact Assessments which must be approved by FIG. Waste management complies with UK Health and Safety (HSE) standards. Municipal and operational waste is retained on-board (with the exception of macerated organic food discards, operational drill cuttings and cooling mud fluids) and either, depending on its nature and the appropriate facilities onshore, is taken to landfill at Stanley or shipped to the UK for correct disposal, which includes all hazardous waste. Currently seven hydrocarbon operators or partner companies are actively associated with drilling campaigns within the Falkland waters.

Tankers, bulk carriers, container ships

The number of merchant vessels passing through the Falkland waters is likely to be greater than otherwise suggested within literature sources. With the advent of Automatic Identification System (AIS), the number of vessels, type and their movements can be recorded daily. Tankers, bulk carriers, container and cargo ships are known to transit the Falkland waters, and in particular passing up the west side of the Islands inside the FICZ, often several each day, heading either for Brazil, Africa, India or Europe (FISHOP pers. Comm.). Five tankers, operating with local Falkland agents/ companies, are regularly present within the Falkland waters; most supplying fuel for transhipment to other vessels or for onshore municipal use.

Ministry of Defence

A number of UK Ministry of Defence (MOD) vessels patrol the Falkland waters with at least one warship present throughout the year. MOD-contracted tankers routinely bring in supplies, including fuel to the military base and other goods to the Islands. MOD non-disposable waste not suitable for landfill or incineration is shipped back to the UK via these tankers.

Cruise ships, expedition vessels & yachts

During the summer 2013 – 2014 there were a total of 16 expedition vessels (< 10,000 gross register tonnage (GRT); max persons 200) and a total of 28 cruise ship vessels (> 10,000 GRT; max persons 3,700) that regularly visited the Falklands. Sixty yachts (mostly private owned) were present in the waters. Over the last two decades tourism in the South-west Atlantic region, including the Falkland Islands, has risen with the numbers of passengers increasing by 60 % and cruise ship vessels by 25 %. Forty-seven vessels operating in the region are current members of the International Association of Antarctica Tour Operators (IAATO) which promotes sound environmental guidelines for operators. These prohibit, among other things, the discharge of plastics,

oil and noxious substances; regulate the discharge of sewage and food waste; and require the removal of most wastes from the area.

Patagonian shelf and regional marine users

There are also significant fisheries in the neighbouring territorial seas and on the high seas, including trawlers, longliners and jigging vessels of varying nationalities. Unlicensed and illegal fisheries are also known to operate. Fishing activities can occur at the border of the Falklands Outer Conservation Zone (FOCZ).

Busy tanker and shipping lanes exist following the coast of South America, especially from the Chubut region northwards to Brazil. In 1997, tanker lanes were moved further offshore to reduce pollution to seabirds, in particular penguins. For the Patagonian Sea region, examples of impacts identified include: coastal South American cities discharging waste directly into the seas, illegal fisheries and entanglement of species in derelict fishing gear (El Foro para la Conservación del Mar Patagónica y Áreas de Influencia 2008).

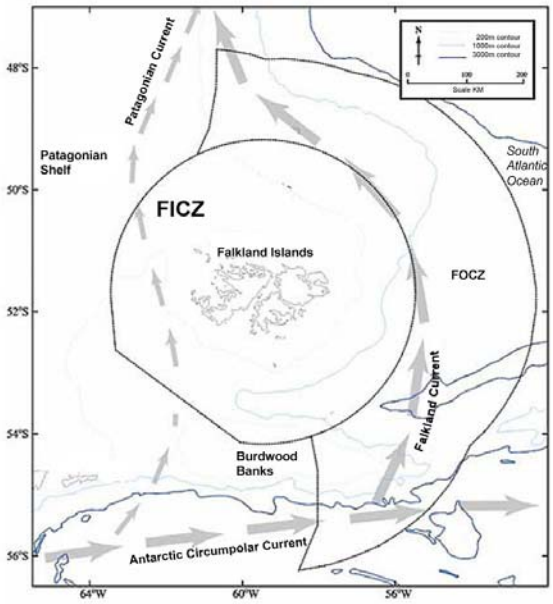


Figure 2. Major oceanography of the seas surrounding the Falkland Islands and management zones; Falkland Inner Conservation Zone and Falkland Outer Conservation Zone

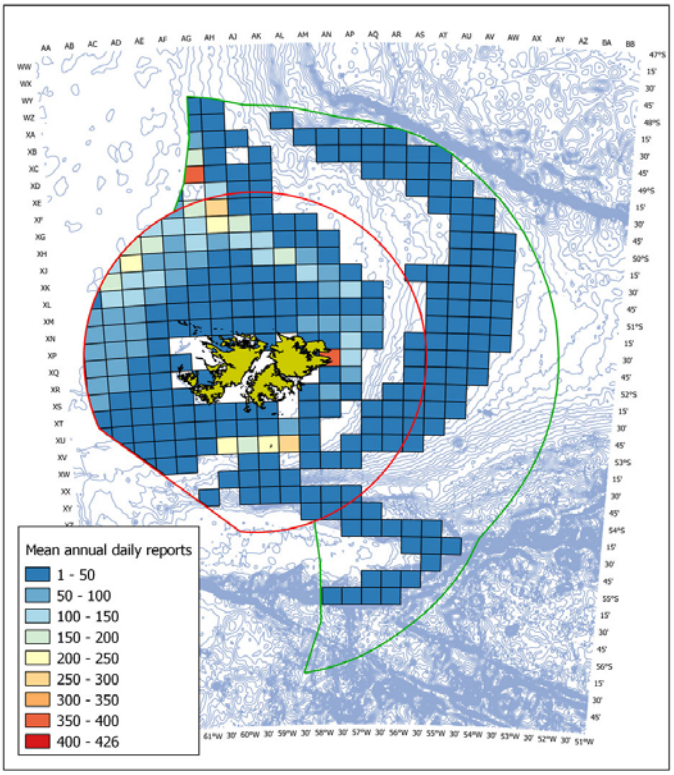


Figure 3. Mean number of daily reports (or vessel position) of fishing vessels per grid square 2003-2013. This represents the vessels' positions on a daily basis (including whilst in harbour) and not fishing activity or effort.

Project aims

Marine debris can be reported under various contexts and accumulation rates are often cited (e.g. how much debris is accumulating within a designated time frame). The purpose of this study is to record the amount of debris that is present on the Falkland shores, or a snapshot in time of all items, including the very old and very recent. Providing accurate baseline data on the levels and types of marine debris levels

across the Falklands will enable future changes or patterns to be identified (e.g. changes in accumulation rates, increases in plastic packaging and waste) and managed where possible.

The main aims of this study were to:

1. Quantify the most common items;
2. Quantify the main material components;
3. Identify any potential sources;
4. Identify regional variations.

Aims for future work will expand on the baseline surveys across all regions of the Falklands and include more accurate information on:

1. Accumulation rates;
2. Invasive species;
3. Identify impacts of marine debris (environmental and economic).

Survey methods were followed according to a Falkland protocol developed from the UNEP and CCAMLR guidelines in an attempt to standardise Falkland data with other regional and global studies. The guidelines aim to achieve a good balance between resolution of data collected and operational efficiency.

All items (excluding driftwood, unprocessed timber and organic waste) were categorised and tallied along a stretch of beach. Start and end locations of the surveys were recorded with a hand-held GPS and distance of beach surveyed calculated. Beach substrate, aspect, tide and presence of beached kelp, flotsam and whale bones were also recorded. Information on origin of items was collected where possible, for example language and place of manufacture on labels. Items were not typically weighed, but their relative sizes were recorded (see Crofts 2014 for methodology).

Debris categories

Classification of debris items was managed under a three tier approach in which tier 1 describes the broadest category (Fig. 4). The second tier describes items by material (e.g. plastic, rubber, glass) and the third tier by form (e.g. bottle, rope, buoys) (Fig. 6).

Standardisation and limitations of data

Standardised beach litter counts use both weight and count of items (UNEP 2009), as both together allow for the widest possible comparison between surveys. Due to surveying remote areas of the Falklands it was not possible to collect and weigh all beach items and weighing individual items adds significant time to survey effort. Additionally, many beach items are not possible to weigh including large nets and ropes which, over time, become buried within the beach substrate. Counting items requires less equipment and simple surveying techniques can be translated to volunteer participation much more readily. To overcome issues of comparisons, for example one net can weigh over 100 kg whereas it would take many hundreds of plastic bottles to weigh the same; the relative size of debris was recorded where possible. Items by numbers are also much more useful to evaluate their impact on the environment, for example 100 packing bands have 100 times the potential to ensnare wildlife whereas 10 kg of packing bands does not translate so readily. For the purpose of this report only numbers of items are reported.

Categories	Examples
CONTAINERS	Bottles, bottle tops, containers, oil drums, aerosol spray cans
FISHING & BOATING	Rope, nets, buoys, lures, traps, fishing line, tori lines, life vests and life rafts
PACKAGING	Food wrappers, drink cartons, food boxes, drinking cans, plastic bags, bin bags, bubble wrap, polystyrene foam, strapping bands, plastic film
CLOTHING & SHOES	Cloth, fabric, garments, hard hats, shoes, sandals, flip flops
HYGIENE	Sanitary pads, toothbrushes, cotton bud sticks
OTHER	Toys, piping and cables, furniture, appliances, miscellaneous and broken pieces

Figure 4. Tier 1 categories of marine debris type.

Geographic survey effort

The majority of surveys were conducted at the north-west, north and east of the Falklands, where we combined effort with other projects – including the Striated Caracara Surveys 2013 (Micky Reeves, FC) and the Falkland Islands Seabird Monitoring Programme (FC). They were carried out opportunistically whilst FC staff were conducting work across the outer islands and mainland. A dedicated survey across the Falklands would be costly and is unlikely to happen. A disadvantage of opportunistic sampling is that survey effort is not consistent between locations and regions, and interpretation of data needs to be carefully considered.

More attention on survey effort will be placed on the West Falkland mainland and the southern region of East Falkland in the summer 2014/15. This report is only a preliminary report on the findings to date.

Results

A total of 122 beach surveys were conducted (Fig. 5), with the majority carried out in the summer of 2013/14, and the earliest recorded in 2007. A total of 32.5 km were surveyed by FC staff, volunteers and landowners.

A total of 9,197 items were recorded (Fig. 6), this equates to an average of 283 items km^{-1} stretch of beach. However, most of the items were not equally distributed throughout the survey transects, so this figure is not a true representation of all beaches. Some beaches collected more debris than others and many areas of the Falklands are still un-surveyed.

Whale Bone Cove (near Stanley) was the beach with the highest number of items recorded with 535 items along 100 metres. The vast majority were very small broken plastic fragments from items that have collected in Stanley harbour over time.

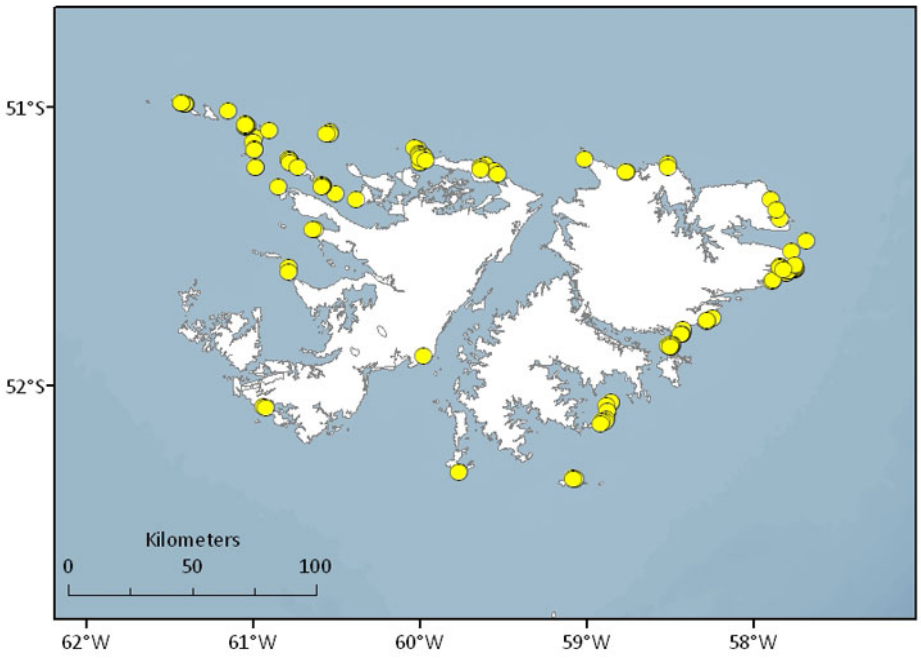


Figure 5. Locations of marine debris beach surveys included in this study.

Common types of debris

Containers, with 3,407 counted individual items, were the most common category for debris items. In total, they accounted for 37 % of all debris recorded. Packaging was the second frequent category with 2,047 items (22 %). Fishing & Boating category accounted for 1,780 items (19 %). Items categorised under Other 18 %, with Clothing & Shoes category 3 %, and Hygiene items less than 1 % (Fig. 7).

Material component of debris items

If all items are broken down into their main material components, the vast majority are manufactured from plastic (94.3 %) (Fig. 8). However, because some clothing items and rubber items also contain plastic-derived materials the figure is likely to be slightly higher. This figure is comparative to other regional surveys carried out in the South Atlantic (Fig. 1).

Item	Number	%	Item	Number	%
Plastic beverage bottle	**2010**	**21.9**	Gloves	6	0.1
Plastic miscellaneous	**1563**	**17.0**	Piping - plumbing	6	0.1
Other plastic bottle	**844**	**9.2**	Aluminium can other	5	0.1
Plastic film - sheet	**728**	**7.9**	Fender	5	0.1
String	**594**	**6.5**	Plastic container lid	5	0.1
Rope	**483**	**5.3**	Shoe sole	5	0.1
Strapping bands	**372**	**4.0**	Fibre glass piece	4	0.0
Polystyrene/insulation	**304**	**3.3**	Gas cylinder	4	0.0
Rolls - packaging	**297**	**3.2**	Glass jar	4	0.0
Net	**284**	**3.1**	Plastic/polystyrene cup	4	0.0
Plastic net float	**230**	**2.5**	Rubber boot (orange)	4	0.0
Bottle top/cap	**192**	**2.1**	Sanitary item	4	0.0
Jig lure	**124**	**1.3**	Spool	4	0.0
Plastic container > 4 L	**96**	**1.0**	Toothbrush	4	0.0
Adhesive tape	**93**	**1.0**	Tori line	4	0.0
Cloth	68	0.7	Bubble wrap	3	0.0
Plastic bag	68	0.7	Clothing	3	0.0
Plastic food packaging	61	0.7	Life raft	3	0.0
Aluminium aerosol can	59	0.6	Light bulb/strip	3	0.0
Sandal / flip flop	48	0.5	Metal paint tin	3	0.0
Aluminium drink can	47	0.5	Paper food packaging	3	0.0
Plastic jar/tub	45	0.5	Plastic sack	3	0.0
Crate/tray	44	0.5	Tyre	3	0.0
Material	42	0.5	Cork	2	0.0
Foam sheet	41	0.4	Drinking straw	2	0.0
Rubber gloves	32	0.3	Football	2	0.0
Woven plastic sack	31	0.3	Furniture	2	0.0
Glass bottle	25	0.3	Paper/cardboard	2	0.0
Jig reel	25	0.3	Soft hat	2	0.0
Ear cleaner bud	23	0.3	Trough/water tank	2	0.0
Cigarette lighter	21	0.2	Wooden broom	2	0.0
Metal piece	19	0.2	Fuel pipe/ floating sleeve	1	0.0
Metal net float	18	0.2	Engine part	1	0.0
Rubber sheet	16	0.2	Fishing line	1	0.0
Oil drum/barrel	15	0.2	Fuel hose	1	0.0
Shoe	15	0.2	Jacket/overall	1	0.0
Rubber boot	14	0.2	Life buoy	1	0.0
Toy wheel	14	0.2	Metal band	1	0.0
Foil food packaging	13	0.1	Plastic other packaging	1	0.0
Aluminium food can	10	0.1	Plastic pen/ lid	1	0.0
Broom	10	0.1	Polystyrene food box	1	0.0
Hard hat	9	0.1	Rope with polystyrene buoys	1	0.0
Glass fragment	7	0.1	Steel net roller	1	0.0
Paint brush	7	0.1	Tarpaulin	1	0.0
Tarram (rigid plastic mesh)	7	0.1	Toiletries	1	0.0
Bucket	6	0.1	Wire	1	0.0

Figure 6. Description all items and total numbers recorded during marine debris surveys for this study.

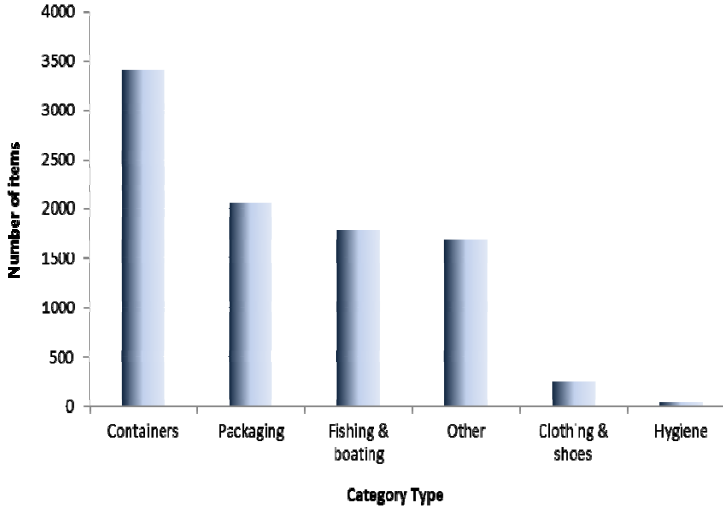


Figure 7. Bar chart showing the frequency of categories of marine debris at the Falkland Islands.

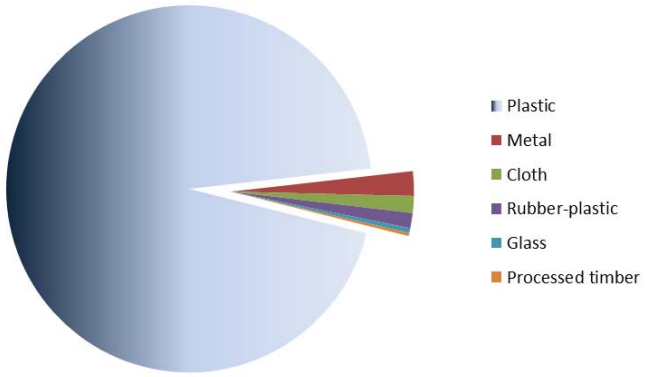


Figure 8. Pie chart representing the main material component of marine debris items.

Containers

Items recorded as Containers are listed in Fig. 9. In total, these items accounted for 37 % of all debris. Plastic bottles were the most frequent marine debris item encountered (84 % within the Containers category). Plastic beverage bottles (e.g. water, soft and fizzy drink) were the most common. This category contained a variety of material components including glass and metals, however plastic was the most common.

Plastic bottles

Plastic beverage bottles were classed as large (≥2 litres) which accounted for 65 % or small (≤ 300 ml) accounting for 35 %. Most beverage bottles were clear plastic, or green. The *other plastic bottles* category included uses for toiletry, domestic and industrial cleaning, lubricating as well as for food and condiments. These accounted for 9 % of all items recorded and overall were the third most common item encountered. Most bottles in this category were coloured opaque plastics.

Origin of containers

Where labels or writing were visible on the container the origin of manufacture or language could be recorded. Five percent of containers could be traced to an origin or language. From this sample, a third (36 %) were Asian (majority plastic beverage bottles). Spanish language (i.e. origin either Spain or South America), English language and South American origin all accounted for around 20 % each. Containers from South American countries included Argentina, Chile, Brazil, Peru and Uruguay (Fig. 10).

In several cases a best before date was legible on plastic bottles. Dates as recent as 2013 and 2104 were recorded.

Type	Number	%	Item	Number	%
Plastic beverage bottle	**2010**	**59.0**	Oil drum/barrel	15	0.4
Other plastic bottle	**844**	**24.8**	Aluminium food can	10	0.3
Bottle top/cap	192	5.6	Bucket	6	0.2
Plastic container	96	2.8	Aluminium can other	5	0.1
Aluminium aerosol can	59	1.7	Plastic container lid	5	0.1
Aluminium drink can	47	1.4	Gas cylinder	4	0.1
Plastic jar/tub	43	1.3	Glass jar	4	0.1
Crate/tray	37	1.1	Metal paint tin	3	0.1
Glass bottle	25	0.7	Trough/water tank	2	0.1

Figure 9. Frequency of items recorded in the Container category.

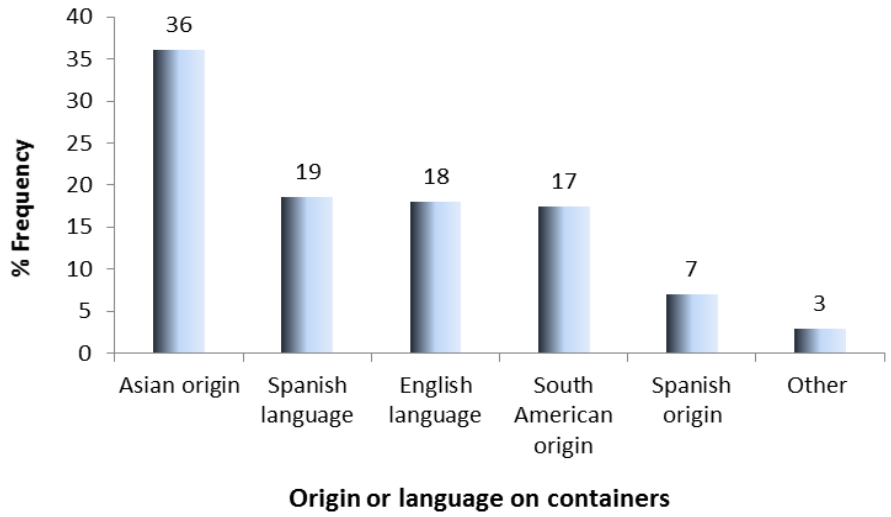


Figure 10. Sources of containers - language or origin of manufacture.

Packaging

Items recorded as Packaging are listed in Fig. 11. In total, these items accounted for 22 % of all debris items.

Within the Packaging category, plastic film/sheet (36 %) and packing or strapping bands (18 %) were the most common items. This was followed by polystyrene pieces and plastic rolls (used as the inner roll for plastic film, Fig. 13.4).

One likely source of commercial packaging items is related to fishing operations from on-board factories (although other sources may also be involved). Plastic film (often blue or white sheets used in packaging of products) and plastic packing bands (secure cardboard boxes) were the most common two items in this category and overall were the 4th and 7th most prevalent item of all debris respectively. Polystyrene pieces were the third most common packaging item and often recorded as small broken fragments from larger blocks. Polystyrene is extremely buoyant and capable of travelling large distances. Plastic rolls (Fig. 13.4) were the 9th most common marine debris found during surveys (Fig. 11).

Origin of packaging items

On items such as food wrappers and plastic bags, language or origin was deciphered were possible and this accounted for only 2 % of the total items in the packaging category. Of these items, 60 % had English language, with 22 % Asian (Fig. 12).

Item	Number	%	Item	Number	%
Film - sheet	**728**	**35.6**	Foil food packaging	13	0.6
Packing bands	**372**	**18.2**	Plastic/ polystyrene cup	4	0.2
Polystyrene/ insulation	**304**	**14.9**	Bubble wrap	3	0.1
Rolls - packaging	**297**	**14.5**	Paper food packaging	3	0.1
Adhesive tape	93	4.5	Plastic sack	3	0.1
Plastic bag	68	3.3	Paper/ cardboard	2	0.1
Plastic food packaging	61	3.0	Metal band	1	0.0
Foam sheet	41	2.0	Plastic other packaging	1	0.0
Woven plastic sack	31	1.5	Polystyrene food box	1	0.0
Rubber sheet	16	0.8	Tarpaulin	1	0.0

Figure 11. Frequency and type of items recorded in the Packaging category.

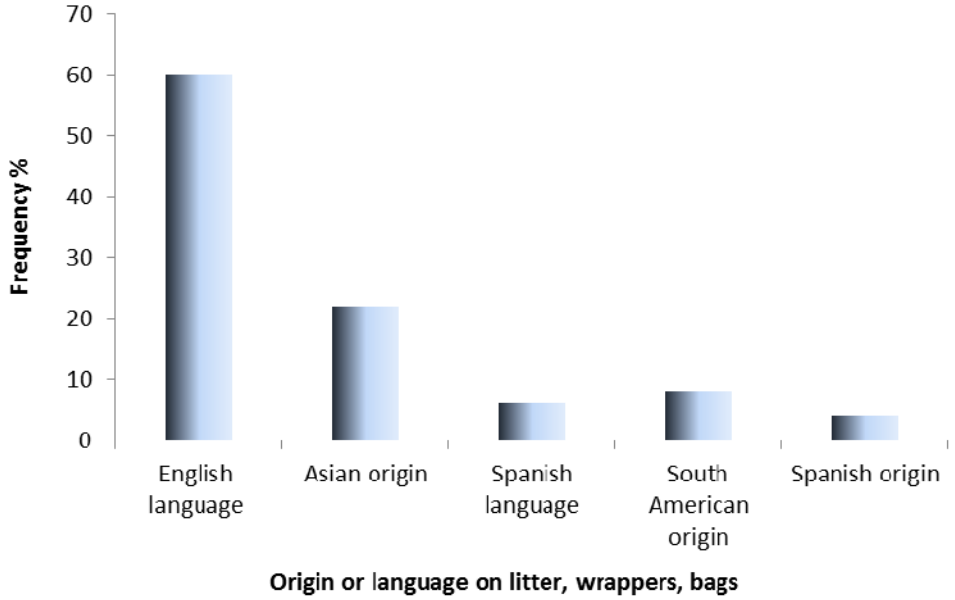


Figure 12. Sources of packaging - language or origin of manufacture.

1. Packing bands

2. Bundle of packing bands

3. Bundle of plastic film

4. Roll of plastic film and plastic inner roll

Figure 13. Examples of frequently encountered packaging items found on beaches.

Fishing & Boating

Items recorded in the Fishing & Boating category are listed in Fig. 14. In total, these items accounted for 19 % of all debris. The most common was string (green-coloured synthetic string made up the vast majority) (33 %) and rope (27 %). Both items were often recorded as small pieces and fragments, where they have degraded over time and would explain, in some part, the large portion they represent in this category. Net items varied in size from small broken pieces of net to the largest being a whole trawl net with net floats attached (found in the north-west). By weight alone, nets would contribute to the heaviest group of items recorded across all surveys.

Due to the floating properties of various fishing and boating items, over time they are likely to strand at shorelines. Plastic buoys were more numerous than metal buoys as plastic increasingly has replaced metal as the main material component. A small proportion of ropes were made from natural fibres, however most nets, string and ropes were synthetic materials. There was a mixture of items varying in degrees of age and the duration they had been stranded onshore. Jig lures and broken jigging reels were recorded, in particular in the north and north-west regions, but were also found during surveys in Berkeley Sound.

Item	Number	%	Item	Number	%
String	**594**	**33.4**	Crate/tray	7	0.4
Rope	**483**	**27.1**	Fender	5	0.3
Net	**284**	**16.0**	Tori line	4	0.2
Plastic net float	**230**	**12.9**	Life raft	3	0.2
Jig lures	124	7.0	Fishing line	1	0.1
Jig reels	25	1.4	Life buoy	1	0.1
Metal net float	18	1.0			

Figure 14. Frequency and type of items recorded in the Fishing & Boating category.

Other

The most common item in the Other category was plastic miscellaneous pieces accounting for 93 % in this group. Most of these items (80 %) were small (<5 cm x 5 cm) consisting of broken pieces from larger objects. Larger miscellaneous items also consisted of broken pieces and unidentifiable plastic items. Twenty percent of these broken items were attributed to one beach in Stanley Harbour (Whale Bone Cove) where small broken and degraded plastic items (of varying age) were stranding. Items in this category were often infrequently encountered, but are often common debris items reported in other regions of the world (e.g. cigarette lighters) and typically associated with human activity on land and in urban areas.

Items	Number	%
Plastic miscellaneous	**1563**	**92.9**
Cigarette lighter	21	1.2
Metal piece	19	1.1
Toy	14	0.8
Broom	10	0.6
Glass fragment	7	0.4
Paint brush	7	0.4
Tarram	7	0.4
Piping - plumbing	6	0.4
Fibre glass piece	4	0.2
Spool	4	0.2
Light bulb/strip	3	0.2
Tyre	3	0.2
Cork	2	0.1
Football	2	0.1
Furniture	2	0.1
Wooden broom	2	0.1
Fuel pipe	1	0.1
Engine part	1	0.1
Fuel hose	1	0.1
Plastic pen/ lid	1	0.1
Steel net roller	1	0.1
Wire	1	0.1

Figure 15. Frequency and type of items in the Other category.

Clothing & Shoes

Rags and cloth represented the highest item within the Clothing & Shoes category at 44 %, followed by sandals /flip flops. The latter are made from buoyant and resistant materials and, in part, this explains their unusually high presence on shorelines. Rubber gloves, hard hats and boots are often associated with commercial marine activities.

Item	Number	%
Cloth/ material	110	44.2
Sandal / flip-flop	48	19.3
Rubber glove	32	12.9
Shoe / sole	20	8.0
Rubber boot	18	7.2
Clothing, hat, glove	12	4.8
Hard hat	9	3.6

Figure 16. Frequency and type of items recorded in the Clothing & Shoes category.

Hygiene

Of all the categories, Hygiene represents the least common items found on beaches. Hygiene items are associated with human sewage and disposal methods. Most items were recorded on beaches in the Stanley vicinity. Cotton ear buds, the most common item in this group, were frequent at Whale Bone Cove.

Item	Number	%
Cotton ear buds	23	71.9
Sanitary items	4	12.5
Toothbrush	4	12.5
Toiletries	1	3.1

Figure 17. Frequency and type of items recorded in the Hygiene category.

Regional variation of marine debris

Surveys were standardised to 100 m stretches of coast. Surveys that included gullies and coves less than 50 m wide that channelled large amounts of debris were excluded as extrapolating the data gave an overestimation and bias to the result.

Geographical location of debris

The Falklands was divided into geographical regions. Stanley, Port William and Berkeley Sound were treated independently due to the direct influence on marine debris sources from human activity in the immediate vicinities. Fig. 18 shows the mean value of items per 100 m stretch of beach, the range and the number of surveys in each region. The data for the south-west region were smoothed to attempt to remove bias due to low survey effort but high debris amounts at these three particular beaches. At this stage the graph provides an initial regional indication of the varying quantities of debris, but it must be stressed that the areas with low survey effort potentially bias the results.

The data were plotted onto a radial graph (Fig. 19) and displayed using GIS mapping (Fig. 20). Initial findings suggest higher quantities of debris accumulating in the westerly regions and less in the east. Intuitively, this would correspond with the prevailing winds and proximity to the nearest significant populated continental mass, South America, although other factors such as local currents, fishery type and effort in the regions, other regional marine users and land-use within the Falklands also need to be considered.

All items that had a label or writing with a language or origin were grouped and plotted onto maps in ArcGIS (Fig. 21 a-e). The distribution of items with a known origin or language can help identify the potential or likely sources where items are entering into the system. Interpretation needs to be precautionary as only a small sample of the total debris items recorded had any language/origin attached. In addition, it is unknown to what level the currents and other ocean or weather features are influencing the movement of marine debris and the final stranding location.

Location	Surveys (n)	Range (min. - max. value)	Mean value
Stanley Harbour	1		535
Berkeley Sound	2	19 - 26	22
Port William	3	31 - 47	40
North	21	1 -374	45
NE	16	5 - 59	14
East	14	1 - 31	14
SE	9	0 - 47	14
South	4	6 - 14	9
SW	3	54 - 264	64
West	3	1 - 113	53
NW	34	1 - 348	57

Figure 18. Regional mean value and ranges for number of marine debris items along 100 m beach surveys.

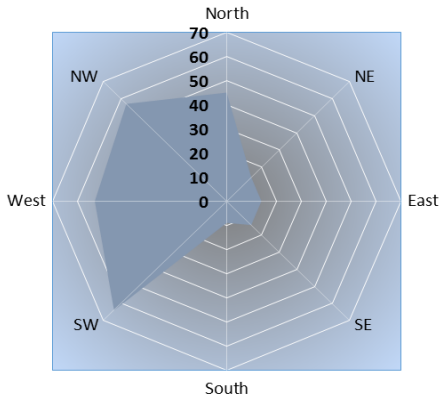
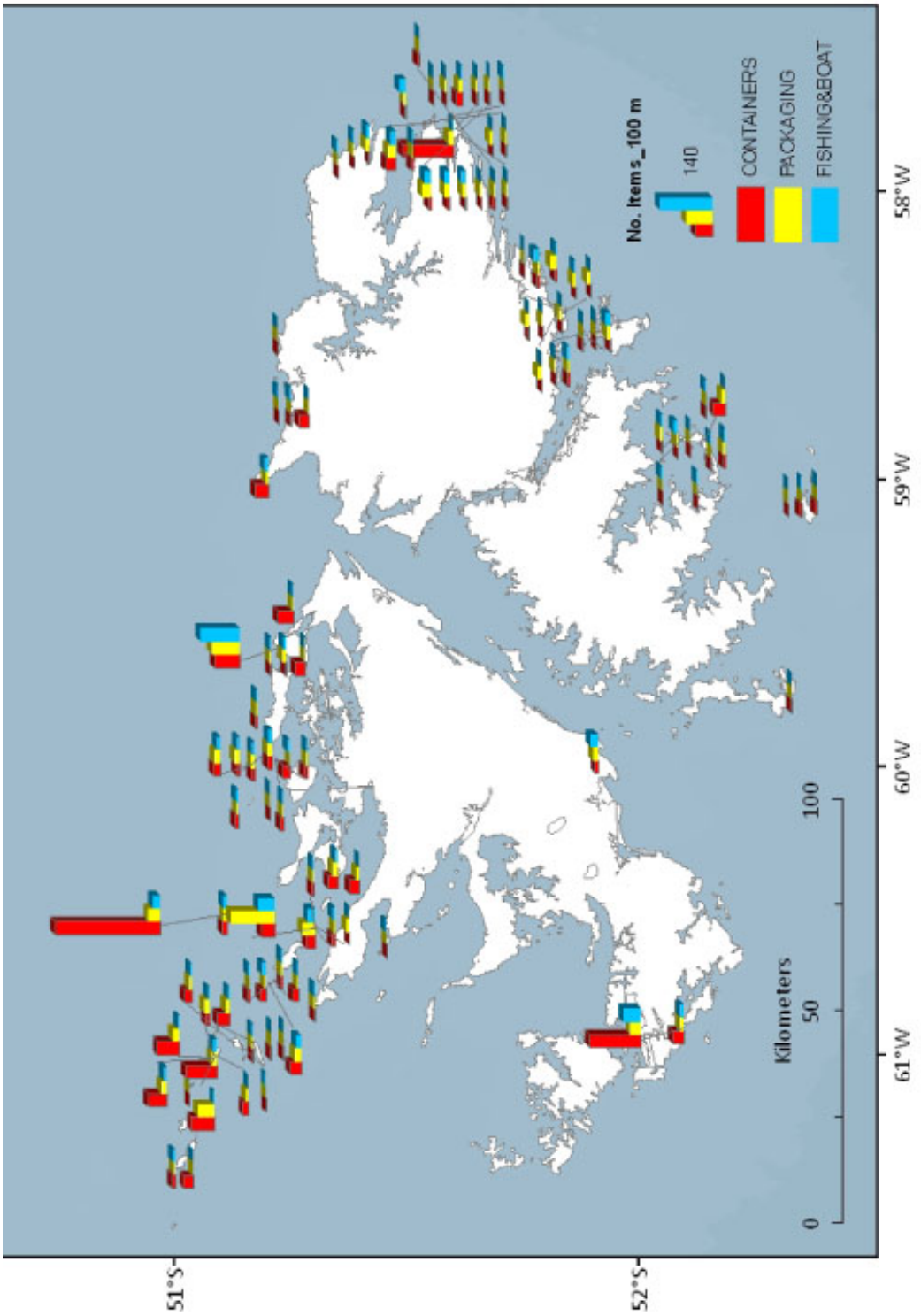
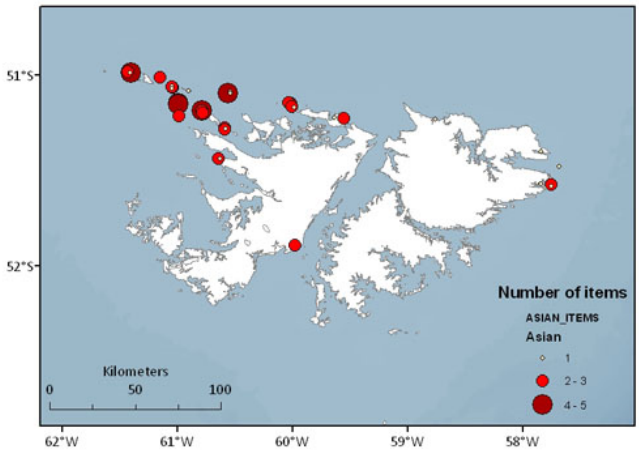


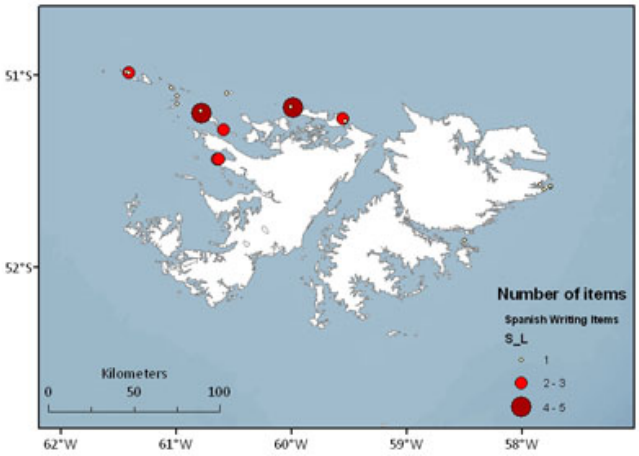
Figure 19. Radial graph showing the regional mean number of marine debris items along 100 m stretches of beach.

Figure 20. Survey locations and bar charts showing the number of items per 100 metres for debris categories; Containers, Packaging and Fishing & Boating.

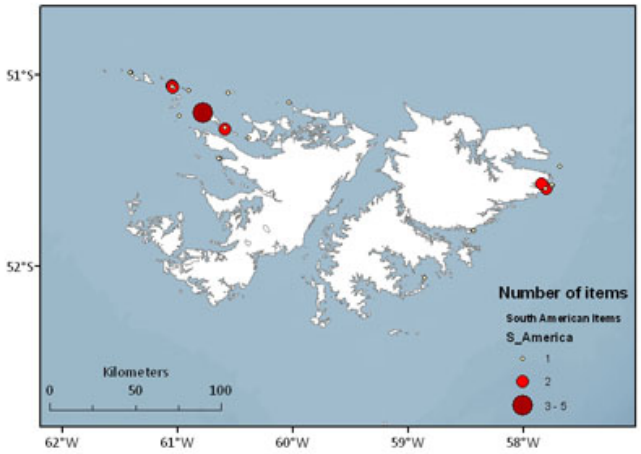




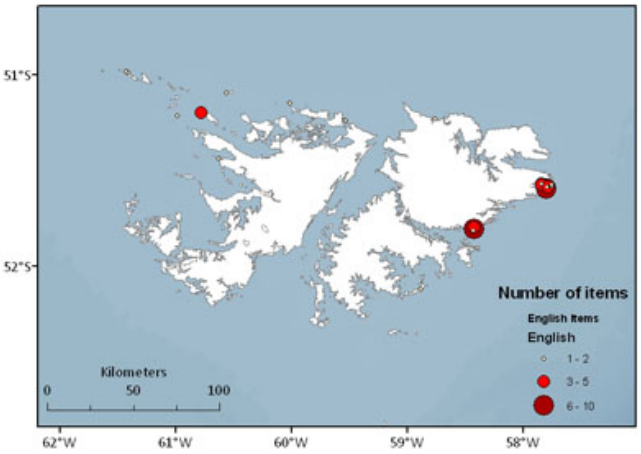
a) Asian.



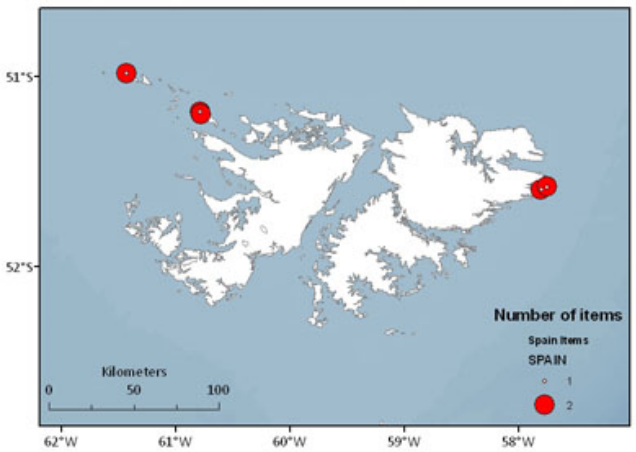
b) Spanish language (origin either South America or Spain).



c) South American (e.g. Argentina, Chile, Brazil, Peru, Uruguay).



d) English language (e.g. origin UK, USA, Falkland Islands).



e) Spanish.

Figure 21. Distribution of marine debris items with known language or origin at the Falkland Islands.

Wildlife impacts

No direct impacts to wildlife, such as entanglements, were observed during the beach surveys conducted for this report.

Species susceptible to entanglements at the Falklands are often sea lions and fur seals where bands and rope loops become lodged around the neck. This can be fatal if a loop is lodged around the neck of a young animal as the band will cut through the flesh causing severe injuries as the animal grows. Seabirds, including penguins, and coastal birds such as ducks, have also been reported ensnared or tangled in marine debris items, in particular nets.

It is likely that interactions are existing in the ocean environment and therefore are not observed or quantifiable, and this would include potentially fatal actions such as mistaken ingestion of marine debris items, e.g. plastic bags (resembling jellyfish) and small pieces of coloured plastic. In addition, marine taxa may become caught in derelict gear or other harmful items.

Discussion

This is the first quantitative study carried out on marine debris on an island-wide scale at the Falkland Islands. However, it is still incomplete with additional survey effort required, particularly in the west and south regions. Despite this, the data produced are still useful and can be used as a preliminary evaluation of marine debris. Unlike other regions in the world, there has been very little data and literature produced to represent the Falklands.

Similar to other regional studies in the South Atlantic (Eriksson *et al*. 2013; Ryan 2013), plastic is the dominant material component of marine debris, and this study suggests as high as 94 % at the Falklands. This is partly due to the ubiquitous use of plastic in our modern day life.

Clear plastic beverage bottles were the most frequent marine debris items. Where origins/ language could be deciphered, Asian was the most common, but it should be noted that the sample size was low. Best before dates as recent as 2013 and 2014 were noted and more information on accumulation rates is required to understand how often items are being washed up on beaches and to determine whether rates will increase over time.

The Containers category represented the highest group of debris items. Containers, being lightweight and often sealed increases buoyancy and the capacity to travel large distances. Plastic bottles, cans, aerosol cans, can be discarded via municipal waste from vessels and from onshore sources. Determining the exact sources will be difficult, although language on labels can provide some indication.

Studies of stranded debris by Ryan (2013) for central South Atlantic and Ivar do Sol (2011) for Antarctic regions, found that items were originating from South America, as well as other sources. It is also highly likely that an unknown portion of items stranding at the Falklands originates from South America - it is probable that lightweight items can travel with surface currents produced by prevailing westerly winds to the Falklands. Limited data are available on what role wider oceanographic features determine the dispersal of debris; the Falkland Islands Fisheries Patrol Vessel found a New Zealand scientific buoy in seas of West Falkland in 2001 that had originally been deployed south of Tasmania, in Antarctic waters (FISHOP pers. Comm.).

Vessels in Falkland waters and surrounding neighbouring seas, including the Patagonian Shelf are likely to influence debris type and amounts at the Falklands. In the past, the fishing industry has been attributed as a significant source (Otley and Ingham 2003), and is still likely to contribute in some part, through either accidental loss of gear or deliberate discarding. Results from a questionnaire to Falkland landowners (Crofts 2011) anecdotally suggested that in the last two decades fishing gear has decreased (in correspondence with FIG vessel licencing stipulations) and plastic items and packaging increased. To what extent packaging related fishing items (strapping bands and plastic film) are entering the system from within the Falkland fishery or from fisheries outside the exclusion zone remains unknown.

For part of the study, surveys were conducted in the Stanley vicinity, including Stanley Harbour, although not strictly beaches that would collect marine debris from the open ocean, the items however can reveal the efficiency of waste disposal in the vicinity. This study does not intend to comprehensively investigate waste management at Stanley, however the results are nonetheless useful. Hygiene items were only recorded in small numbers on beaches in the Stanley vicinity, including the many cotton bud sticks on Whale Bone Cove and sanitary pads at shorelines behind the South Common (Megabid), Mile pond and vicinity of Surf Bay.

Marine debris can be managed through reducing the amount of items entering the system in the first place or through removing stranded debris directly from the shorelines. It is unlikely that removal of items would ever exceed the amounts entering the system or collecting on the shores, and would not be cost efficient due to the remote nature of beaches and low population at the Falkland Islands.

Where management options can be identified that address local sources (e.g. blown items from landfills, littering, disposing non-degradable items down sinks and toilets, and increased awareness for marine users) this will in the long term help to improve the problem. However, inevitably an unknown portion of debris will be outside the management capacity of the Falklands, including items that originate from other continental landmasses via oceans.

Marine debris is only likely to increase, even if newer and faster degrading materials are pioneered and waste management procedures globally improved, the current levels of debris in the world's oceans, and overwhelmingly mostly plastic, will be present for many years to come.

Acknowledgements:

This study was partially funded by the Falkland Islands Government Environmental Studies Budget 2013. The study could not have been conducted without landowners granting permission to Falklands Conservation to access land. Surveys were often conducted in conjunction with other FC work, including the Striated Caracara survey 2013 and Falkland Islands Seabird Monitoring Programme, in addition to the Gap Analysis Project for seabirds through the South Atlantic Environmental Research Institute. Collation of data involved a number of FC staff, volunteers and landowners (see Appendix 1). Figure 2 was produced by Paul Brewin, with the kind permission of John Barton, Falkland Islands Fisheries Department. Thanks to Roy Summers and FISHOP for help in collating marine vessel and user information in the FI waters.

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Appendix 1. Survey sites

Beach	Area	Date	Surveyor	Landowner	Project
Behind MegaBid	Stanley Common	14-Mar-14	Sarah Crofts	Stanley Common	Marine debris project
Berthas Beach	Fitzroy Farm	11-Mar-14	Sarah Crofts	Falkland Land Holding	Marine debris project
Berthas Beach	Fitzroy Farm	12-Mar-14	Iris Thompson	Falkland Land Holding	Marine debris project
Berthas Beach	Fitzroy Farm	12-Mar-14	Iris Thompson	Falkland Land Holding	Marine debris project
Berthas Beach	Fitzroy Farm	11-Mar-14	Sarah Crofts	Falkland Land Holding	Marine debris project
Christina Bay	Stanley Common	06-Mar-14	Sarah Crofts	Stanley Common	Marine debris project
Christina Bay	Stanley Common	06-Mar-14	Sarah Crofts	Stanley Common	Marine debris project
Christina Bay	Stanley Common	06-Mar-14	Sarah Crofts	Stanley Common	Marine debris project
Christina Bay	Stanley Common	06-Mar-14	Sarah Crofts	Stanley Common	Marine debris project
Cow Bay	Johnsons Harbour	16-Feb-14	Carol Peck	Jan Cheek	Volunteer
East Cove	Fitzroy Farm	11-Mar-14	Sarah Crofts	Falkland Land Holding	Marine debris project
Fox Point Beach	Fitzroy Farm	11-Mar-14	Sarah Crofts	Falkland Land Holding	Marine debris project
Hooker Point	Stanley Common	05-Mar-14	Sarah Crofts	Stanley Common	Marine debris project
Kidney Is.	Port William	01-Sep-07	Ken Passfield/Sally Poncet	Falkland Islands Gov.	Volunteer
Long Island Beach	Long Island Berkeley Sound	12-Mar-14	Sarah Crofts &Iris Thompson	Neil & Glenda Watson	Marine debris project
Magellan Beach	Johnsons Harbour Berkeley Sound	12-Mar-14	Sarah Crofts &Iris Thompson	Jan Cheek	Marine debris project
Mile Pond	Stanley Common	11-Mar-14	Sarah Crofts &Iris Thompson	Stanley Common	Marine debris project
Mile Pond	Stanley Common	11-Mar-14	Sarah Crofts &Iris Thompson	Stanley Common	Marine debris project
Cape Pembroke	Stanley Common	06-Mar-14	Sarah Crofts	Stanley Common	Marine debris project
Cape Pembroke	Stanley Common	06-Mar-14	Sarah Crofts	Stanley Common	Marine debris project
Surf Bay North	Stanley Common	06-Mar-14	Sarah Crofts	Stanley Common	Marine debris project
Surf Bay North	Stanley Common	06-Mar-14	Sarah Crofts	Stanley Common	Marine debris project
Volunteer Beach	Johnsons Harbour	16-Feb-14	Carol Peck	Jan Cheek	Volunteer
Top Tussac Is.	Port William	02-Oct-11	SMSG	Falkland Islands Gov.	Volunteer
Middle Is.	Choiseul Sound	09-Jan-14	Sarah Crofts	Falklands Conservation	Marine debris project
Middle Is.	Choiseul Sound	09-Jan-14	Sarah Crofts	Falklands Conservation	Marine debris project
Middle Is.	Choiseul Sound	09-Jan-14	Sarah Crofts	Falklands Conservation	Marine debris project
Middle Is.	Choiseul Sound	09-Jan-14	Sarah Crofts	Falklands Conservation	Marine debris project
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Middle Is.	Choiseul Sound	09-Jan-14	Sarah Crofts	Falklands Conservation	Marine debris project
Middle Is.	Choiseul Sound	09-Jan-14	Sarah Crofts	Falklands Conservation	Marine debris project
Middle Is.	Choiseul Sound	09-Jan-14	Sarah Crofts	Falklands Conservation	Marine debris project
Dunbar Is.	Byron Sound	18-Dec-13	Sarah Crofts	Roddy Napier	Striated Caracara Survey
Elephant Jason Is.	Jason Islands	13-Dec-13	Micky Reeves	Falkland Islands Gov.	Striated Caracara Survey
Elephant Jason Is.	Jason Islands	13-Dec-13	Sarah Crofts	Falkland Islands Gov.	Striated Caracara Survey
Flat Jason Is.	Jason Islands	17-Dec-13	Sarah Crofts	Falkland Islands Gov.	Striated Caracara Survey
Flat Jason Is.	Jason Islands	17-Dec-13	Sarah Crofts	Falkland Islands Gov.	Striated Caracara Survey
Flat Jason Is.	Jason Islands	17-Dec-13	Sarah Crofts	Falkland Islands Gov.	Striated Caracara Survey
Flat Jason Is.	Jason Islands	17-Dec-13	Sarah Crofts	Falkland Islands Gov.	Striated Caracara Survey
Flat Jason Is.	Jason Islands	17-Dec-13	Sarah Crofts	Falkland Islands Gov.	Striated Caracara Survey

Flat Jason Is.	Jason Islands	17-Dec-13	Sarah Crofts	Falkland Islands Gov.	Striated Caracara Survey
The Fridays	Jason Islands	16-Dec-13	Sarah Crofts	Falkland Islands Gov.	Striated Caracara Survey
Steeple Jason Is.	Jason Islands	31-Dec-11	Sarah Crofts	Wildlife Conservation Society	FISMP
North Fur Is.	Jason Islands	16-Dec-13	Sarah Crofts	Falkland Islands Gov.	Striated Caracara Survey
North Twin Is.	Carcass Island	14-Dec-13	Sarah Crofts	Falkland Island Development	Striated Caracara Survey
North Twin Is.	Carcass Island	14-Dec-13	Sarah Crofts	Falkland Island Development	Striated Caracara Survey
North Twin Is.	Carcass Island	14-Dec-13	Sarah Crofts	Falkland Island Development	Striated Caracara Survey
South Fur Is.	Jason Islands	12-Dec-13	Sarah Crofts	Falkland Islands Gov.	Striated Caracara Survey
South Fur Is.	Jason Islands	12-Dec-13	Sarah Crofts	Falkland Islands Gov.	Striated Caracara Survey
South Jason Is.	Jason Islands	16-Dec-13	Sarah Crofts	Falkland Islands Gov.	Striated Caracara Survey
South Jason Is.	Jason Islands	16-Dec-13	Sarah Crofts	Falkland Islands Gov.	Striated Caracara Survey
South Twin Is.	Carcass Island	15-Nov-13	Sarah Crofts	Falklands Conservation	Striated Caracara Survey
South Twin Is.	Carcass Island	15-Nov-13	Sarah Crofts	Falklands Conservation	Striated Caracara Survey
South Twin Is.	Carcass Island	14-Dec-14	Sarah Crofts	Falklands Conservation	Striated Caracara Survey
Whale Point	Fitzroy Farm	16-Feb-14	Andrea Stanworth	Falkland Land Holdings	Volunteer
St Mary Wreck	Fitzroy Farm	16-Feb-14	Andrea Stanworth	Falkland Land Holdings	Volunteer
St Mary Wreck	Fitzroy Farm	16-Feb-14	Andrea Stanworth	Falkland Land Holdings	Volunteer
Hadassa Bay	Stanley Common	04-Apr-14	Sarah Crofts	Stanley Common	Marine debris project
Hadassa Bay	Stanley Common	04-Apr-14	Sarah Crofts	Stanley Common	Marine debris project
Hadassa Bay	Stanley Common	04-Apr-14	Sarah Crofts	Stanley Common	Marine debris project
West Point Is.	Carcass Island	10-Dec-13	Sarah Crofts	Roddy Napier	Striated Caracara Survey
Steeple Jason	Jason Islands	22-Jan-14	Sarah Crofts	Wildlife Conservation Society	FISMP
Steeple Jason	Jason Islands	22-Jan-14	Sarah Crofts	Wildlife Conservation Society	FISMP
Steeple Jason	Jason Islands	22-Jan-14	Sarah Crofts	Wildlife Conservation Society	FISMP
Steeple Jason	Jason Islands	22-Jan-14	Sarah Crofts	Wildlife Conservation Society	FISMP
Steeple Jason	Jason Islands	24-Jan-14	Sarah Crofts	Wildlife Conservation Society	FISMP
Governor Islet	Pebble Island	20-Dec-13	Sarah Crofts	Dean Brothers	Striated Caracara Survey
Governor Islet	Pebble Island	20-Dec-13	Sarah Crofts	Dean Brothers	Striated Caracara Survey
Pebble Is.	Pebble Island	23-Oct-14	Micky Reeves	Dean Brothers	Striated Caracara Survey
Saunders Is.	Saunders Island	01-Sep-07	Suzan & Marcus Pole-Evans	David & Suzan Pole-Evans	Volunteer
Pebble Is.	Pebble Island	16-Apr-14	Sarah Crofts	Dean Brothers	GAP seabirds
Pebble Is.	Pebble Island	16-Apr-14	Sarah Crofts	Dean Brothers	GAP seabirds
Pebble Is.	Pebble Island	16-Apr-14	Sarah Crofts	Dean Brothers	GAP seabirds
Pebble Is.	Pebble Island	16-Apr-14	Sarah Crofts	Dean Brothers	GAP seabirds
Pebble Islet	Pebble Island	20-Dec-13	Sarah Crofts	Dean Brothers	Striated Caracara Survey
Pebble Islet	Pebble Island	20-Dec-13	Sarah Crofts	Dean Brothers	Striated Caracara Survey
Pebble Islet	Pebble Island	20-Dec-13	Sarah Crofts	Dean Brothers	Striated Caracara Survey
Pebble Islet	Pebble Island	20-Dec-13	Sarah Crofts	Dean Brothers	Striated Caracara Survey
Pebble Islet	Pebble Island	20-Dec-13	Micky Reeves	Dean Brothers	Striated Caracara Survey
Pebble Islet	Pebble Island	20-Dec-13	Micky Reeves	Dean Brothers	Striated Caracara Survey
Pebble Islet	Pebble Island	20-Dec-13	Micky Reeves	Dean Brothers	Striated Caracara Survey

Pebble Islet	Pebble Island	20-Dec-13	Micky Reeves	Dean Brothers	Striated Caracara Survey
Pebble Islet	Pebble Island	20-Jan-13	Micky Reeves	Dean Brothers	Striated Caracara Survey
Sedge Is.	Sedge Island	19-Dec-13	Sarah Crofts	David Hawksworth	Striated Caracara Survey
Sedge Is.	Sedge Island	19-Dec-13	Sarah Crofts	David Hawksworth	Striated Caracara Survey
Sedge Is.	Sedge Island	19-Dec-13	Sarah Crofts	David Hawksworth	Striated Caracara Survey
Bense Is.	King George Bay	07-Dec-13	Sarah Crofts	Sub-Antarctic Foundation for Ecosystem Research	Striated Caracara Survey
Bense Is.	King George Bay	07-Dec-13	Sarah Crofts	Sub-Antarctic Foundation for Ecosystem Research	Striated Caracara Survey
First Passage Is.	King George Bay	07-Dec-13	Sarah Crofts	Ali and Marlane Marsh	Striated Caracara Survey
First Passage Is.	King George Bay	07-Dec-13	Sarah Crofts	Ali and Marlane Marsh	Striated Caracara Survey
Low Is.	Carcass Island	18-Dec-13	Sarah Crofts	Roddy Napier	Striated Caracara Survey
Low Is.	Carcass Island	18-Dec-13	Sarah Crofts	Roddy Napier	Striated Caracara Survey
Low Is.	Carcass Island	18-Dec-13	Micky Reeves	Roddy Napier	Striated Caracara Survey
Low Is.	Carcass Island	18-Dec-13	Sarah Crofts	Roddy Napier	Striated Caracara Survey
Low Is.	Carcass Island	18-Dec-13	Sarah Crofts	Roddy Napier	Striated Caracara Survey
Carcass Bay	Falkland Sound	09-Oct-13	Micky Reeves	Keith & Nuala Knight	Striated Caracara Survey
Port Stephens	Port Stephens	20-Nov-13	Sarah Crofts	Peter & Ann Robertson	FISMP
Port Stephens	Port Stephens	20-Nov-13	Sarah Crofts	Peter & Ann Robertson	FISMP
Elephant Beach	Elephant Beach	20-Apr-14	Martine Blake & co.	Ben Berntsen	Volunteer
Elephant Beach	Elephant Beach	20-Apr-14	Martine Blake & Co	Ben Berntsen	Volunteer
Elephant Beach	Elephant Beach	20-Apr-14	Martine Blake & Co.	Ben Berntsen	Volunteer
Cape Dolphin	Cape Dolphin	19-Apr-14	Martine Blake & Co.	Lavinia Corp	Volunteer
Cape Bougainville	Gibraltar Station	01-Apr-14	Sarah Crofts	Nick & Annie Pitaluga	GAP seabirds
Cape Bougainville	Gibraltar Station	01-Apr-14	Sarah Crofts	Nick & Annie Pitaluga	GAP seabirds
Whale Bone Cove	Stanley Common	17-May-14	Sarah Crofts	Stanley Common	Marine debris project
Bleaker Is.	Bleaker Island	26-Mar-14	Sarah Crofts	Mike & Phyl Rendell	GAP seabirds
Bleaker Is.	Bleaker Island	26-Mar-14	Sarah Crofts	Mike & Phyl Rendell	GAP seabirds
Bleaker Is.	Bleaker Island	26-Mar-14	Sarah Crofts	Mike & Phyl Rendell	GAP seabirds
Bleaker Is.	Bleaker Island	26-Mar-14	Sarah Crofts	Mike & Phyl Rendell	GAP seabirds
Bleaker Is.	Bleaker Island	26-Mar-14	Sarah Crofts	Mike & Phyl Rendell	GAP seabirds
Bleaker Is.	Bleaker Island	26-Mar-14	Sarah Crofts	Mike & Phyl Rendell	GAP seabirds
Bleaker Is.	Bleaker Island	26-Mar-14	iLaria Marengo	Mike & Phyl Rendell	GAP seabirds
Bleaker Is.	Bleaker Island	26-Mar-14	iLaria Marengo	Mike & Phyl Rendell	GAP seabirds
Bleaker Is.	Bleaker Island	26-Mar-14	iLaria Marengo	Mike & Phyl Rendell	GAP seabirds
Bleaker Is.	Bleaker Island	26-Mar-14	iLaria Marengo	Mike & Phyl Rendell	GAP seabirds
Sea Lion Is.	Sea Lion Island	16-Mar-14	Andy Stanworth	Falkland Island Development	Volunteer
George Is.	George Island	01-Sep-07	Chris May	Christopher & Lyndsay May	Volunteer
Sea Lion Is.	Sea Lion Island	23-Jan-13	Sarah Crofts	Falkland Island Development	Striated Caracara Survey
Sea Lion Is.	Sea Lion Island	23-Jan-14	Sarah Crofts	Falkland Island Development	Striated Caracara Survey