UK Overseas Territories and Crown Dependencies: 2011 Biodiversity snapshot.

Falkland Islands: Appendices.

Author: Nick Rendell, Environmental Planning Department, Falkland Island Government.

More information available at: www.epd.gov.fk

This section includes a series of appendices that provide additional information relating to that provided in the Falkland Islands chapter of the publication: UK Overseas Territories and Crown Dependencies: 2011 Biodiversity snapshot.

All information relating to the Falkland Islands is available at http://jncc.defra.gov.uk/page-5606

The entire publication is available for download at http://jncc.defra.gov.uk/page-5759

Table of Contents

APPENDIX 1: BIODIVERSITY RELATED NATIONAL STRATEGIES AND LEGISLATION .. 3
APPENDIX 2: PROTECTED AREAS AND BIODIVERSITY/HABITAT SITES OF INTERNATIONAL BIODIVERSITY IMPORTANCE 11
APPENDIX 3: RESEARCH PRIORITIES 18
APPENDIX 4: RESEARCH PRIORITIES 15
TERRESTRIAL HABITATS 20
MARINE HABITATS 20
INTERTIDAL HABITATS 21
FRESHWATER HABITATS 21
APPENDIX 6: SPECIES 22
ENDANGERED AND THREATENED SPECIES 22
ENDEMIC FLORA 24
NATIVE FLORA 25
FRESHWATER ALGAE, MOSSES, LICHENS AND FUNGI 28
BIRD SPECIES 29
TERRESTRIAL INVERTEBRATES 29
FRESHWATER FISH AND INVERTEBRATE SPECIES 32
MARINE MAMMALS 36
OTHER MARINE SPECIES 38
APPENDIX 7: BIODIVERSITY THREATS 40
INVASIVE SPECIES (MARINE AND TERRESTRIAL) 40
FERAL GRAZING ANIMALS 44
CLIMATE CHANGE IMPACTS 45
APPENDIX 8: USEFUL CONTACTS 53
APPENDIX 9: COMPREHENSIVE BIBLIOGRAPHY 56

APPENDIX 1: BIODIVERSITY RELATED NATIONAL STRATEGIES AND LEGISLATION

National environmental strategies

- The Falkland Islands Environmental Charter (September 2001) that lays out eleven key commitments for FIG and UK Government. http://www.ukotcf.org/pdf/charters/falklands.pdf
- Falkland Islands Structure Plan (2001-16) http://www.epd.gov.fk/?page_id=131
- Falkland Islands Government Islands Plan (2009-14) http://www.falklands.gov.fk//The_Islands_Plan.html (Link)
- Falkland Islands Biodiversity Strategy (2008-18) http://www.epd.gov.fk/?page_id=166(Link)
- Falkland Islands State of the Environment Report 2008 http://www.epd.gov.fk/?page_id=166 (Link)
- Falkland Islands Government National Oil Spill Contingency Plan 2009

National legislation

1. Conservation of Wildlife and Nature Ordinance 1999 http://www.falklandsconservation.com/wildlife/law.html
2. Endangered Species Ordinance 2003
3. Environment Protection (Overseas Territories) (Amendment) Order 1997 http://www.bgs.ac.uk/falklands-oil/download/Marine_Env_Prot_Ord_95.pdf
4. Fisheries (Conservation and Management) Ordinance 2005
5. Grass Fires Ordinance 2002
6. Marine Farming Ordinance 2006
7. Marine Mammals Ordinance 1992 http://www.bgs.ac.uk/falklandsoil/download/Marine_Mammals_Ord_92.pdf
8. Merchant Shipping (Oil Pollution) Act 1971, Oil in Territorial Waters Ordinance & MARPOL
9. Offshore Minerals Ordinance 1994 http://www.bgs.ac.uk/falklands-oil/download/minsord.pdf
10. Plant Disease Regulation Controls 1944 and Customs Ordinance 20 03 – controls the import of plants and animals
11. Planning Ordinance 1991 – includes provisions for the preparation of development plans, the handling of planning applications and Environmental Impact Assessments

Conservation of Wildlife and Nature Ordinance 1999

http://www.falklandsconservation.com/wildlife/law.html

The Conservation of Wildlife and Nature Ordinance 1999 was drafted to replace the previous Wild Animals and Birds Protection Ordinance 1964. It contains provisions for the protection

of wild birds, wild animals and wild plants, introductions of new species and for the designation of National Nature Reserves.

It extends across all land and the territorial sea adjacent to the Falkland Islands up to a distance of twelve nautical miles to the baselines. However, the Fisheries (Conservation and Management) Ordinance 2005 also extends the Conservation of Wildlife and Nature Ordinance 1999 to the fishing waters beyond the territorial sea.

Introduction of New Species

It is an offence to release or allow to escape in to the wild, any animal or bird which is of a kind not ordinarily resident or a visitor to the Falkland Islands. It is also an offence to plant or otherwise cause to grow in the wild any plant not ordinarily found growing in the wild. There is no enforcement of seed mixtures used with in pasture improvement, although provision exists for the granting of licences.

National Nature Reserves

The ordinance provides for the designation of National Nature Reserves on any area of crown land, marine area or on privately owned land with the agreement of the owner. All Nature Reserve Orders or Sanctuary Orders previously designated under the Wildlife and Birds Protection Ordinance 1964 and the Nature Reserves Ordinance 1964 were re-designated as National Nature Reserves under the new ordinance.

There are eighteen National Nature Reserves (that is, 18 separate sites, islands or geographically connected and wholly owned group of islands (Table 3.2, Fig. 3.2). Eight NNRs are owned by FIG, nine are privately owned and one is owned by Falklands Conservation.

Under provisions in the Conservation of Wildlife and Nature Ordinance 1999, absolute, temporal or seasonal NNR-specific regulations can be made regarding access and use of the land and native wildlife. These regulations would be in addition to those set out for protected animals and birds.

Endangered Species Ordinance 2003

The Endangered Species Ordinance 2003 was enacted in order that the Falkland Islands upholds the Convention on International Trade in Endangered Species (CITES). The ordinance controls the import and export of species listed under Appendix I, II and III of CITES and gives management authority of CITES to FIG (and delegated to the Department of Customs and Immigration). Under a Memorandum of Understanding, FIG can request advice regarding the trade of CITES species from the Joint Nature Conservation Committee in UK.

The Falkland Islands have been party to the Convention since 1973, although there are only a few species normally resident in the Falkland Islands that are CITES listed. There may be a need to review the listing for some of the uncommon genera that are listed and traded in UK, such as *Olsynium* and *Calceolaria*. But as there are relatively few requests to export CITES-listed species from the Falkland Islands, risks to Falkland Isl and biodiversity from such trade is considered low at present, and the regulatory regime is adequate to address the issue.

There has been a moratorium in the Falkland Islands since 2001 preventing the export of penguins or eggs for collections or breeding programmes. This will only change if there is a significant change in the conservation status of any of the penguin species and collection/capture is considered necessary for the species survival.

Environment Protection (Overseas Territories) (Amendment) Order 1997
http://www.bgs.ac.uk/falklands-oil/download/Marine_Env_Prot_Ord_95.pdf

The Environment Protection (Overseas Territories) (Amendment) Order1997 enables the provision of the London Dumping Convention to be implemented in Falkland Island waters. It is very closely based on Part II of the UK Food and Environment Protection Act 1985. Under Section 3, a licence is required for deposits in Falkland Islands waters or Falkland Islands controlled waters whether in the sea or under the sea-bed. A licence is required for deposits from a range of sources including vessels, platforms and other man-made structures, but excluding pipelines. Scuttling of vessels and incineration at sea also require licensing. The ordinance contains details of the offences that may be committed for failure to obtain a licence or non-compliance with the terms of a licence.

The Deposits in the Sea (Exemptions) Order 1995 sets out 25 categories of material that are exempt from the requirement to obtain a licence under the ordinance. The categories include disposal of sewage or domestic waste originating on a vessel or platform, certain types of cooling and ballast water, drill cuttings or muds under certain circumstances and the incineration of hydrocarbons. There is little legislative control over ballast water management and hull cleanliness in the Falkland Islands.

It should be noted that several of the exemptions relating to hydrocarbon exploration and production are caught by other legislation, notably the Offshore Minerals Ordinance and the Merchant Shipping (Oil Pollution) Act.

Fisheries (Conservation and Management) Ordinance 2005
The Fisheries (Conservation and Management) Ordinance 2005 gives legislative effect to a major review and modernisation of fisheries policy including the introduction of property rights in the Falkland Islands fishery. The increased security through the allocation of property rights for up to 25 years is intended to encourage diversification and value adding activities in the Falkland Islands, together with investment in research and development.

Under the Fisheries (Conservation and Management) Ordinance 2005, sustainability means maintaining the potential of fisheries resources to meet the reasonably foreseeable needs of future generations; and avoiding, remedying, or mitigating adverse effects of fishing on the marine environment so far as it is reasonably practicable to do so.

The ordinance has the following environmental and information principles:

- associated or dependent species shall be maintained at or above a level that ensures their long term viability
- biological diversity of the marine environment shall be maintained
- habitats of particular significance for fisheries management shall be protected
- decisions shall be based on the best available information

- decision-makers shall consider any uncertainty in the information available in any case
- decision-makers shall be cautious when information is uncertain, unreliable, or inadequate

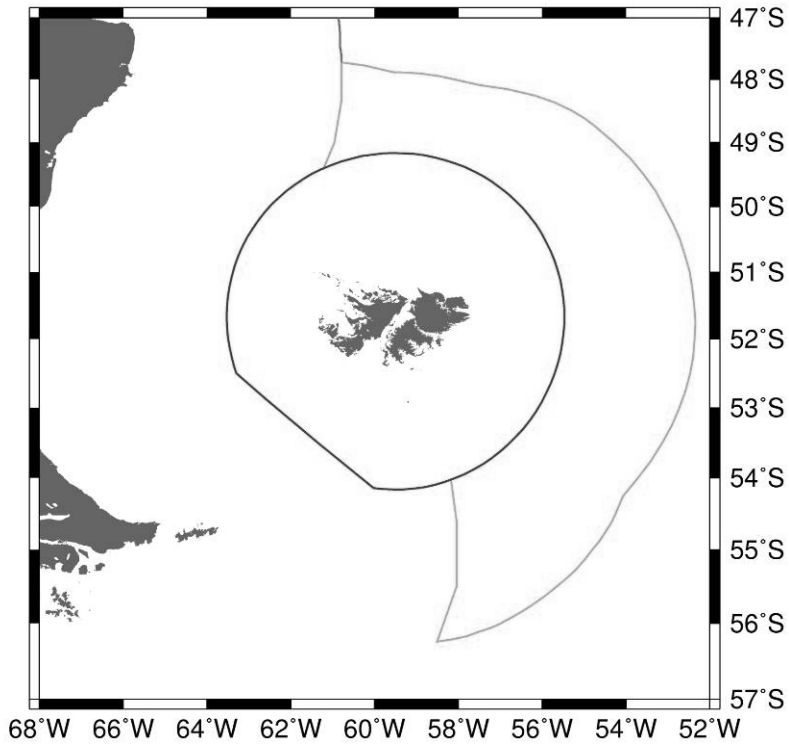
The ordinance has the following objectives:

(a) The implementation of efficient and cost-effective fisheries management on behalf of the Falkland Islands;
(b) Ensuring that the exploitation of fisheries resources and the carrying on of any related activities are conducted in a manner consistent with the need to have regard to the impact of fishing activities on non target species and the long term sustainability of the marine environment.
(c) Ensuring, through proper conservation and management measures, that the living resources of the fishing waters are protected from over-exploitation;
(d) Achieving the optimum utilisation of the living resources of the fishing waters; and
(e) Ensuring that conservation and management measures in the fishing waters and the high seas are in accordance with the obligations of the Falkland Islands under international agreements that deal with fish stocks.

The Director of Fisheries may under the ordinance set or vary any sustainability measure for one or more stocks, which may relate to one or more of the following:

- for stock managed by effort, any Total Allowable Effort in relation to that stock;
- for stock managed by quota, any Total Allowable Catch for that stock;
- the size, sex, or biological state of any fish of any stock that may be taken;
- the areas from which any fish of any stock may be taken;
- the fishing methods by which any fish of any stock may be taken or which may be used in any area;
- the period for which fishing may take place in any fishery.

The waters covered by the ordinance include the internal waters and territorial seas, FICZ and FOCZ. The Fisheries (Conservation and Management) Ordinance 2005 also extends the Conservation of Wildlife and Nature Ordinance 1999 to the fishing waters beyond the territorial sea.



The location of the FICZ and FOCZ relative to the Falkland Islands and continental South America.

Grass Fires Ordinance 2002

The Grass Fires Ordinance 2002 was enacted after considerable damage caused by a number of agricultural fires burnt out of control during the summer of 2001/02. Under the ordinance, fires may be started between 1 April and 15 September without permission but during the closed season, permission to burn areas on specific dates must be sought from the Department of Agriculture, which seeks guidance from the Fire Service. Dependent on the conditions of camp and weather, the FIG Fire Service does not usually permit burning after October/November.

Marine Farming Ordinance 2006

The Marine Farming Ordinance was created in 2006 to allow the licensing of farming of fish, crustaceans and molluscs. The ordinance has been enacted but is not yet in force. Under the ordinance, when making a decision about applications the Governor must consider the benefits to the Falklands Islands that the proposed fish farm will generate and the effects that the activities or infrastructure of the fish farm will have on the marine environment.

Marine Mammals Ordinance 1992

http://www.bgs.ac.uk/falklands-oil/download/Marine_Mammals_Ord_92.pdf

The Marine Mammals Ordinance 1992 protects all marine mammals (including whales, porpoises, dolphins, otters, seals, fur seals, sea lions and elephant seals), and makes it an offence to take, wound or kill any marine mammal in the Falkland Islands or in Falkland Islands waters with intent to do so, or to poison any marine mammal. Falkland Islands waters in this ordinance correspond to the boundaries of the Falkland Islands Outer

Conservation Zone (FOCZ).

It is an offence to use on land or at sea any explosive in such a manner as, in all the circumstances of the case, is likely to cause harm to any marine mammal. There are also restrictions on the use of nets, trawl lines and hooks specified by regulations.

Contravention of these controls may, for a body corporate, result in a fine not exceeding £250,000. Powers of arrest are placed in the hands of police officers and fishery protection officers, and vessels may be detained in port until the case has been heard and the fine paid. The ordinance also controls the import and export of any marine mammal or any part of a marine mammal living or dead.

Merchant Shipping (Oil Pollution) Act 1971, Oil in Territorial Waters Ordinance & MARPOL

The UK Merchant Shipping (Oil Pollution) Act 1971 effectively implemented, and slightly extended, the International Convention on Civil Liability for Oil Pollution Damage (CLC) in the UK. The Act regulated the responsibilities of ship owners for damage caused by oil pollution from their ships. It has not been adopted in the Falkland Islands but Parts I and II have been applied by virtue of the Falkland Islands Merchant Shipping (Registration of Ships) Regulations 2001. The Falkland Islands does not have any port state control, as the UK does under the Act.

The Oil in Territorial Waters Ordinance (1987) controls the discharge of oil and oily mixtures in the territorial (12 nm) waters of the Falkland Islands from factories and during unloading and loading of vessels. It is closely based on the UK Oil in Navigable Waters Act of 1958. Many defences are provided for in the legislation, and it is likely that the strict liability regime in the Offshore Minerals Ordinance 1994 will be used in preference to the 1960 legislation for any future prosecutions in relation to oil and gas exploration and production.

Declared harbours, i.e. Stanley Harbour, Port William, Berkeley Sound and Fox Bay, are controlled under the outdated Harbour Ordinance of 1902. Mare Harbour is a declared military port and has its own ordinance administered by an appointed Queen's Harbour Master.

The International Marine Organisation's convention on ballast water has not yet been adopted by the UK and the technology for ballast water cleaning is still being developed.

The adoption of the UK merchant shipping legislation has provided for tight control of pollution from ships registered in the Falkland Islands, following the International Convention for the Prevention of Pollution from Ships (MARPOL). Current Falkland Islands legislation obliges all Falkland Islands registered vessels to comply with MARPOL 73/78 regulations, with the exception of Annex IV (sewage from ships). It was specifically requested that this annex not be applied, as the Falkland Islands is unable to comply with the legislative requirement for adequate reception facilities (FIG Attorney General's Chambers, personal communication).

However, the regulations only apply to Falkland Islands registered ships and foreign flagged vessels operating within the territorial limits (12 nm) of the Falkland Islands. In the UK, the

Merchant Shipping (Prevention of Pollution) (Limits) Regulations extend pollution regulations out to the 200 nautical mile limits and there is no reason why the Falklands should not do likewise apart from the political situation. Currently, where foreign flagged vessels working beyond 12 miles are in breach of MARPOL, FIG, through the FCO, may request that the flagging state make a prosecution in that country.

Offshore Minerals Ordinance 1994
http://www.bgs.ac.uk/falklands-oil/download/minsord.pdf

This ordinance enables seismic survey work and exploratory drilling under specific licence conditions, including provision for a mandatory Environmental Impact Assessment.

In the Offshore Minerals ordinance 1994, sections 14, 15 and 16 are the key sections of the ordinance relating to liability for damage to the environment. Sections 47 - 60 relate to abandonment of offshore structures, and sections 64 - 67 deal with requirements for environmental impact assessments to accompany applications for licences. Section 14 imposes on an operator strict liability (i.e. liability in law without proof of negligence on his part being necessary so as to establish his liability) for loss or damage in certain defined circumstances. Damage to the environment is defined as meaning any impact on the living or non-living components of the environment of the controlled waters or of the Falkland Islands or the ecosystems of the controlled waters or of the Falkland Islands.

Under the Offshore Minerals Ordinance 1994, marine mammals surveys should be conducted prior to seismic surveys and require that there should be a slow build up of power.

Rather than relying on detailed statutory controls over discharges, the present controls are broadly based on the regime of "strict liability" for environmental damage. The onus is on oil companies/licence applicants to furnish details of plans for environmental protection and their own corporate environmental policy as part of the application procedure. During appraisal of applications, it is expected that guidelines such as those of the United Kingdom Offshore Operators Association (UKOOA) for exploration operations in near-shore and sensitive areas will be used as a guide to determine the environmental commitment of applicants.

- **Oil pollution** – is managed by the Environment Protection (Overseas Territories) (Amendment) Order 1997, the Merchant Shipping (Oil Pollution) Act 1971, Merchant Shipping Act 1995 and Oil in Territorial Waters Ordinance 1987.

A number of ordinances have been enacted in the Falkland Islands to protect the land and seas around the archipelago from at-sea activities and vessels within the 200 nautical mile limit. These include the Offshore Minerals Ordinance 1994 (as discussed above), the Environment Protection (Overseas Territories) (Amendment) Order1997, Merchant Shipping (Oil Pollution) Act 1971, Merchant Shipping Act 1995 and Oil in Territorial Waters Ordinance 1987.

Plant Disease Regulation Controls 1944 and Customs Ordinance 2003 – controls the import of plants and animals

The import of plants into the Falkland Islands is controlled by the Plant Disease Regulation Ordinance 1944 (plus various amendments), which allows the entry of packaged seeds and wood but all other plants require an import licence, including a phyto-sanitary certificate that declares the product free of soil, insects and diseases. This legislation is implemented by the Department of Agriculture and it is difficult in some cases to determine the biosecurity threat of some plants, particularly ornamental species.

The import of items of animal origin into the Falkland Islands is controlled under the Customs Ordinance 2003, which has proclamations under Section 143 for live animals, eggs, semen of animals and shearing equipment. Any applications to import finfish for aquaculture (e.g. salmon, cod) or ornamental fish for tanks and ponds (e.g. coy carp, goldfish) must meet import regulations which may include the need to undertake an environment impact assessment.

Planning Ordinance 1991 – includes provisions for the preparation of development plans, the handling of planning applications and Environmental Impact Assessments

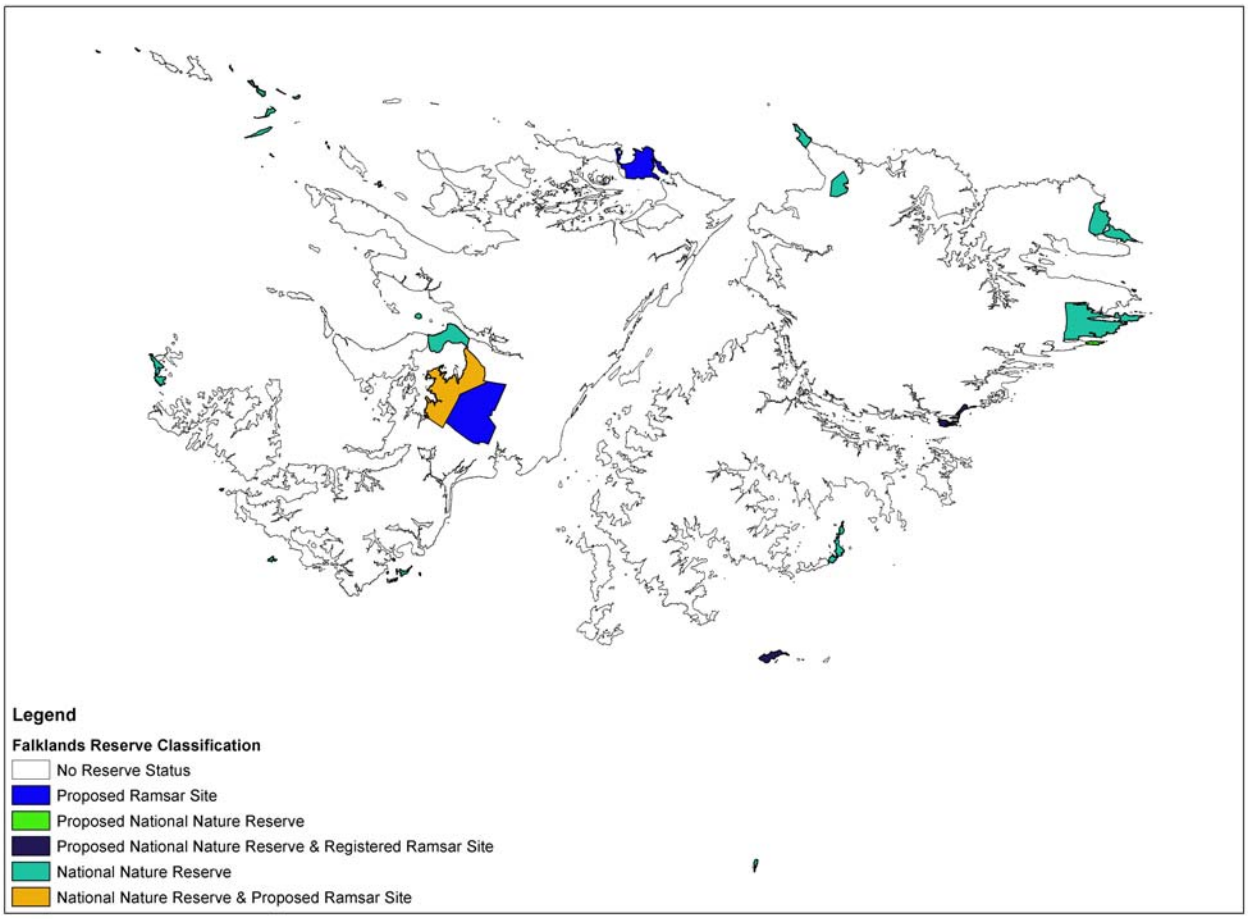
The Planning Ordinance 1991 introduced a simplified UK system of planning control in the Falkland Islands. The ordinance includes provisions for the preparation of development plans and for the handling of planning applications by the FIG Environmental Planning Officer. The Planning and Building Committee make decisions on all applications and there is a right of appeal for applicants to the Executive Council. Unlike the equivalent UK legislation, planning control extends to the territorial sea of the Falkland Islands, i.e. up to 12 miles from the coastline, under the Falkland Islands (Territorial Sea) Order 1989.

Under section 33 of the ordinance, there is provision for the Governor to make regulations for the environmental effects of specified developments to be considered before planning permission is given. No such regulations have yet been produced, though the Mining Ordinances contain some provision for environmental impact assessments to be carried out for minerals developments. FIG is giving urgent priority to the drafting of such regulations.

APPENDIX 2: PR OTECTED AREAS AND BIODIVERSITY/HABITAT SITES OF INTERNATIONAL BIODIVERSITY IMPORTANCE

National Protected Areas

Map of protected areas and areas proposed to be protected (Falkland Islands Structure Plan 2001-16)



Date	Order	Designated Area	Landowner	Management plan
1973	**Jason Islands**	Flat Jason 51º 06'S 60º 53'W (Designated separately, 1966) Elephant Jason 51º 09'S 60º 51'W South Jason 51º 12'S 60º 53'W North Fur Is. 51º 08'S 60º 44'W South Fur Is. 51º 15'S 60º 51'W Jason East Cay 51º 00'S 61º 18'W Jason West Cay 50º 58'S 61º 25'W The Fridays 51º 03'S 60º 58'W	FIG	None

Date	Order	Designated Area	Landowner	Management plan
		White Rock 51º 17'S 60º 53'W Seal Rocks 51º 07'S 60º 48'W		
1964	**The Twins Islands**	51º 15'S 60º 38'W Northwest of Carcass Island	Falklands Conservation	None
1964	**Low Island**	51º 19'S 60º 27'W Southeast of Carcass Island	Private	None
1966	**Middle Island**	51º 38'S 60º 20'W King George Bay, West Falkland	FIG	None
2009	**Chartres Horse Paddock**	51º42'S 60º 03' W East of Chartres Farm Settlement , West Falkland	Private	None
1998	**Narrows**	51º 41'S 60º 19'W Narrows Farm, West Falkland	Private	None
1998	**East Bay**	51º 48'S 60º 13'W East Bay Farm, West Falkland	Private	None
1993	**New Island South**	51º 43'S 61º 18'W	Private	Produced by NICT 2007
1978	**Sea Dog Island***	Sea Dog Island 52 00'S 61 06'W	FIG	None
1969	**Bird Island**	Bird Island 52º 10'S 60º 54'W	FIG	None
1978	**Arch Islands***	Big Arch Island 52 13'S 60 27'W Natural Arch Clump Island Tussac Island Pyramid Rock Last Rock and Albemarle Rock	FIG	None
1964	**Beauchene Island**	52º 54'S 59º 11'W	FIG	In preparation
2011	**Sea Lion Island**	52º 25'S 59º 30'W	Private	Produced by FC. Adopted by FIG 2011
1970	**Bleaker Island**	52º 18'S 58º 51'W Bleaker Island north of Long Gulch	Private	None
1973	**Stanley Common**	51º 43'S 57º 49'W	FIG	Adopted for: Murrell River

Date	Order	Designated Area	Landowner	Management plan
				2006 Gypsy Cove 2007 Yorke Bay Pond 2007
1964	**Kidney & Cochon Islands**	Cochon Island 51º 36'S 57º 47'W Kidney Island 51º 38'S 57º 45'W	FIG	In preparation
1968	**Volunteer & Cow Bay**	51º 29'S 57º 50'W East Falkland	Private	None
1968	**Cape Dolphin**	51º 15'S 58º 51'W	Private	None
1996	**Moss Side**	51º 23'S 58º 49'W, Pond and sand-grass flats behind Elephant Beach	Private	None

* Sea Dog and Arch Islands designated jointly under the same order.

Internationally Important Bird Areas (IBAs) (Not designated)	Internationally Important Plant Areas (IPAs) (Not designated)	Ramsar Site (designated)
Beauchene Island		
Beaver Island Group		
Bertha's Beach (East Falklands)		Bertha's Beach (East Falklands)
Bird Island		
	Big Pond, Cerritos, East Falklands	
Bleaker Island Group		
Bull Point (East Falklands)	Bull Point (East Falklands)	
	Cape Pembroke, East Falklands	
	Chartres Horse Paddock	
Elephant Cays Group		
	Hawk's Nest Ponds & Little Chartres Gully	
	Hill Cove Mountains	

Hope Harbour (West Falklands)		
Hummock Island Group		
Jason Islands Group		
Keppel Island		
Kidney Island Group		
Lively Island Group		
	Long Mountain, East Bay, West Falklands	
New Island Group		
Passage Islands Group		
Pebble Island Group	Pebble Island Group	
	Port Stephens and Albemarle Coast	
Saunders Island	Saunders Island	
Sea Lion Island Group	Sea Lion Island Group	Sea Lion Island
Seal Bay (East Falkland)		
Speedwell Island Group		
Volunteer Point (East Falklands)		
	West Lagoons Pond, Hill Cove	
West Point Island Group		

APPENDIX 3: RESEARCH PRIORITIES

The lack of baseline data on most species and habitats in the Falkland Islands presents the biggest requirement in terms of research needs and influences all research objectives. The potential impact of climate change and introduced species also present major research needs.

Seabird and sea mammal ecology studies

Many of our seabird, whale, dolphin and seal species in the Falkland Islands require species Action plans as their populations are declining because of threatening processes at breeding and/or foraging sites. However, identifying conservation and management actions is difficult because our knowledge of many of these species is relatively poor. We have some snapshot studies, but few long-term studies of large numbers of individuals to create sufficiently robust datasets for the correct conservation actions to be identifies.

Shallow marine environment

Despite an enormous area of the Falkland Islands territory being shallow marine waters, little is known about this habitat and there are few conservation measures in place to protect it. Threats and pressures to the shallow marine environment have recently begun to mount with a number of activities planned for the future, including inshore fisheries, aquaculture, oil, inshore shipping, as well as whale watching and dive tourism. The coastal environment is an important habitat for birds, some which are endemic, as well as being a nursery grounds for a number of commercial fish and squid species. The marine habitats, invertebrates and seaweeds have not been scientifically surveyed and documented in both the shallow and offshore marine environment and this data is necessary in order to inform environmental impact assessments for new developments and to plan for marine protected areas. There is considerable interest in the shallow, marine environment by local biologists and marine enthusiasts but there is little funding available at a scale at which research is desperately needed.

Analysis and interpretation of existing data

The Falkland Islands has some excellent survey data for many species but not always in an interpreted form that allows it to be easily fed into Species and Habitat Action Plans and allow the identification of Key Biodiversity Areas. The terrestrial and marine datasets need to analysed, particularly spatially, in order to feed into site management planning and to prioritise the areas where the best outputs will be possible for the money, time and effort spent. Many local scientists working in the Falkland Islands lack high level analysis skills, and there is no island-wide approach to data storage and geographical information system computer programmes by FIG departments and environmental organisations.

Biodiversity Strategy Implementation

Implementation of the Biodiversity Strategy for the Falkland Islands is required, including Species and Habitat Action Plans and Site Management Plans with integration of sustainable development into government departments and planning. With the Biodiversity Strategy in place the organisation of a research priorities workshop is underway. Requirements include; development of site management plans; development of Geo-

diversity conservation; 5-year review for "State of Environment" type report; 5-year review of Biodiversity Strategy.

Biodiversity monitoring programme

The continuation and expansion of a robust biodiversity monitoring programme, incorporating the full breadth of biodiversity components including habitats, plants, seabirds, invertebrates, invasive species etc is needed. This will include monitoring components within the Biodiversity Strategy, SAPs and HAPs: Monitoring, survey and research as defined within a monitoring strategy and within SAPs and HAPs.

Inshore Marine Survey and informed zonification of the marine environment

Little is known of the marine inshore benthic and habitats and coastal cetaceans around the Falkland Islands. Although, more is known of at-sea utilisation of Falkland waters by seabirds and marine mammals, there has been no collation of this data and no attempt has been made to model at sea sightings of seabirds and mammals, seabird satellite data and fisheries data to zone areas at sea either as marine Important Bird Areas (IBAs) or Marine Protected Areas (MPAs). This will be a stepwise process to first collate data sources, identify data gaps, collect data (particularly for marine benthic and cetaceans), model data and develop stakeholder consultation leading up through IBAs and NNR to MPAs: Inshore Surveys of marine habitat and species including boat survey, dive surveys and cetacean studies; Seaward extension of selected IBAs and NNRs; Modelling of marine data to inform designation of MPAs.

Conservation and management regime for Illex squid

Introduction of a regional fisheries management organisation in the South West Atlantic for conservation of Illex squid (and other species) on the high seas: Convene a meeting of interested parties; Undertake a relevant scientific research programme to elucidate Illex population dynamics with a view to designing appropriate conservation matters.

Research and stock assessment on commercially exploited fish and squid species

To design appropriate conservation measures and targets to provide long term sustainable exploitation, including taking account of other ecosystem relationships: Stock assessment modelling and mode development; Research programmes including surveys.

Habitat restoration and Invasive species control and removal

Good progress has been made in surveying in vasive species and conducting small island eradications – notably of rats and foxes. There is a need to increase the scale of eradication projects to clear larger islands of rats. Invasive plant control is urgently required concerning several key species notably on specific parts of East Falkland. Invasive Plant Clearance; Native Plant Restoration; Rat Eradication; Fox eradication (trail/feasibility study).

Rockhopper Research

The rockhopper penguin is the species in most serious decline in the Falklands but little is known of the causes. The species has not received higher prioritisation as it is probable that the cause is due to long-term oceanographic changes. This can only be tackled at a global scale through climate change initiatives and therefore at a local level there is little that can be practically done to aid conservation. To an extent even if the causes are known and they are oceanographic then we can do little practically and hence resources have been targeted

at where they can make the most difference, for example at black-browed albatross and fisheries interaction where the cause of declines is known and a difference can be made: Regional workshop to pool resources and define and prioritise research; Develop a regional research programme; Initiate a regional research Programme with FI component.

APPENDIX 4: INSTITUTIONAL ARRANGEMENTS

Political framework

The Falkland Islands are an Overseas Territory of the United Kingdom, executive authority being vested in Her Majesty the Queen and exercised by the Governor on her behalf, with the advice and assistance of the Executive and Legislative Councils. The UK's relationship with its Overseas Territories is defined in the 1999 White Paper "Partnership for Progress and Prosperity". The UK is committed to encouraging the Overseas Territories to have the greatest possible control over their own affairs, but retains international responsibilities for the territories, including the obligation to ensure that international law is respected.

The Falkland Islands are self-sufficient in all areas except for defence and external relations, which remain the responsibility of the British Government. The right of self-determination and self-government has been extended to the Falkland Islands and in internal matters the Governor, as the Queen's representative, would not over- rule the decision of the elected councillors.

The present Falkland Islands Constitution came into force in 1985. The constitution determines the form of democracy and the division into Legislative and Executive Councils of the elected councillors. Legislative Councillors, five from Stanley and three from camp, are elected every four years. Each year, the Legislative Councillors elect three of their number to stand as members on the Executive Council. The Governor is advised by Executive Council, over which he presides and which is composed of the three elected councillors and two ex-officio members, the Chief Executive and Financial Secretary. In addition, the Commander British Forces Falkland Islands and the Attorney General may attend Executive Council meetings and speak on any matter. Executive Council meetings are held monthly.

Legislative Council meets approximately every two months and until 2002, it was chaired by the Governor, but since then, it has been chaired by an independent speaker. The Legislative Council is empowered to pass laws for the maintenance of Law, Order, Legislation and the Government of the Islands, subject to the approval of the Queen acting through the Secretary of State for Foreign Affairs.

Environmental organisations

The Environmental Committee advises Executive Council on environmental issues. This committee meets bi-monthly and is comprised of two Councillors, local conservation groups and representatives of the key industries. It provides advice on the implementation of local environmental legislation, international environmental conventions, the issuing of research permits, and drafting and implementation of local environment strategies, action plans and site management plans.

FIG's Environmental Planning Department is tasked with environmental issues, planning and building control and consists of an Environmental Planning Officer, an Environmental Officer, a Building Control Officer and a Clerk. FIG also provides core costs to Falklands Conservation, a non-governmental environmental organisation, in order that the Falkland Islands have an independent environmental advocacy group, and so that Falklands Conservation can undertake environmental monitoring and education, and has the capacity

to seek additional funds.

Additionally to Falklands Conservation, there are also a number of local and international non-governmental conservation and research organisations that work in the Falkland Islands, including New Island Conservation Trust, Falkland Islands Trust, Beaver Island Land Care Group, Antarctic Research Trust and SubAntarctic Foundation Ecosystems Research. Many non-governmental organisations in southern South America are part of the 'Sea and Sky' project, which is a science-based programme for the conservation of the Patagonian seascape. Falklands Conservation will contribute data from the Falkland Islands to the project.

The Falkland Islands receive support and advice on wildlife and environmental policies from the Foreign Commonwealth Office (FCO), Joint Nature Conservation Committee (JNCC), Department for Environment, Food and Rural Affairs (Defra), Royal Botanic Gardens Kew and BirdLife International, the international arm of RSPB. The latter organisation's input to the Falkland Islands is channelled through the RSPB, whose support for Falklands environmental issues is given through Falklands Conservation.

In addition, the Falkland Islands receive input from a variety of overseas research institutes, including Instituto Superior de Psicologia Aplicada (Portugal), Max Planck Institute for Ornithology (Germany), University of Bath (UK), Hawk Mountain Acopian Center for Conservation Learning (USA), for a high proportion of its environmental monitoring and research.

Environmental funding

FIG provides an annual 'Environmental Studies Budget' of around £40,000 annually to the Environmental Planning Department for environmental research and management, which is allocated to landowners, environmental organisations, FIG departments and scientists by the Environmental Committee. Local funding is also sought for environmental work through community-based fundraising, local businesses and charitable trusts.

However, a greater source of funding is obtained internationally, through international scientists sourcing funds themselves and from the UK Overseas Territories Environment Programme (OTEP), which is sourced jointly by the FCO and Department for International Development and the Darwin Initiative, which is funded by Defra. There are some funding opportunities for UK Overseas Territories with the European Commission.

It was recently estimated that to meet all biodiversity priorities in the Falkland Islands approximately £716,000 per year would be needed, with the largest costs for survey, research and monitoring work, particularly in the implementing species action plans (GHK 2007).

APPENDIX 5: HABITAT TYPES

TERRESTRIAL HABITATS

The Falkland Islands Broad Habitat Classification (Broughton 2000a) sets out a framework of 19 habitat types, which provide a comprehensive, exclusive, structured and measurable set of vegetation groupings.

1. Tussac	11. Bogs
2. Improved grassland	12. Standing open water
3. Greens and neutral grassland	13. Rivers and streams
4. Acid grassland	14. Inland rock
5. Dwarf shrub heath	15. Built up areas and gardens
6. Montane habitats	16. Arable and horticulture
7. Fern beds	17. Sand dunes
8. Scrub	18. Maritime rock, shingle, cliff and slope
9. Coniferous woodland	19. Littoral sediments
10. Fen, marsh and swamp	

Habitats listed for comprehensive action plans in the Biodiversity Strategy:

Mainland tussac
Whitegrass-fachine acid grassland
Fachine scrub
Boxwood scrub

MARINE HABITATS

There is limited information on the intertidal and shallow marine environment (down to 30 m water depth) in the Falkland Islands. Within the main coastal embayments and inlets of East Falkland (for example the Bay of Harbours, Adventure Sound, and Berkeley Sound) and around the chain of north-westerly islands from Pebble Island to the Jason Islands, water depths are typically 20-40 m (Fig. 1.2). The most steeply shelving inshore seabed profile is to the south-west of the archipelago between New Island and Cape Meredith and directly southwest of Beaver Island, the 100 m isobath is only one km from the coast.

Biogeographically, the marine flora of The Falkland Islands have features in common with Antarctica, other sub-Antarctic Islands and the continents of the southern hemisphere, particularly South America. The rich marine flora of Patagonia, Tierra del Fuego and the Falkland Islands appears to form a particular biogeographical grouping (John *et al*. 1994).

A number of studies have been or are currently being undertaken to fill specific knowledge gaps of this important environment.

These studies include:

- micro-algae, coliform bacteria and biotoxin monitoring
- seaweeds

- inter-tidal habitat surveys
- shallow marine invertebrates

INTERTIDAL HABITATS

There are twice daily tides around the islands, ranging from 0.3m to 3.5m above local datum. Six intertidal habitats were recognised during the baseline Falkland Islands intertidal survey work of 1994 - 1996 (Bingham 1995, 1996).

1. Boulder shore
2. Stony shore
3. Sandy shore
4. Muddy shore
5. Rocky shore
6. Cliff shore

FRESHWATER HABITATS

Analysis of the 255 10-km grid squares containing land across the Falkland Islands shows that only 9% are completely inland (Woods and Woods 1997). A variety of freshwater bodies occur in the Falkland Islands, including coastal barrier ponds, oxbow ponds, glacial tarns and erosion hollows, and slump features in peat. Inland fresh water bodies are especially numerous on peaty lowland areas.

Most of the freshwater bodies in the Falkland Islands are shallow, less than 2 m deep and wind-induced sediment re-suspension is apparent in most standing bodies of water. This often leads to high turbidity and extreme pH values, which effect photosynthesis and planktonic and benthic community development (Noon 2002). Nutrient-rich lakes with dense algal growth are rare, occurring only where there is drainage from seabird colonies or geese grazing areas (Clark *et al*. 1994).

Deficiency of nutrients and presence of humic acids derived from peat means that most lakes and rivers have a low pH level (4.0 – 5.0), although some are extremely acidic (3.1) (Clarke *et al*. 1994). Freshwater is high in sodium and chloride, which have a marine origin (Noon 2002).

Many sites lack active inflows and outflows, and are fed through ground water replenishment with wind evaporation possibly accounting for significant moisture loss. Mount Adam Tarn (West Falkland) and Black Tarn (East Falkland) are probably the deepest freshwater bodies, and represent glacial features distinct from most other water bodies.

APPENDIX 6: SPECIES

This appendix includes lists and detailed information on:

ENDANGERED AND THREATENED SPECIES

CITES listed species found in the Falkland Islands

Common name	Scientific name	CITES Appendix	Notes and comments on species status
Birds			
Cattle egret	*Bulbuculus ibis*	III	Regular non-breeding vagrant, often in large numbers
Black-necked swan	*Cygnus melancoyphus*	II	Widespread breeding bird
Red-backed hawk	*Buteo polyosoma*	II	Widespread breeding species
Peregrine falcon	*Falco peregrinus cassini*	I	Widespread but uncommon breeding species
Striated caracara	*Phalcoboenus australis*	II	Uncommon breeding species. FI is main br eeding locality for this species (~500 breeding pairs)
Southern caracara	*Caracara plancus*	II	Widespread but uncommon breeding species
Barn owl	*Tyto alba*	II	Rare breeding species
Short-eared owl	*Asio flammeus*	II	Rare breeding species
Mammals			
Arnoux's beaked whale	*Berardius arnuxii*	I	No information on status available in FI waters, but almost certainly rare as stranding
Southern bottlenose whale	*Hyperoodon planiformes*	I	No information on status available in FI waters, but almost certainly rare as stranding
Hector's beaked whale	*Mesoplodon hectori*	II	No information on status available in FI waters, but almost certainly rare as stranding
Gray's beaked whale	*Mesoplodon grayi*	II	No information on status available in FI waters, but almost certainly rare as stranding
Strap-tooth beaked whale	*Mesoplodon layardii*	II	No information on status available in FI waters, but almost certainly rare as stranding
Cuvier's beaked whale	*Ziphius cavirostris*	II	No information on status available in FI waters, but almost certainly rare as stranding
Sperm whale	*Physeter catodon*	I	Very occasional stranding, sometimes many individuals
Commerson's dolphin	*Cephalorhynchus commersonii*	II	Common in inshore areas but rarely strands
Long finned pilot whale	*Globiocephala melas*	II	Occasionally strands in large numbers. App ears to be common offshore.
Peale's dolphin	*Lagenorhynchus australis*	II	Common in inshore areas but rarely strands
Hourglass dolphin	*Lagenorhynchus cruciger*	II	Very rare. Only two records of strandings.
Killer whale	*Orcinus orca*	I	Occasionally seen offshore. Not known to strand on FI beaches.

Common name	Scientific name	CITES Appendix	Notes and comments on species status
Southern minke whale	*Balaenoptera bonerensis*	I	Rare offshore and very rarely strands anywhere
Fin whale	*Balaenoptera physalus*	I	Rare offshore and very rarely strands anywhere
Sei whale	*Balaenoptera borealis*	I	Rare offshore and very rarely strands anywhere
Blue whale	*Balaenoptera musculus*	I	Rare offshore and very rarely strands anywhere
Humpback whale	*Megaptera novaeangliae*	I	Rare offshore and very rarely strands anywhere
Southern right whale	*Eubalaena australis*	I	Rare offshore and very rarely strands anywhere
Sea otter	*Lontra feline*	I	Introduced. Status unclear though, may be extinct.
South American fur seal	*Arctocephalus australis*	II	Scattered localities, numbers not great
Southern elephant seal	*Mirounga leonina*	II	Common breeding species
Argentine grey fox	*Pseudalopex griseus*	II	Introduced to six islands – now limited to four islands after eradications on two islands
Guanaco	*Lama guanicoe*	II	One introduced population
Fish & Invertebrates			
Basking shark	*Cetorhinus maximus*	III	GB only. Status uncertain in FI waters.
Black or wire corals	*Bathypathes patula*	II	No information on status available in FI waters.
Scleractinian (hard) coral	*Caryophyllia capensis*	II	No information on status available in FI waters.
Scleractinian (hard) coral	*Sphenotrochus gardineri*	II	No information on status available in FI waters.
Scleractinian (hard) coral	*Flabellum curvatum*	II	No information on status available in FI waters.
Scleractinian (hard) coral	*Flabellum thouarsii*	II	No information on status available in FI waters.
Scleractinian (hard) coral	*Balanophyllia malouinensis*	II	No information on status available in FI waters.
Hydrocorals (lace corals)	*Errina antarctica*	II	No information on status available in FI waters.
Hydrocorals (lace corals)	*Errinopsis reticulum*	II	No information on status available in FI waters.
Hydrocorals (lace corals)	*Sporadopora dichotoma*	II	No information on status available in FI waters.
Plants			
Dog orchid	*Codonorchis lessonii*	II	Widespread in whitegrass and diddle-dee camp
Pale yellow orchid	*Gavilea australis*	II	Rare but locally very numerous
Yellow orchid	*Gavilea littoralis*	II	Widespread but rare to scarce
Gaudichaud's orchid	*Chloraea gaudichaudii*	II	Widespread but scarce

ENDEMIC FLORA

Thirteen species are currently considered endemic to the Falkland Islands:

Latin name:	Common name:
Calceolaria fothergilli	Lady's slipper
Chevreulia lycopodioides	Clubmoss cudweed
Erigeron incertus	Hairy daisy
Gamochaeta antarctica	Antarctic cudweed
Hamadryas argentea	Silvery buttercup
Leucheria suaveolens	Vanilla daisy
Nassauvia gaudichaudii	Coastal naussauvia
Nassauvia serpens	Snake plant
Nastanthus falklandicus	False-plantain
Phlebolium maclovianum	Rock-cress
Plantago moorei	Moore’s plantain
Senecio littoralis	Woolly ragwort
Senecio vaginatus	Smooth ragwort

NATIVE FLORA

Plants listed or scheduled to be listed under the Con servation of Wildlife and Nature Ordinance, the National Red Data List for Fa lklands flora (Broughton and McAdam 2002a), IUCN 2001 and CITES.

Scientific name	English name	FI Ordinance	FI Red list	IUCN 2001	CITES
Adiantum chilense	Maidenhair fern	Protected	Endangered		
Arachnitis quetrihuensis	Spider flower	To be protected	Vulnerable		
Blechnum cordatum	Chilean tall fern	To be protected	Vulnerable		
Botrychium dusenii	Dusen's moonwort	Protected	Vulnerable		
*Calandrinia feltonii**	Felton’s flower	Protected	Critically endangered		
Calceolaria biflora	Yellow lady's slipper	Protected	Critically endangered		
Chloraea gaudichaudii	Gaudichaud's orchid	Protected	Not listed		II
Codonorchis lessonii	Dog orchid	Not protected	Not listed		II
Draba magellanica	Fuegian whitlowgrass	To be protected	Critically endangered		
Erigeron incertus	Hairy daisy	Protected	Vulnerable	Vulnerable	
Gamochaeta antarctica	Antarctic cudweed	To be protected	Endangered	Endangered	
Gavilea australis	Pale yellow orchid	Protected	Vulnerable		II
Gavilea littoralis	Yellow orchid	Protected	Not listed		II
Hieraceum patagonicum	Patagonian hawkweed	Protected	Endangered		
Huperzia fuegiana	Fir clubmoss	Protected	Endangered		
Limosella australis	Mudwort	To be protected	Vulnerable		
Nastanthus	False-plantain	Protected	Vulnerable	Vulnerable	

Scientific name	English name	FI Ordinance	FI Red list	IUCN 2001	CITES
falklandicus					
Ophioglossum crotalophoroides	Adder's tongue	Protected	Vulnerable		
Phlebolobium maclovianum	Rock-cress	Protected	Vulnerable	Vulnerable	
Plantago moorei	Moore's plantain	To be protected	Vulnerable	Vulnerable	
Potamogeton linguatus	Pondweed	Protected	Near threatened		
Rumohra adiantiformis	Leathery shield-fern	Protected	Endangered		
Ruppia filofolia	Tasselweed	To be protected	Vulnerable		
Saxifraga magellanica	Saxifrage	Protected	Critically endangered		
*Schizaea fistulosa***		Protected	Not listed		
Scutellaria nummulariifolia	Skullcap	To be protected	Critically endangered		
Sisyrinchium chilense	Yellow pale maiden	Protected	Not listed		
Suaeda argentinensis	Shrubby seablite	Protected	Critically endangered		
*Viola maculata****	Common violet	Protected	Not listed		
Viola magellanica	Fuegian violet	To be protected	Vulnerable		
Hamadryas argentea	Silvery buttercup	Not protected	Near threatened	Near threatened	
Schoenoplectus californicus	California club-rush	Not protected	Near threatened		
Acaena antarctica	Antarctic prickly-burr	Not protected	Data deficient		
Alopecurus magellanicus	Fuegian foxtail	Not protected	Data deficient		
Carex aematorrhyncha	Blood-beak sedge	Not protected	Data deficient		

Scientific name	English name	FI Ordinance	FI Red list	IUCN 2001	CITES
Carex barrosii	Barros sedge	Not protected	Data deficient		
Carex magellanica	Fuegian sedge	Not protected	Data deficient		
Grammitis poeppigiana	Strap-fern	Not protected	Data deficient		
Koeleria permollis	Berg's hair-grass	Not protected	Data deficient		
Chevreulia lycopodioides	Clubmoss cudweed	Not protected	Least concern	Least concern	
Leucheria suaveolens	Vanilla daisy	Not protected	Least concern	Least concern	
Nassauvia gaudichaudii	Coastal nassauvia	Not protected	Least concern	Least concern	
Nassauvia serpens	Snakeplant	Not protected	Least concern	Least concern	
Senecio littoralis	Woolly ragwort	Not protected	Least concern	Least concern	
Senecio vaginatus	Smooth ragwort	Not protected	Least concern	Least concern	

* *Calandrinia feltonii* has recently been identified as not being an endemic species but has not yet been de-listed. However, the currently undescribed *Calandrinia* sp. may require listing.

** *Schizaea fistulosa* is no longer believed to ha ve been part of the flora (Broughton 2000a).

*** *Viola maculata* is given protected status not be cause it is rare or endangered, but because it is thought to be the larval food plant of the Queen-of-the-Falklands Fritillary (*Issoria cytheris*) a nationally rare butterfly and protected wild animal.

Non-vascular plants

In contrast to the vascular plant families, the non-vascular flora (freshwater algae, liverworts, lichens and mosses), as well as th e mycoflora of the Falkland Islands are poorly studied. Information on other lower plants comprises predominantly recorded species lists with limited data on abundance and distribution.

FRESHWATER ALGAE, MOSSES, LICHENS AND FUNGI

Studies of freshwater algae were completed as part of the 'Falkland Islands - Biodiversity Research in Lakes Project' (FI-BRIL) conducted by University College London Environmental Change Research Centre during 2001 - 2003. Diatom flora was investigated in 28 lake, pond and stream habitats, with eleven new taxa described, and approximately one third of taxa having a restricted regional distribution (Flower 2005).

One stonewort (Charophyte) species, *Nitella opaca* (dark stonewort), is known from ponds at two locations. It is a freshwater alga, despite its relatively large, rigid and upwards-growing appearance.

Bryophyte and lichen collection occurred in the Falkland Islands particularly in the summer of 1967-1968 by H. Imshaug and co-workers of Michigan State University, and also by Galloway (1988) and Dalby (2000). The Imshaug expedition collected almost 3,000 lichens and 1,779 bryophytes and from these, Imshaug estimated the total lichen flora to consist of about 235 species, of which he identified approximately 170 known species (A. Fryday, personal communication).

Since 2000, A. Fryday at the Michigan State University Herbarium has been reappraising Imshaug's lichen collections and has described several new species, determined that many are un-described species, and reported many species as new to the Falkland Islands. Other workers have also described several new lichen species and a new genus of bryophilous fungi from Imshaug's collections. Details of all of Imshaug's lichen collections are available on-line at the Michigan State University Herbarium web-site http://www.herbarium.msu.edu/

Around 168 species and subspecies of moss and liverwort across 53 genera are recorded from the Falkland Island, with 43 species possibly being endemic (Greene 1986; Ochyra and Broughton 2004). However, there has been limited survey work in the Falkland Islands and in adjacent territories (McDowall 2005). All but six of the non-endemic mosses are also present in Patagonia and a number are also widespread across the cool temperate zone in the northern and southern hemisphere. There are 131 recorded species of liverworts, including three endemic species, almost all exclusively from the southern hemisphere (Engel 1990).

Over 337 species of macro- and micro- non lichenised fungi, including ten endemics, are listed for the Falkland Islands, although survey effort has been limited in effort and extent (Watling 2000, 2002). It has been estimated that to obtain an almost complete record of fungi species present could take between 5 – 10 years. Using experience and studies from elsewhere, Watling (2000) estimated that there could be 500 species of larger fungi and 1,850 total fungi species in the Falkland Islands. Many of the recorded fungi species are familiar European and North American species and have probably been introduced to the Falkland Islands. Additionally some have been introduced with exotic plantings such as the mycorrhizal associations with conifer tree roots and false truffles with eucalyptus (Watling 2000).

Few typically Antarctic fungi have been found in the Falkland Islands (Jalink and Nauta 1993; Watling 2000). However, Watling (2000) identified a number of species that have a

very restricted distribution and/or specialised habitat niches. For example, moss cushions in the Falkland Islands control their own microclimate, and this has been found to encourage specialised associations with fungi.

Baseline surveying and taxonomic identification of lower plants, particularly lichen and mosses, are a high research priority.

BIRD SPECIES

The avifauna of the Falkland Islands is fairly well documented. A total of 227 bird species have been recorded in the Falkland Islands, although this list includes some unsubstantiated sightings. There are 21 resident land birds, 18 resident water birds, 22 breeding seabirds, 18 annual non-breeding migrants and at least 143 species recorded as occasional visitors (Woods and Woods 2006). The close proximity of the Falkland Islands to the South American mainland means that many southern South American species are occasionally seen in the Falkland Islands. Species from sub-Antarctic islands, especially South Georgia, may also occur in the Falkland Islands.

All bird species, except upland goose and feral domestic goose are protected in the Falkland Islands under the Conservation of Wildlife and Nature Ordinance 1999. Yellow-billed teal and Patagonian crested duck may be captured and killed by authorised persons at any time outside the period 1st July to 31st March. Licences may be issued under the Conservation of Wildlife and Nature Ordinance 1999 to shoot turkey vultures to protect livestock, to collect eggs from various bird species for personal consumption, to conduct scientific research on birds and to collect bird specimens for educational purposes.

The Falkland Islands are particularly important for their birdlife and support globally significant numbers of some species, as well as two endemic species and 14 sub-species. The populations of seabirds are the most significant component of the avifauna, due to the upwelling of the northerly flowing Falkland Islands Current bringing cold, deep, nutrient-rich water from the Antarctic, and in contrast, Falkland terrestrial habitats are comparatively poor for supporting birdlife (Woods 1988).

There is no Falkland Islands National Red Data List for birds but various breeding bird species have a global conservation status by the IUCN, are listed under the Convention of Migratory Species (CMS) and its daughter agreement, the Agreement on the Conservation of Albatrosses and Petrels (ACAP) or Convention on the International Trade on Endangered Species (CITES).

TERRESTRIAL INVERTEBRATES

Invertebrates consist of annelids and four extant subphyla of arthropods: chelicerates (spiders, mites and scorpions), myriapods (millipedes and centipedes), hexapods (6 legged insects) and crustaceans (woodlice) (Jones 2004). Up until the last few years, there has been sparse knowledge of the terrestrial invertebrate fauna of the Falkland Islands. Robinson (1984) compiled a checklist of all insects that have been recorded in the Falkland Islands but this does not contain information regarding habitats, ecology, distribution or abundance.

However, the Falkland Islands Invertebrates Conservation Project 2004 – 2007 was recently completed, which filled the significant knowledge gaps. In a land without native trees, reptiles, amphibians or terrestrial mammals, insect life forms a very important part of the Falkland Islands ecology. Insects perform a critical role in the breakdown and recycling of organic matter and the formation of soils and at all stages of insects are important food sources for a variety of birds (Jones 2004).

The Falkland Islands Invertebrates Conservation Project 2004 – 2007 began as an initial pilot study during 2002/03. The project collection now holds approximately 200,000 individual invertebrates. Sampling has been conducted at a variety of sites, including 15 main localities, using a variety of recognised methods (Jones 2008b).

Many specimens remain to be fully described and analysed and initial taxonomic analyses have identified many species never before recorded for the islands including many, which are likely to be new to science (Jones 2008b). The genetics of a number of the species are currently being studied. It is entirely possible that this group of animals could provide the largest genetic resource within the islands. It is recognised that there may be a number of other keystone species in the terrestrial and freshwater invertebrate, but due to a lack of study, their importance has not yet been realised.

Although not currently fully explored, it is estimated that two thirds of the invertebrate fauna of the islands is endemic, although only 13 terrestrial invertebrates currently recognised as endemic. The invertebrate species recorded in the Falkland Islands have close affinities to the fauna of South America and form a link between the continent and South Georgia. Several native species have reduced or even absent wings, a feature in common with other island systems.

Falklands Conservation holds all invertebrate data on its Recorder database and an Invertebrates Collection will be available publicly from mid-2008 onwards.

Annelids

Twelve species of earthworm reported in the Falklands, with nine species found in recent times and three historical records (Reynolds and Jones 2006). The species are a mix of South American, South African or cosmopolitan-range species.

Chelicerates

Chelicerate representatives in the Falkland Islands include spiders, harvestmen, psuedoscorpions and mites. Lavery (2004) records 43 native and introduced species of spiders present in the Falkland Islands, although there is a degree of taxonomic identification work required. Sixteen spider species (405) are suggested to be endemic (Lavery 2007). There are also two harvestmen (Opiliones) species and one species of pseudoscorpion, although further work to differentiate the species is required. There are at least 32 species of mite in the Falkland Islands (Stary and Block 1996).

The spiders, harvestmen and pseudoscorpions of the Falklands have close affinities to the fauna of South America and form a link between the continent and South Georgia. Only one

native spider (*Beauchenia striata*) does not have a clear affinity to South American, and its relationship to the Falkland Islands is yet to be resolved (Lavey 2004).

Hexapods

The hexapods are categorised by having various stages of life, including eggs, nymphs or larvae and adults, and often the juvenile nymph or larvae occupy a completely different environmental niche to the adult. The number of species of hexapods in the Falkland Islands will increase with the remaining taxonomic work of the Falkland Islands Invertebrates Conservation Project (Jones 2008b). Currently, there are over 50 species of true flies (Diptera), including many species of sub-Antarctic kelp fly and hoverfly, 12 species of parasitic wasp (Hymenoptera) and 20 breeding species of moths and one butterfly (Lepidoptera). The beetle diversity is particularly high (Fuller 1995; Jones 2004), with at least 110 species identified, with 15 species of ground beetles (Carabidae), 20 species of weevils (Curculionidae), 16 species of darkling beetle (Tenebrionidae), 15 Hemipteran bugs and 12 booklice species (Psocoptera).

Protected and threatened invertebrates

With the exception of all butterfly species (of the genus *Rhopalocera*), the Conservation of Wildlife and Nature Ordinance 1999 has no provision for the general protection of the invertebrate fauna. However, this reflects that current lack of knowledge about invertebrates rather than a specific wish not to protect them.

The current Invertebrate Programme run by Falklands Conservation may identify some species or species groups or invertebrate habitat that may require some form of legislative protection. Jones (2008c) suggests that five years of annual monitoring would be necessary in order to draw up a potential Red List for Falkland terrestrial invertebrate species along with a plan to collect any remaining data needed to confirm or deny their place on such a list. However, Jones (2008c) proposed that the Queen of the Falklands Fritillary is a potential threatened species due to its apparent rarity in the islands.

Introduced invertebrates

A number of non-native species have become established in the Falkland Islands, some during the 1800s and some much more recently. The successful spread of so many introduced invertebrate species may, at least in part, arise from the depauperate nature of the indigenous fauna and the opportunities that this provides. Indeed, a number of the species, such as some of the lumbricid worms and predatory staphylinid beetles, fill ecological roles that previously seem to have been empty (Jones 2008c).

Important invertebrate habitats

The Falkland Islands Broad Habitat Classification sets out 19 habitat types (Broughton 2000). Some of these habitat types are more critical to the survival of invertebrates, including tussac grass, scrub and montane habitats (Fuller 1995; A. Jones, personal communication). The physical complexity of the tussac grass and scrub (i.e. fachine and boxwood) habitat provides a range of niches for invertebrates.

FRESHWATER FISH AND INVERTEBRATE SPECIES

Freshwater fish

The most extensive survey of the freshwater fish of the Falkland Islands was undertaken over five weeks in 1999 when 146 sites were studied (McDowall *et al*. 2001, 2005). However, coverage was not exhaustive and many waterbodies remain to be examined to obtain a full knowledge of the distribution of Falklands freshwater fishes.

Six species of fish are found in freshwater and the brackish water in estuaries and in the lower reaches of rivers in the Falkland Islands. The zebra trout (*Aplochiton zebra*) and Falklands minnow (*Galaxias maculatus*) are native species and widely found in freshwater bodies. The brown trout (*Salmo trutta*) is an introduced species that is also widely found in the Falkland Islands. These three species follow a diadromous life cycle but can survive in landlocked water bodies. In addition, three marine fish, mullet (*Eleginops maclovinus*) and two species of smelt/pejerrey (*Odontesthes nigricans* and *Odontesthes smitii*) are also found in the lower reaches and estuaries of streams and rivers in the Falkland Islands.

Two further fish species have been recorded in the Falkland Islands: *G. puyen* (*Galaxias platei* = *Galaxias smithii*) and southern pouched lamprey (*Geotria australis*). However, as these records date from early sampling during the late 1800s and early 1900s and because neither has been recorded subsequently, it would seem probable that the samples were incorrectly attributed to the Falkland Islands.

Zebra trout

The zebra trout is a native species to the Falkland Islands, southern Argentina and Chile (McDowall *et al*. 2005). The species is widely distributed across southern Argentina and Chile, but its range in The Falkland Islands have become severely reduced in recent years, possibly due to the expansion in range of the introduced brown trout.

The zebra trout is predominantly a mid-water swimming species and can be seen swimming freely in pools and streams. It does not appear to hide amongst boulders or under banks. Very little is known about the life history of the zebra trout. It seems probable that it spawns in freshwater in autumn near where they normally live and larvae are carried downstream into the sea. The larvae feed and grow as marine plankton for several months before returning to freshwater. The zebra trout has also been found in landlocked freshwater, completing its entire life cycle there without migrating. Its diet consists of Falklands minnows, caddis flies and amphipods and (Perry 2007).

Throughout the surveys, on only two occasions have zebra trout been found co-occurring with brown trout (McDowall *et al*. 2001). It appears that brown trout returning to freshwater to breed out compete and prey upon zebra trout and as the spread of brown trout continues, it appears inevitable that zebra trout will become extinct in the Falklands except in some landlocked waters. Brown trout can also survive in landlocked freshwater but are unlikely to thrive in small landlocked ponds that lack the tributary streams with coarse gravel substrates required for spawning.

Falklands minnow

The Falklands minnow is widely distributed in freshwater habitats in the Falkland Islands, especially in the lower reaches of streams. The species is found widely across the cool temperate zone of the southern hemisphere, including South America, Australia and New Zealand. Genetic testing shows that the distribution of the species is due to marine dispersal (McDowall *et al*. 2005).

Falklands minnows are most often found in gently flowing waters swimming in mid water in small loose shoals, generally not far upstream from the sea. There are also some populations in lakes and ponds throughout the islands. The life history of the minnow has been studied across its range but not specifically in the Falkland Islands.

Spawning is typically in autumn when mature (one year old) fish move downstream until they encounter the salt wedge in the stream estuaries. The migration often occurs at the time of spring tides when the rising tide floods across the estuary banks allowing the minnows to spawn amongst the bank vegetation.

After spawning, adults probably die, whilst the eggs develop on land amongst the vegetation where plentiful moisture stops the eggs from dehydrating. In the cool temperature of the Falkland Islands, the eggs probably take three to four weeks to develop and during the next very high tide are washed from the vegetation and dispersed to sea (McDowall *et al*. 2005). Little is known about the marine life of the larvae, but it is assumed that they live in the surface waters.

The larvae spend the winter at sea feeding and growing, and the young fish begin to return to freshwater during the following spring. Minnows returning from the sea are translucent (because they lack haemoglobin), which is a possible adaptation to reduce visibility in the marine habitat. Upon returning to freshwater, the fish change from using haemocyanin to haemoglobin and rapidly develop colour. The diet of the Falklands minnow is predominantly amphipods and chironomids (Perry 2007).

Whilst the species generally follows a diadromous lifecycle, they are also found in landlocked lakes and ponds. The adjustments in behaviour to facilitate this adaptation are not known.

No fishery for Falklands minnow exists as in other countries where returning juveniles are targeted.

Brown trout

Brown trout were introduced to the Falkland Islands through several consignments of British and Chilean eggs and fry being released in various rivers from 1946 through to 1952. They quickly became established in the release rivers and estuaries by 1957 and since then have gradually extended their range through the archipelago due to their adaptability and sea going habit (McDowall *et al*. 2005). The locally referred to rainbow trout is merely a more brightly coloured brown trout, more common in the peaty upper reaches of rivers. It is assumed that with time, the brown trout will colonise all waters with the exception of some small landlocked ponds that lack the necessary aerated gravel substrates for spawning.

During autumn, brown trout migrate up river to gravel beds in smaller headwater streams to spawn. Eggs develop over winter and hatch during the spring. The young alevins remain associated with the gravel beds until the yolk sack is spent, after which they move into the streams to feed and grow. It is assumed that their main food is chironomid larvae and amphipods (McDowall *et al*. 2005; Perry 2007).

Some young will migrate downstream to the sea, whilst others will remain to feed and grow in freshwater. Those that migrate to the sea will probably spend several years feeding and growing rapidly, some possibly moving in and out of the river estuaries on a daily basis, until they eventually move back into freshwater to spawn. After spawning, the adult fish will move back down river to the sea where food supplies are richer.

The brown trout is a generalised carnivore and in the Falkland Islands feeds on amphipods, krill, molluscs, small fish and insects including chironomid larvae and pupae, caddisfly and stonefly nymphs (McDowall *et al*. 2005; Perry 2007). Sea run trout are much larger than trout resident wholly in freshwater due to the impoverished food resources in rivers in the Falkland Islands. A study of the diet of brown trout and zebra trout at one site in East Falkland found no evidence of brown trout predating on zebra trout or Falklands minnow, though the salmonids examined were mostly small (< 250 mm) (Perry 2007).

The brown trout population is currently expanding and as a non-native species is causing significant impact on the populations of native zebra trout, which is in danger of extinction in much of its former range, in the Falkland Islands and in South America. Perry (2007) suggested that, while salmonid predation may be important amongst the larger size classes, resource competition particularly as competition for food is the main cause for the apparent displacement and decline of native galaxiids.

The brown trout fishery is an important recreational asset to the Falkland Islands. Many residents of the islands, as well as military personnel and overseas tourists, fish for trout. There is a small scale supply of trout to people and restaurants via one local company (Falklands Fresh) as well as by local anglers.

Rainbow trout (*Oncorhynchus mykiss*), brook char (*Salvelinus fontinalis*) and Atlantic salmon (*Salmo salar*) were also released into waterways in the Falkland Islands, but they did not become established.

Smelt

Two species of smelt are present in the Falklands: *Odontesthes smithii* and *Odontesthes nigricans*. Both species are found widely in southern Argentina and Chile, and in the Falkland Islands, they are thought to be widely distributed, but there is little information on their range or biology (McDowall *et al*. 2005). They are primarily an inshore coastal and estuarine species that feed on crustaceans and small fishes and may be an important prey species for some bird species.

Mullet

The Falklands "mullet" (*Eleginops maclovinus*) belongs to the family Nototheniidae or Antarctic cods. The Falklands mullet is a stout bodied fish widely distributed in rivers and estuaries along the South American coast as far north as Uruguay on the east coast and Talcahuano, Chile on the west coast (McDowall *et al*. 2005). In the Falkland Islands, it is found primarily in shallow coastal waters in river estuaries and coastal lagoons and is also occasionally caught in deeper waters by the commercial fishing fleet.

The mullet is a benthic- living omnivore that feeds on a range of benthic fauna and flora including polychaetes, crustaceans and macro-algae in tidal estuarine areas. Since 2000, a small artisanal beach seine fishery for mullet has existed and a long-term research project was undertaken by the Fisheries Department to investigate the biology and standing biomass of mullet in the Falkland Islands (Brickle *et al*. 2003b).

This research has shown that mullet exhibit protanderous hermaphroditism, that is the fish start life as males and then turn into females. Fish that are smaller than 40cm are predominantly male, whilst fish greater than 50 cm are female (Brickle *et al*. 2003b). Mullet have small eggs and a high fecundity, and it is probable that the change to female at larger sizes is an adaptation to maximise the female reproductive success and fecundity allowing mullet to take advantage of an environmental niche.

The inshore marine water of the Falkland Islands has a poor diversity of fish species and may not be a favourable environment for fish. Part of the reason for this may be the periodic changes in salinity and temperature due to rainfall. Rainfall and runoff are detrimental to the survival of juveniles and may be one reason why mullet spawn in deeper water (Brickle *et al*. 2003b). Mullet are omnivorous and due to the lack of competition, the species has a high growth rate. The only other large fish that may compete in inshore waters in the Falkland Islands is the relatively recently introduced brown trout.

Parasite, physical tagging and recapture experiments suggest that smaller fish (< 45cm) remain resident in the bays and estuaries, whereas larger fish may migrate to deeper water (Brickle *et al*. 2003b). There is an absence of larger commercial fish in winter. Larger fish return to inshore creeks in August to feed before they spawn in September in slightly deeper waters. The inshore niche is taken over by the juvenile- and medium-sized fish, perhaps to avoid food competition and cannibalism with adults. In October, November and December, the number of larger fish present in the lower reaches of streams increases steadily as larger fish return downstream after spawning.

At present levels of exploitation, there is no perceived risk to stock sustainability. If, however, the level of exploitation were to grow, careful monitoring would be required as the commercial fishery targets fish of greater than 50cm, which are the reproductive females (Brickle *et al*. 2003b).

Freshwater invertebrates

The invertebrate community in freshwater ponds, streams and rivers in the Falkland Islands have been studied in an ad hoc manner but there is a relatively comprehensive understanding of the general faunal composition at studied sites. Sampling has occurred as part of broad scale ecology surveys (e.g. Clark *et al*. 1990, 1994), sampling for specific

invertebrates (e.g. amphipods, Stock and Platvoet 1991), in conjunction with freshwater fish surveys (R. McDowall, unpublished data) and specific freshwater invertebrate surveys, completed in 1993 by Dartnall and Hollwedel (2007) and in 2001 by Brooks *et al*. (2005).

While the presence of molluscs, amphipods, caddis larvae, waterboatmen, parasitic cercaria, and truly planktonic rotifers make the Falkland Islands fauna markedly richer than any sub-Antarctic, or maritime Antarctic island, it is nevertheless sparse when compared with other temperate and tropical locations (Dartnall and Hollwedel 2007). The fauna lacks many insects with aquatic larvae, including dragonflies, damselflies and mayflies. There is no evidence that the low abundance and diversity of aquatic invertebrates results from anything other than isolation, low nutrients and generally harsh environmental conditions.

Dartnall and Hollwedel (2007) suggest, based on surveys at 48 waterbodies and other published records, that there are 129 species of freshwater invertebrates in the Falkland Islands, including 79 rotifer, 34 arthropoda, six Platyhelminthes, three gastrotricha, two nematoda, two annelida, two molluscs and one tardigrada, with additionally two arachnid mites (Bartsch 2001). However, the records for and the identification of some species are not agreed between all scientific groups. For example, Pugh and Scott (2002) list five freshwater molluscs for the Falkland Islands and Dartnall and Hollwedel (2007) do not support some of the records of Cladocera reported by Brooks *et al*. (2005).

Most freshwater invertebrate species found in the Falkland Islands are restricted to Southern Hemisphere or South America. Two endemic amphipods and one endemic stonefly are recognised (Stock and Platvoet 1991; McLellan 2001). But most of the survey reports include unidentified specimens, which may also be endemic species.

Whilst the freshwater fauna may not be particularly diverse, there is a sufficient abundance to support the various freshwater fish and waterfowl present in the waterways. Only the gammarid amphipods, trichopterans, chironomids, cladocerans and copepods) are likely to be important prey (Brooke *et al*. 2005).

MARINE MAMMALS

There are insufficient data available for most species of marine mammal in the Falkland Islands. There are more Falklands-specific data for pinniped species (seals and sea lions) compared to cetaceans (whales and dolphins). Information on foraging and breeding areas, seasonal distribution and abundance and diet is particularly scarce. There is much anecdotal information about marine mammal species in the Falkland Islands but it is not documented or collated in a form that is easily available.

The at-sea bird and marine mammal surveys conducted between 1998 and 2000 by the Falklands Conservation's 'Seabirds at Sea Team' added greatly to the knowledge of the frequency and distribution of wildlife in Falkland Islands waters (White *et al*. 2002). Many whale species sighted in the waters of the Falkland Islands are passing through on their migration routes and thus it is difficult to decide which species should be regarded as constituting the cetacean fauna of the Falkland Islands (Bonner 1986). There are probably more than 20 species that occur in Falkland Islands waters but probably only two or three species live in the waters of the Falkland Islands for their entire life. It is suggested that a

significant proportion of the world's populations of Peale's dolphin and Commerson's dolphins may exist in the Falkland Islands, with perhaps a closed population of Commerson's dolphins in Falkland Islands waters.

There is no Falkland Islands National Red Data List of marine mammals, though eleven cetacean species seen in the Falkland Islands are categorised as globally threatened by the IUCN, including three species as endangered (Table 10.1). Ten species are listed under the Convention on the Conservation of Migratory Species of Wild Animals (CMS) and 16 species are CITES listed species, such that trade/export must be regulated by FIG (see Chp. 3).

Four pinniped species occur in the Falkland Islands, with three breeding species (South American fur seal, southern sea lion and southern elephant seal) and one vagrant (leopard seal). The fur seal and sea lion are eared seals (Otariidae), while the elephant seal and leopard seal are phocids and are less agile on land than eared seals, due to their less flexible hind limbs. None of three pinniped species are red listed by the IUCN, but all three species are listed under CMS and trade in southern elephant seals and South American fur seal must be regulated under CITES (Table 10.1).

In the Falkland Islands, the Marine Mammals Ordinance 1992 protects all marine mammals in all waters, from the coast to the edge of the economic exclusion zone.

IUCN Conservation Status, CMS and CITES listings for the regularly sighted cetaceans and pinnipeds in Falkland Islands waters.

Species	IUCN Conservation Status	CMS	CITES
Arnoux's beaked whale	Lower risk – conservation dependent	Not listed	Appendix I
Blue whale	Endangered	Appendix I	Appendix I
Commerson's dolphin	Data deficient	Appendix II	Appendix II
Cuvier's beaked whale	Data deficient	Not listed	Appendix II
Fin whale	Endangered	Appendix I/II	Appendix I
Gray's beaked whale	Data deficient	Not listed	Appendix II
Hourglass dolphin	Not listed	Not listed	Appendix II
Humpback whale	Vulnerable	Appendix I/II	Appendix I
Killer whale	Lower risk – conservation dependent	Appendix II	Appendix II
Peale's dolphin	Data deficient	Appendix II	Appendix II
Sei whale	Endangered	Appendix I/II	Appendix I
Southern bottlenose	Lower risk – conservation	Not listed	Appendix I

whale	dependent		
Southern minke whale	Lower risk – conservation dependent	Appendix II	Appendix I
Southern right whale	Lower risk – conservation dependent	Appendix I	Appendix I
Sperm whale	Vulnerable	Appendix I/II	Appendix I
Strap tooth beaked whale	Data deficient	Not listed	Appendix II
South American fur seal	Least concern	Appendix II	Appendix II
Southern elephant seal	Least concern	Appendix II	Appendix II
Southern sea lion	Least concern	Appendix II	Not listed

OTHER MARINE SPECIES

Seaweeds

Seaweeds inhabit the intertidal and shallow marine environment and they make a major contribution to primary production, as well as providing a habitat and/or a food source for a wide range of marine fauna including crustaceans, cephalopod and fish (Tingley *et al*. 1996). The seaweeds of the Falkland Islands are somewhat poorly inventoried and studied. Three studies have been conducted, one nearly one hundred years ago (Cotton 1915), and more recently, a 15-site study during 1999 (Westermeier and Patino 1999) and a four-week survey of 12 sites during 2002/03 (Clayton 2003). Cotton (1915) identified 180 species and Clayton (1993; M. Clayton, personal communication) identified at least 74 brown and green species, with a number of red seaweed species requiring further taxonomical work.

Abundant and dominant species in Falkland Islands waters include tree kelps (*Lessonia* sp.), gull kelp (*Durvillea* sp.), giant kelp (*Macrocystis pyrifera*), *Iridaea* sp. and sea lettuce (*Ulva* sp.). Suitable anchor points, light penetration and exposure appear to influence the distribution of giant kelp (Tingley *et al*. 1996), whilst tree kelps are found on most open coasts. *Iridaea* and *Ulva* are important food items for steamer ducks and kelp geese.

Marine invertebrates

During 1920 to 1950, the British Colonial Office and the Falkland Islands Government funded a number of research expeditions coordinated by the Discovery Committee around Antarctica, South Orkneys, South Sandwiches, South Orkneys and the Falkland Islands. Discovery Investigations were intended to provide the scientific background to the stock management of the commercial Antarctic whale fishery, but a number of specific research projects were carried out in the region of the Falkland Islands, including shallow and deep water trawling surveys and monographs on many groups of the marine fauna were published.

This was the starting point for all subsequent shallow marine surveys. In 1996, the first detailed shallow marine survey was commissioned by FIG as part of a Falklands Environmental Baseline Survey and approximately 250 sites at 15 locations were surveyed (Tingley *et al*. 1996). Locations were selected using a number of different criteria focusing on areas that might be affected by anthropogenic activities, and marine species were recorded in accordance with the UK Marine Nature Conservation Review survey guidelines (Hiscock 1990).

An extensive amount of data and specimens were collected and approximately 445 likely species were identified, mostly molluscs, echinoderms and sea squirts, many of which had not previously been recorded in the Falkland Islands (Tingley *et al*. 1996). A vast amount of reference material was preserved and further taxonomic work was subsequently carried out on these specimens, but not all specimens could be identified to species level and the total number of species was estimated to be less than that previously reported (Gardline Surveys 1998h).

During 1994 – 1996, the life cycle, including reproduction, spat settlement, growth and condition, of the native blue mussel (*Mytilus edulis chilensis*) was studied at several sites around the Falkland Islands (Gray 1997).

Despite this early research, baseline surveying, habitat mapping and taxonomic identification of shallow marine invertebrates remain a high research priority for the Falkland Islands. The 'Shallow Marine Surveys Group' (SMSG) is currently conducting surveys of the shallow marine environment, including full taxonomic identification of all species collected. SMSG is comprised of fisheries scientists, naturalists and dive enthusiasts, and all work is undertaken in a voluntary capacity. SMSG has funds from the FIG Environmental Studies Budget and Antarctic Research Trust, and in-kind support from the Falkland Islands Fisheries Department and a variety of marine experts located across the world. SMSG will produce a series of scientific publication as well as a comprehensive marine life reference book for the Falkland Islands.

Cephalopods, elasmobranches and finfish

Relatively few squid, octopuses, skates, sharks and fish species spend their entire life in the shallow marine environment (see Chp. 11). However, coastal waters are important breeding grounds for the squid *Loligo gahi*, southern red octopus (*Enteroctopus megalocyathus*) and icefish (*Champsocephalus esox*). In addition, all the freshwater fish species in the Falkland Islands complete part of their lifecycle in the marine environment and this is further discussed in Chp. 7.

APPENDIX 7: BIODIVERSITY THREATS

INVASIVE SPECIES (MARINE AND TERRESTRIAL)

The IUCN has identified that the introduction of non-native species is one of the major threats to native biological diversity. The impact of invasive and alien species can be immense, insidious and often irreversible. In the past, the natural ocean barrier in the Falkland Islands has provided effective biological isolation that has allowed unique species, ecosystems or wildlife behaviours to develop. However, just a few hundred years of human trade and travel has removed these barriers and introduced alien species to areas were the native species are not adapted to the new threat.

Island ecosystems are particularly vulnerable to alien introductions as the native flora and fauna often have limited biotic resistance to predation, grazing or competition. A wide range of plants and animals has been introduced to the Falkland Islands but introduced livestock such as sheep, horses and goats, as well as rats, mice and cats have had the biggest environmental effects. In the Falkland Islands, the native avifauna is predominantly ground nesting species and this makes them very susceptible to introduced predators. Indeed, the presence of introduced mammalian predators such as cats, rats and mice is the major factor controlling the distribution and abundance of nine Falkland Islands passerine bird species (Hall *et al*. 2002).

Not all non-native species in the Falkland Islands are invasives. The Convention on Biological Diversity defines an invasive alien species as one whose introduction and/or spread threatens biological diversity. In the Falkland Islands, this excludes non-native grazing animals (e.g. sheep, cattle, horses and others) that are actively and responsibly managed for agriculture or recreation but it does include livestock that is feral and/or has uncontrolled/unmanaged land access.

A brief risk assessment was conducted of known introduced species in the Falkland Islands (Whitehead 2008). The assessment asked ten questions on the invasiveness potential for each non-native species to provide each species with an invasiveness ranking. Species with a ranking above a set target were identified as most appropriate for control effort because they had most, if not all, of the following characteristics:

- recorded as invasive on the Falklands or elsewhere
- have the ability to spread
- likely to cause economic, ecological and/ or agricultural damage
- pose risks to human and/ or livestock health
- their current distribution on the Falklands is localised
- effective control methods are available
- control would be supported by the community

A number of individuals and organisations in the Falkland Islands are involved in the research, control and eradication of invasive species, including landowners, FIG, UK Ministry of Defence, Stanley Growers, Falklands Conservation, New Island Conservation Trust, SubAntarctic Foundation for Ecosystem Research and most recently, the 'South Atlantic Invasive Species Programme, which has funding from the European Commission for the period 2006 – 2009.

Invasive micro-organisms

There are relatively few introduced animal and plant micro-organisms in the Falkland Islands that could be considered invasive. Such potential invasive micro-organisms include foot and mouth disease, bird flu and freshwater algae such as didymo (*Didymosphenia geminata*) which adversely affects freshwater fish, plant and invertebra te species in the southern parts of New Zealand. Th e biosecurity risks associated with invasive freshwater organisms associated with fishing gear is highlighted in the Falkland Islands Trout Fishing poster.

Invasive plants

The list of introduced plant species is certainly not complete, with many species observed in Stanley gardens not yet recorded. Of the known introduced plants, t he risk assessment procedure identified 22 introduced plants scoring above 15, which are therefore considered invasive species in the Falkland Islands (Table 12.1) (Whitehead 2008).

Potentially invasive plant species scoring 15 or above in the risk assessment

Common Name	Scientific Name	Score
Calafate	*Berberis buxifolia*	19
Gorse	*Ulex europaeus*	19
Broom	*Cytisus scoparius*	18
Darwin's barberry	*Berberis darwinii*	18
European ragwort	*Senecio jacobea*	18
Oxford ragwort	*Senecio squalidus*	18
Creeping thistle	*Cirsium arvense*	16
Chilean rhubarb	*Gunnera tinctoria*	16
Spear thistle	*Cirsium vulgare*	16
Slender thistle	*Carduus tenuiflorus*	16
Hemlock	*Conium maculatum*	16
Scotch heather	*Calluna vulgaris*	16
Stone crop	*Sedum acre*	16
Curled/yellow dock	*Rumex crispus*	15
Broad-leaved dock	*Rumex obtusifolius*	15
Mouse-ear hawkweed	*Hieracium pilosella*	15
Orange hawkweed	*Hieracium aurantiacum*	15
Lupin	*Lupinus arboreus*	15
Spiny sow-thistle	*Sonchus asper*	15

Smooth sow-thistle	*Sonchus oleraceus*	15
Marram Grass	*Ammophila arenaria*	15
Rowan	*Sorbus aucuparia*	15

These plants are categorised as invasive because they out-compete local flora species, reduce agricultural productivity (e.g. spines become entrapped in fleeces and pierce the skin of sheep creating entry points for disease) and some are poisonous to livestock (Summers 2007). However, some of the species also have agricultural and conservation benefits, with gorse for example providing shelter for livestock and breeding habitat for landbirds.

Calafate and gorse are locally widespread and the other species are limited to various locations such as Stanley, Mount Pleasant/Mare Harbour, Fox Bay and Saunders Island. Only European ragwort and Oxford ragwort are thought to be recent introductions and have a very limited distribution around Mount Pleasant/Mare Harbour (Summers 2007). Distribution data, cost-effective and achievable control and/or eradication methods applicable to the Falkland Islands for most invasive plants are limited. Consequently, few control/eradication programmes are in operation.

Invasive land and marine invertebrates

Analysis of native land invertebrate survey data for the Falkland Islands is soon to be completed. However, from this baseline data, the presence of introduced species and whether some species are invasive may well be difficult to determine with any great certainty. Knowledge of the shallow and offshore marine environment in the Falkland Islands is relatively poor.

The shallow marine environment in the Falkland Islands is species rich in some groups but poor in others and any new predatory species would face little competition. Vessel hulls and ballast water are two potential methods of transporting invasive marine species (Lewis *et al*. 2005), although in the Falkland Islands, the threat of introductions from ballast water is low because relatively few vessels carry or discharge ballast water here. However, the chance of vessel hulls carrying foreign species is high. There is little legislative control over ballast water management and hull cleanliness in the Falkland Islands.

Two introduced marine invertebrates– a polychaete worm (*Chaetopterus variopedatus*) and a sea squirt (*Ciona intestinalis*) – have been recorded in the Falkland Islands but it is not known if they are invasive (Shallow Marine Surveys Group, unpublished data). Pacific oysters are considered to be invasive elsewhere (e.g. France) and it is also a possibility in the Falkland Islands, although they do not currently breed here possibly due to the low water temperatures.

Invasive animals

Nineteen introduced animals scored above 15 and are therefore considered invasive species in the Falkland Islands (Table 12.2) (Whitehead 2008).

Potentially invasive animal species scoring 15 or above in the risk assessment.

Common Name	Scientific Name	Score
Black rat	*Rattus rattus*	20
Norway rat	*Rattus norvegicus*	19
House mouse	*Mus musculus*	17
Patagonian fox	*Lycalopex griseus*	17
Cat	*Felis catus**	17
Greylag goose	*Anser anser**	17
Goat	*Capra hircus**	17
Greenbottle fly	*Lucilia sericata*	17
Greenbottle fly	*Protophormia terraenovae*	17
European earwig	*Forficula auricularia*	16
Sheep	*Ovis aries**	16
Brown hare	*Lepus europaeus*	16
South American guanaco	*Lama guanicoe*	15
Cattle	*Bos Taurus**	15
European rabbit	*Oryctolagus cuniculus*	15
Nth American cotton-tail rabbit	*Sylvilagus* spp.	15
Reindeer	*Rangifer tarandus**	15
Brown trout	*Salmo trutta*	15
Pig	*Sus scrofa**	15

FERAL GRAZING ANIMALS

In the Falkland Islands, up until the 1980s, livestock was put seasonally onto most ground, including offshore islands. However, today due to the low prices for wool and meat, small offshore islands and some farmland areas have been fenced and de-stocked. Most livestock in the Falkland Islands are actively and responsibly managed for agriculture, with currently approximately 500,000 sheep and 5,000 cattle island-wide. There are also several hundred goats, with two flocks on East Falkland and two on islands and 171 pigs (see Chp. 8 for further details).

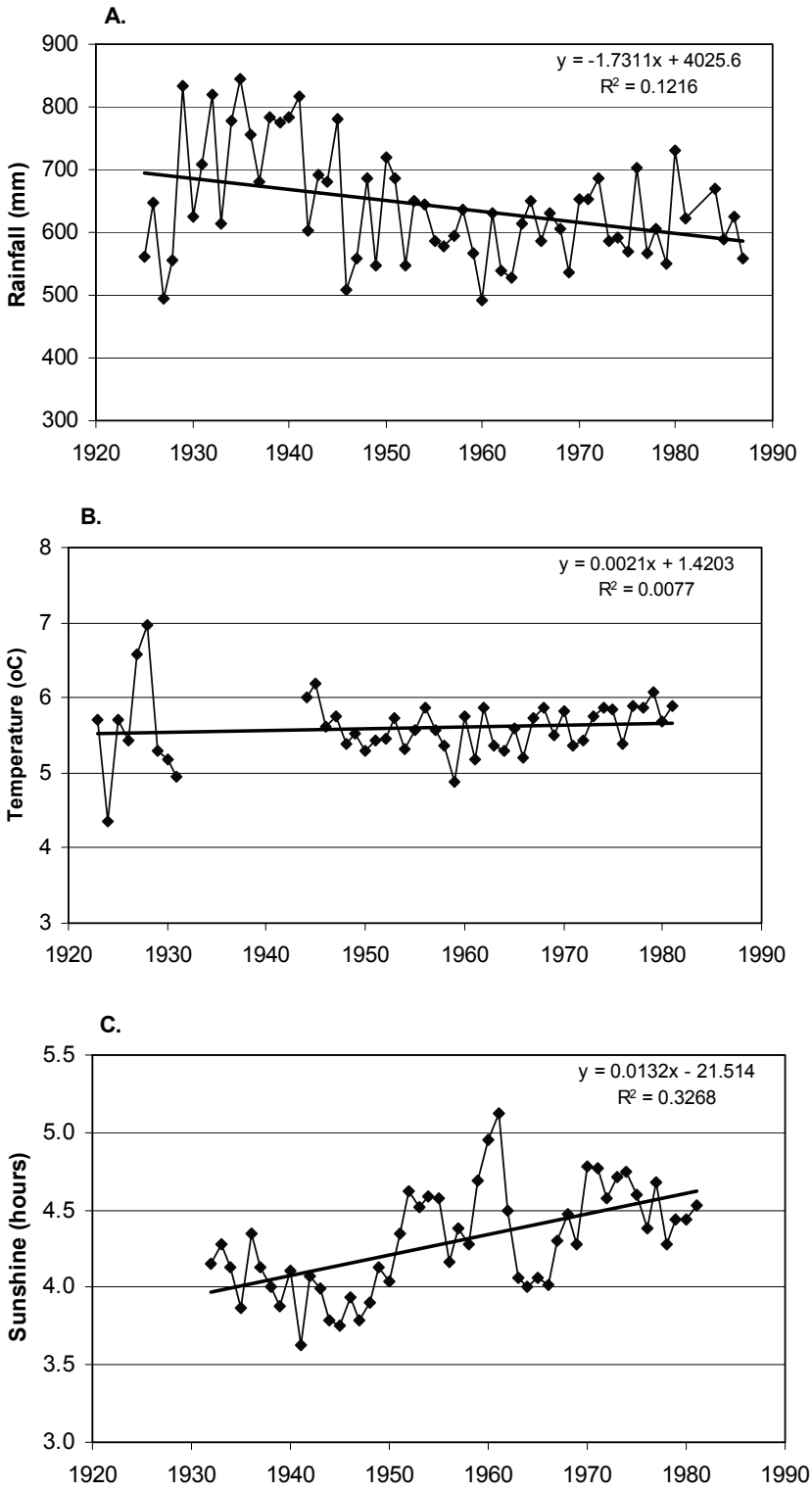
There are few unmanaged livestock in the Falkland Islands, with some cattle and goats on Wickham Heights (East Falkland), which is owned by FIG. When unmanaged, of the current livestock animals, sheep would probably most rapidly kill the tussac grass, pigs would have the greatest impact in the long term as they uproot vegetation, whilst goats might have the highest breeding success and survival.

Grazing in general has had a significant impact on many habitats and species in the Falkland Islands, but mostly particularly on tussac grass, fachine, native boxwood and snake plant. Compared to lightly grazed pastures, heavily grazed pastures have less plant diversity and intensive grazing in the summer months produces a grassier and more productive sward but these species are almost always non-native, whilst native species diversity is reduced (Broughton and McAdam 2002c).

Early results of the rotational grazing system promoted by the Department of Agriculture suggest that native species such as mountain blue grass and cinnamon grass are returning to areas where they have not been seen for some time (Department of Agriculture, unpublished data). Joint research by the Department of Agriculture and Falklands Conservation on the effects of intensively rotating sheep over whitegrass pasture on small passerine bird abundance showed that the bird numbers increased slightly when the whitegrass sward was opened up, although the bird population was too small to obtain statistically significant results (A. Kerr, personal communication).

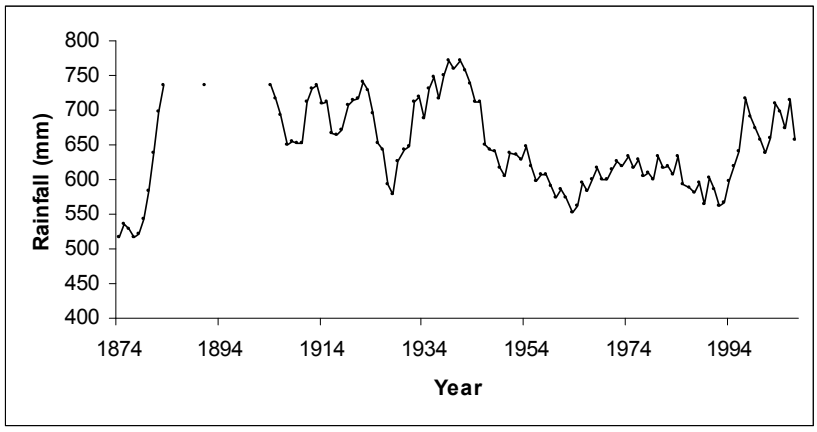
CLIMATE CHANGE IMPACTS

Examination of meteorological data between 1923 and 1981 indicates a drying and warming of the climate in the Falkland Islands (See Figs. A,B, C).



Average annual meteorological data collected in Stanley by the UK Met Office and British Antarctic Survey between 1923 and 1981. A. rainfall, B. temperature and C. sunshine.

More recent climate data has not been not comprehensively analysed. One rainfall data set for Stanley held by PWD suggests that the annual rainfall increased during the period 1910 - 1940, subsequently declined, but has been on the increase since 1995 (Fig. 1.7).

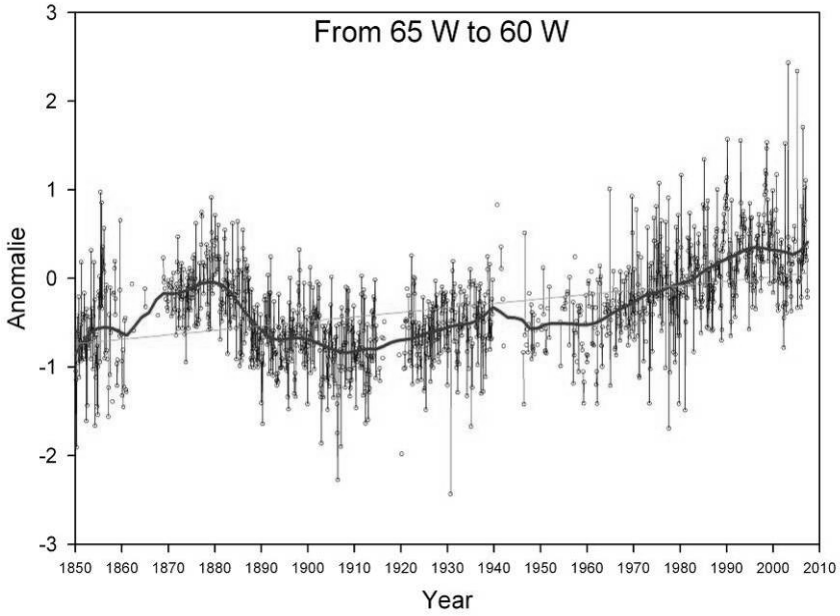


Five year average annual rainfall 1874 – 2006 for Stanley (Source – M. Keenleyside, PWD)

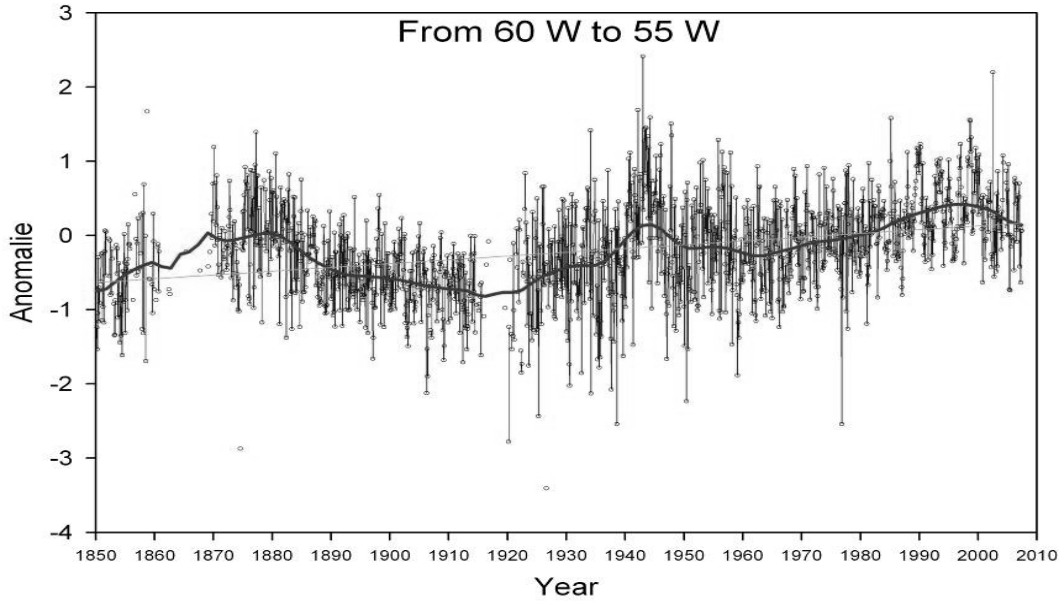
However, rainfall data has been not analysed in any form in recent years, and this is necessary in order to predict impacts on freshwater quantity and also quality. Changes may result in a need to develop new infrastructure for extracting potable water for Stanley, Mount Pleasant Complex, farm settlements and sites with tourist lodges. Freshwater plants, invertebrates and fish may also be affected. Stream volumes could be monitored by electronic logging devices left in-situ.

Sea surface and land temperature data analysed by the UK Climatic Research Unit of the University of East Anglia (Rayner *et al*. 2003; Parker *et al*. 2004; http://www.cru.uea.ac.uk/cru/data/temperature/), show a steady increase in the number of warmer than normal sea conditions since the 1960s (Figs D and E).

D

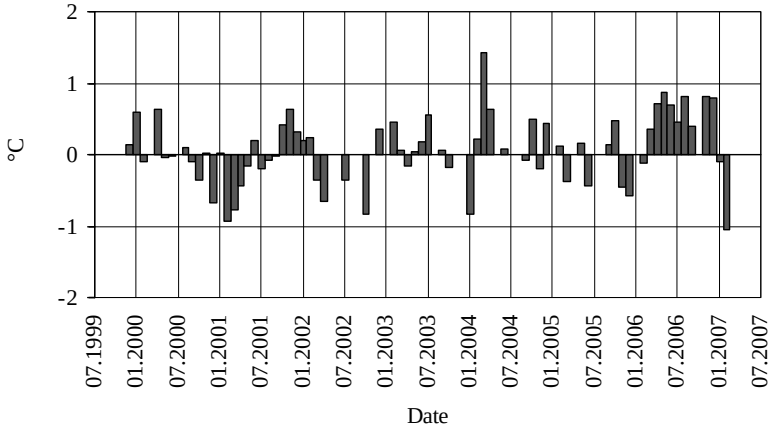


Anomaly index of changes in sea surface temperature (gray line series) around the



Falkland Islands since 1850, with the local average shown as the smoothed black line (prepared by N. Huin, Falklands Conservation)

There has been constant monitoring of the marine environment through oceanographic surveys carried out by Falkland Islands Fisheries Department since 1999. In years studied, there were quite large fluctuations of sea temperatures on the shelf of the Falkland Islands comparable with the predicted value (Fig F).



F: Changes in sea surface temperature in Falkland Island waters since 1999 (FIFD, unpublished data)

Sea level has been measured at various sites in the Falkland Islands over multiple years, with the longest continuous monitoring in Port Stanley from 1964 onwards by Proudman Oceanographic Laboratory (Liverpool, UK) using a conventional float and stilling well tide gauge, pressure transducers and more recently, a POL 'B' gauge as part of a the Global Sea Level Observing System (GLOSS). The data suggests a 0.7 to 1.3 mm/year sea level rise over the last 40 years; the "global average" rate of change of sea level during the 20th century is 1 – 2 mm/year (Woodworth *et al*. 2005). Priority should be given to supporting this

long-term monitoring programme, both for the Falkland Islands, and for the South Atlantic and Southern Ocean, where it is difficult to maintain sea level monitoring systems.

Global projections of sea level rise reported by the Intergovernmental Panel on Climate Change Working Group indicate that sea level could rise on average about 5 mm/yr, within a range of uncertainty of 2 - 9 mm/yr. An important point to bear in mind is that the current best estimates represent a rate of sea-level rise that is about two to five times the rate experienced over the past 100 years (1.0 - 2.5 mm/yr).

Changes in sea level at regional and local levels in the Falkland Islands will not necessarily be the same as the global average change because vertical land movements affect sea level and there are dynamic effects resulting from oceanic circulation, wind and pressure patterns, and ocean-water density that cause variations in the level of the sea surface (Watson *et al*. 1997 and ref therein). Areas particularly vulnerable to a rise in sea level in the Falkland Islands include most of Lafonia and many low lying offshore islands.

The University of Durham is working on a palaeo-environmental history of the Falkland Islands by studying peat sections. A record of Falklands vegetation change – which is hoped to be proxy for climate – over the past 17,000 years will be established through radiocarbon dating and identification of the plants through preserved pollen (P. Stone, personal communication). Dating the change will allow the Falklands climate change to be compared with the established global climate pattern over the same period, thus establishing how the Falkland Islands interacts at a global level.

Effects of predicted climate change

In contrast to some other UK Overseas Territories, there is unlikely to be any climate warming in the Falkland Islands. Our scientists suggest that the initial strong melting of Antarctic ice due to global warming will result in cooler water and air temperatures, and increased cloud cover and levels of rainfall in the Falkland Islands. However, north of the Falkland Islands (e.g. 40-50 ^{o}S), water temperatures may be higher. There will be an increase in the intensity and frequency of extreme storm weather, which generally cause the most damage.

These are best guesses by scientists as there has been little analysis of land or oceanographic climate data to develop predictive models in order for the Falkland Islands Government and its people to prepare for the ramifications of global climate change. However, there is considerable data available for complex and informative modelling to be undertaken.

Even with only minor changes in atmospheric and oceanic circulation, local shifts in centres of production and mixes of species in marine- and fresh-waters are expected to occur as ecosystems are displaced geographically and change internally (Canziani and Diaz 1997). Any changes to the distribution of marine resources will potentially have huge detrimental effects on top marine predators, and thus major implications for the biodiversity and economy of the Falkland Islands.

Wildlife

The Falkland Islands have an abundance of species and the interaction between them means that even terrestrial species rely to some degree on the marine environment or marine species for survival.

The effect of climate change on Falklands wildlife could be direct, e.g. change in krill abundance or indirect, through changes in food webs and increased occurrences of algal blooms and epizootics. Due to the size of the Falkland Islands and its low lying land, it is likely that species and habitats have little room for manoeuvre in terms of latitudinal shifts and the rate of climatic change may exceed the ability of species to adapt and move. Documented results of climate change elsewhere include changes in the timing of breeding, population and plant and animal health (e.g. Barbraud and Weimerskirch 2006).

Little or nothing is also known of the effect of climate change on plants and vegetation communities in the Falkland Islands. A number of the nationally threatened plants in the Falkland Islands have small, isolated populations that are inherently vulnerable to chance natural events. It is possible that future climate change may increase the frequently of chance natural events such as severe droughts or storm surges (Broughton 2002).

In a trial using open top chambers that experimentally increased air temperature in acid grassland and dwarf scrub heath habitats in Lafonia, the total vegetation cover decreased in the chambers compared to test plots within a two-year period (Bokhorst 2007). Results from the research being undertaken by the University of Durham should also be available soon. The OTEP-funded Falklands Plant Conservation Programme that began in July 2007 will also establish some long-term monitoring sites.

There is a significant database of penguin information held by Falklands Conservation that could be incorporated with oceanographic data to investigate the effects of oceanographic anomalies. Although the fledging success of thin-billed prion chicks on New Island remains consistent year to year despite temperature anomalies, during periods of higher sea temperature, provisioning rates are lower and chicks fledge at a lower body weight, which is a significant factor determining subsequent recruitment of young birds to the adult breeding population (Quillfeldt *et al*. 2007).

Research on the French sub-Antarctic islands suggests that the predicted southward shift of the Polar Front caused by oceanic warming could lead to a significant decrease in the breeding performance of top predator seabirds (Inchausti *et al*. 2003).

A global review of the effects of climate change on marine mammals suggests that the potential effects on species range are unknown for the sei whale, sperm whale, all beaked whale species, Peale's dolphin, killer whale, long-finned pilot whale, South American fur seal, South American sea lion and southern elephant seal. Negative effects were suspected for Commerson's dolphin and hourglass dolphin (Learmouth *et al*. 2006). However, not enough is known about whales and dolphins in the Falkland Islands in order to predict or even determine effects of climate change.

One area of concern regarding climate change and wildlife in the Falkland Islands is the response of invasive species. There are many non-native species currently established in

the Falkland Islands that may become invasive as the climate changes. There have been some studies on other sub-Antarctic islands of the effects of climate change on invasive species, but the results and predictions remain unclear (Ferreira *et al*. 2006). Little is known of our marine invertebrates, let alone introduced marine species, as to whether they are invasive or could become invasive due to changes in salinity and water temperature.

Falklands Community

Given the current rate of increase in sea level, there is a threat in the longer term to buildings located close to rivers, estuaries and seafront, particularly for Stanley. However, in the short- to medium-term, an increase in the number of storms poses a risk of damage to all homes, buildings and built infrastructure such as roads, drainage systems, power production and water supplies. The current building regulations in the Falkland Islands require that buildings are constructed to withstand 100 knot winds, well beyond current storm winds experienced in the Falkland Islands (ca. 50 – 60 knots).

Reductions in temperature and light levels can also be associated with higher and lower incidences of certain medical disorders, such as depressive conditions and skin cancer.

Fisheries

The Falkland Islands fishery is mainly a deep-sea fishery represented by large oceanic trawlers and jiggers that are able to work in almost all weather conditions, with an extremely small proportion of inshore artisanal fishery (inshore pot fishing for crabs and seine fishing for mullet).

Cooler and less saline waters may affect the distribution and abundance of the main species of inshore fauna and flora. However, the extent of this impact is poorly understood as the majority of shelf species have evolved high tolerance to environmental fluctuations. Stronger storms could cause more damage to sub-littoral kelp forests because of increased surge, which might lead to shrinkage of the spawning grounds of *Loligo* squid and thus, a decrease in their abundance.

With the initial predicted warming in ocean temperatures, temperature-sensitive toxins produced by phytoplankton could cause problems of wildlife health to top marine predators, as well as to aquaculture (Canzianzi and Diaz 1997; Huin 2003). However, the predicted stronger winds and surge may in fact reduce the chances of toxic algal blooms, due to the stronger mixing of near-shore waters.

The cooling of the Antarctic Current and warming of the Brazilian Current might create a stronger gradient zone, which could potentially boost the primary production and correspondingly, favour aggregations of squid and commercial fishes within the economic waters of the Falkland Islands.

This sort of predicted oceanographic event did in fact occur during the autumn of 2006 and there were higher than usual commercial catches of *Illex* squid and demersal fish species, including hake, hoki and kingclip, in the northern part of the Falkland Conservation Zones.

However, squid, the most commercially important fisheries in the Falkland Islands, are very variable by nature and it would be difficult to tell whether a change in the amount of stock is

symptomatic of climate change, or due to short-term oceanographic variability or fishing pressure.

Agriculture
It is suspected that the changes in the amount of sunlight, rainfall and air temperature will negatively affect agricultural production. Focused monitoring of the climate by the Department of Agriculture will begin to build up a picture of the impact in time. The Department of Agriculture holds a significant amount of climatic data, but it lacks the resources to store, analyse and extract useful information.

Tourism
The continued visits of cruise ships rely on both the wildlife and safe landing places. Climate change effects on wildlife are covered above. Most built infrastructure in place to facilitate safe landings (i.e. jetties and long ramps etc) is probably likely to need replacing well before any significant increase in sea level requires change. However, an increase in storm events may lead to more damage to landing infrastructure.

Domestic adaptations and mitigations to climate change
Mitigation of climate effects is wholly beyond the ability of Falkland Islands to implement, and the only means is through international protocols such as Kyoto. The Falkland Islands Government signed up to the Kyoto Agreement under the UK's ratification as an Annex 1 country in March 2007. The Falkland Islands are not required to reduce their emissions or place a ceiling on emissions in the first commitment period of 2008 - 2012 (and the same situation is likely for the following periods).

However, the Falkland Islands is expected to introduce policies in line with objectives of the UK Climate Change Programme and to this end, FIG has completed the 'Waste Heat Recovery Programme' infrastructure developments to the power station and has installed the first generators in a wind farm close to Stanley. The two projects together have required a budget of £2,715,000. The wind farm is expected to reduce diesel fuel consumption for power generation for Stanley by 40%.

In addition, the FIG Camp Energy Policy - to install wind turbines at farm settlements - has been largely completed. Typically, about 80% of the farm energy requirements are now produced by wind power. FIG has also agreed in principle to supporting grants for better insulation of homes but money has not yet been allocated.

However, FIG needs to ensure that the issue of climate change is prioritised at a high level corporately with no onus on one particular government department and this will require support, commitment and action from all Councillors, Executive Council, Heads of Department, industry, business and the general community, as well as from the Foreign and Commonwealth Office

In terms of further limiting our own carbon emissions and planning for the future, FIG needs to consider:

- Increasing public awareness about climate change and its possible impacts on the Falkland Islands

- Increasing the use of renewable energy, e.g. solar and wind power, and improved building insulation standards. Grants could be provided to householders to encourage the installation of energy efficient measures, particularly draught proofing.
- Increasing the use of energy efficient equipment and heating systems, and re-use of waste oils and other flammable liquids
- Ensuring sustainable patterns of development in Stanley and in camp, i.e. efficient use of land close to facilities, continuing existing development patterns – such as the orientation of housing to the north (sun) and in sheltered north facing locations
- Encouraging sustainable forms of transport – walking, cycling, sharing of cars, taxis etc
- Ensuring existing FIG, MoD, local private and UK-based climate monitoring programmes are sufficiently funded and supported
- Supporting the establishment/continuation of long-term wildlife monitoring programmes, including studies of plant, insect and bird phenology (timing) and distribution along altitudinal gradients
- Nationally protecting areas with intact habitat from sea level to mountain areas, such as are found in the Hill Cove area, Beaver Island, Weddell Island and the Jason Island Group
- Seeking funds and international support for research, particularly for modelling of available data to determine predicted impacts of climate change on the Falkland Islands

Opportunities for International and UK involvement with Falklands climate change issues

Although many of these listed activities could be implemented domestically, the Falkland Islands Government does not have sufficient scientific resources to undertake the data analysis and modelling required to develop a better understanding of the likely impacts of global climate change on sunlight levels, air and sea temperature, rainfall, wind strength and direction, ocean currents and marine and terrestrial productivity in the Falkland Islands.

This type of scientific programme would be most suitable as an internationally-based collaborative project between the Falkland Islands Government, Falklands organisations involved in climate monitoring in the Falklands, the UK Government, the Foreign and Commonwealth Office, the UK Met Office and climate change institutions in the UK and perhaps also elsewhere. Significant funds, particularly for scientific time, are necessary.

It must also be recognised that the Falkland Islands community relies to a significant extent on climate monitoring systems funded and maintained by UK organisations whose involvement is not guaranteed into the future.

APPENDIX 8: USEFUL CONTACTS

Antony Payne
Head of Environment Department
Environmental Planning Officer
Environmental Planning Department
Falkland Islands Government
PO Box 611
Stanley
Falkland Islands
FIQQ 1ZZ
Ph: +500 28480
Fax: +500 27391
www.epd.gov.fk
apayne.planning@taxation.gov.fk

Nicholas Rendell
Environmental Officer
Environmental Planning Department
Falkland Islands Government
PO Box 611
Stanley
Falkland Islands
FIQQ 1ZZ
Ph: +500 28480
Fax: +500 27391
www.epd.gov.fk
nrendell.planning@taxation.gov.fk

Minister of Environment
Member Legislative Assembly (MLA) Emma Edwards
Contact via
Claudette Prior MBE
Clerk of the Legislative Assembly and Executive Council / PR Officer
Tel: + 500 27451/27455
Fax: +500 27456
Email: clerkofcouncils@sec.gov.fk

John Barton
Head of Marine Department
Director of Natural Resources
Falkland Islands Fisheries Department
PO Box 598
Stanley FIQQ 1ZZ
Falkland Islands
Tel: (+500) 27260
Fax: (+500) 27265
Email via: gskene@fisheries.gov.fk

Non Governmental Organisations

Falklands Conservation
Craig Dockrill
Chief Executive Officer
Falklands Conservation
41 Ross Road, Stanley
Box 26
Falkland Islands
F1QQ 1ZZ
Tel: +500 22247
info@conservation.org.fk
www.falklandsconservation.com

New Island Conservation Trust
www.falklandswildlife.com

Antarctic Research Trust
www.antarctic-research.de

Shallow Marine Survey Group
www.smsg-falklands.org

Elephant Seal Research Group
www.eleseal.org

Falkland Islands Tourist Board:
www.falklandislands.com

FIG links:
Falkland Islands Government homepage
www.falklands.gov.fk

Environmental Planning Department
www.epd.gov.fk

Department of Fisheries
http://fis.com/falklandfish/

Department of Agriculture
www.agriculture.gov.fk

Department of Mineral Resources
http://www.bgs.ac.uk/falklands-oil/

Locally-based Project Partners

Falklands Conservation (FC)
New Island Conservation Trust (NICT)
Shallow Marine Survey Group (SMSG)
Beaver Island Land Care Group (BILC)
Falkland Islands Trust (FIT)
FIG Environmental Planning Department (EPD)
FIG Falkland Islands Fisheries Department (FIFD)
FIG Department of Agriculture

List of partners that work with the OT

Elephant Seal Research Group (ESRG)
Sea Mammal Research Unit
SubAntarctic Foundation Ecosystems Research
Instituto Superior de Psicologia Aplicada (Portugal)
Max Planck Institute for Ornithology
University of Bath
University of Swansea
University of Antwerp
Universidad de Magellanes (Punta Arenas)
Antarctic Research Trust
Memorial University of Newfoundland
Hawk Mountain Acopian Center for Conservation Learning
Wildlife Conservation Society

Overseas Territories Environmental Programme (OTEP)
Darwin Initiative (DEFRA)

RBG Kew
JNCC
Royal Society for the Protection of Birds
BirdLife International

APPENDIX 9: COMPREHENSIVE BIBLIOGRAPHY

References

Agnew DJ. 2002. Critical aspe cts of the Falkland Islands pelagic e cosystem: distribution, spawning and migration of pelagic animals in relatio n to oil exploration. Aquatic Conservation and Freshwater Ecosystems 12: 39-50.

Agreement on the Con servation of Albatrosses and Petr els – Seabird Bycatch Working Group (ACAP-SBWG). 2007. Report of the first meeting. ACAP 3rd meeting of the Advisory Committee. 17-18 June 2007, Valdivia, Chile.

Alderman R, Double MC, Valencia J. and Gales RP. 20 05. Genetic affinit ies of newly sampled populations of wandering and black-browed albatross. Emu 105: 169-179.

Aldiss DT and Edwards EJ. 1999. The geology of the Fal kland Islands. British Geological Survey Technical Report.

Annual Farming Statistics 1935 – 2004. Fa lkland Island Government Department of Agriculture, Stanley.

Arkhipkin AI, Middleton DAJ, Porte la JM and Bellido JM. 2003a. Alternative usage of common feeding grounds by large predators: the case of two hakes (*Merluccius hubbsi* and *M. australis*) in the southwest Atlantic. Aquatic Living Resources 16: 487-500.

Arkhipkin A, Brickle P and Laptikhovsky V. 20 03b. Variation in the diet of the Patagonian toothfish with size, depth and season around the Falkland Islands. Journal of Fish Biology 63: 428-441.

Arkhipkin AI, Middleton DA and Barton J. 2008. Management and conservation of a short-lived resource: *Loligo gahi* around the Falkland Islands. American Fisheries Society Symposium 49: 1243 - 1252.

Arkhipkin A, Baumgartner N, Brickle P, Laptikhovsky V, Po mert J, Shcherbich Z. 2008. Biology of two abundant skates, *Bathyraja brachyurops* and *B. griseocauda* in Falkland Island waters (Southwest Atlantic). ICES Journal of Marine Science in press.

Ashford JR and Martin AR. 1996 . Interactio ns between cetaceans and longline fishery operations around South Georgia. Marine Mammal Science 12: 452-457.

Balech E. 1971. Microplankton de la campana oceanografica Productividad III. Revista del Museo Argentino de ciencias naturales "Bernardino Rivadavia". Hidrobiologia 3: 1-202.

Banks R, Van Buren A, Cherel Y and Whitfield J. 2006. Genetic evidence for three species of rockhopper penguins, *Eudyptes chrysocome*. Polar Biology 30: 61-67.

Barbraud C and Weimerskirch H. 2006. Antarctic birds bre ed later in response to climate change. PNAS: 6248-6251.

Barlow J and Gisiner R. 2006. Mitigating, monitoring and assessing the eff ects of anthropogenic sound on beaked whales. Journal of Cetacean Research and Man agement 7: 239-249.

Barnes DKA. 2002. Invasions by marine life on plastic debris. Nature 416: 808 – 809.

Barton J. 2002. Fisheries and fisheries management in Falkland Island conservation zones. Aquatic Conservation and Freshwater Ecosystems 12: 127-135

Bartsch I. 2001. A n ew freshwater halacarid mite, genu s *Peregrinacarus* (Halacaridae, Acari) from the Falklands. Hydrobiologia 452: 139 – 144.

Bastida R, Roux A an d Martinez DE. 1992. Benthic Communities of the Argentine Continental Shelf. Oceanologica Acta 15: 687-698.

Beale CM. 2007. Ma naging visitor access t o seabird colonies: a spatial simulation and empirical observations. Ibis 149: 102-111.

Bellati J and von Thungen J. 1990. Lamb predation in Patagonian ranches. Proceedings of the Fourteenth Vertebrate Pest Conference 1990. University of Nebraska.

Bennett AG. 1933. The pe nguin population of the Falkland Islands in 1932/33. Unpublished report to the Falkland Islands Government.

Berrow SD, Wood AG and Prince PA. 2000a. Foraging location and ra nge of white-chinned petrels *Procellaria aequinoctialis* breeding in So uth Georgia. Journal o f Avian Biology 31: 303-311.

Berrow SD, Croxall JP and Grant SD. 2000b. Status of white-chinned petrels *Procellaria aequinoctialis* Linnaeus 1758, at Bird Island, South Georgia. Antarctic Science 12: 399-405.

Bingham M. 1995. Berkeley Sound Phase 1 Coastline Survey 1994/95. Falklands Conservation, Stanley.

Bingham M. 1996. Ph ase 1 Coastline Surv ey Report 1995/96. Falklands Conse rvation, Stanley.

Bingham M. 1998. The distribution, abu ndance and population trends of gentoo, rockhopper and king penguins in the Falkland Islands. Oryx 32: 223-232.

Birdlife International. 2 004. Threatened birds of the world 2004. Birdlife Intern ational, Cambridge, UK.

Bizikov VA and Middleton DAJ. 2002. Scallop *Zygochlamys patagonica* (Bivalvia: Pectinidae): a potentia l new fisher y resource for the Falkland Islan ds. Scientif ic Report, Fisheries Department, Falkland Islands Government.

Boersma PD, Stokes DL and Yorio PM. 1990. Repr oductive variability and historical change of Magellanic penguins (*Spheniscus magellanicus*) at Punta Tombo, Arg entina. Pp 15-43 in Davis L and

Darby L (Eds) Penguin Biology. Academic Press, California, USA.

Boersma PD, Stokes DL and Strange IJ. 2 001. Tracking breeding penguins a t the New Island South Reserve. A report of work carried out between 1997 and 2001. Unp ublished report to New Island South Conservation Trust.

Boersma PD, Stokes DL and Strange IJ. 2002 . Applying ecology to conservation: tracking breeding penguins at N ew Island South reserve, Falkland Islands. Aq uatic Conservation: Marine Freshwater Ecosystem 12: 63-74.

Boersma PD, Van Buren AN and Strange IJ. 2004. Tracking of pe nguins at New Island, Falkland Islands: Results from the 2001-02 and 2003-04 seasons. Unpublished report to New Island South Conservation Trust.

Bokhorst S. 2007. F unctioning of terrestrial ecosystems of the Maritime Anta rctic in a warmer climate. Netherlands Institute of Ecology, The Netherlands.

Bonner WN. 1986. Marine Mammals of the Falkland Islands. British Antarctic Survey.

Bowgen KM. 2007. Pathological findings from black-browed albatross chicks from New Island, Falkland Islands. Master of Science Thesis, University of London.

Breen BM and Bildstein KL. 2008. Distribution and abundance of the turkey vulture in the Falkland Islands, summer 2006-2007 and autumn – winter 2007. Hawk Mountain Sanctuary and Falklands Conservation.

Brickle P, Laptikhovsky V, Pompert J and Bishop A. 2003a. Ontogenetic changes in the feeding habits and dietary overlap between three abundant rajid species on the Falkland Islands' shelf. Journal of the Marine Biological Association of the UK 83: 1119-1125.

Brickle P, Laptikhovsky V, MacKenzie K and Arkhipkin A. 2003b. The Falkland mullet *Eleginops maclovinus*: Biology and fishery in Falkland Islands' waters. Scientific Report, Fisheries Department, Falkland Islands Government.

Brickle P, Shcherbich Z, Laptikhovsky V. and Arkhipkin A. 2005. Aspects of the biology of the Falkland Islands' rockcod *Patagonotothen ramsayi* (Regan, 1913) on the southern Patagonian Shelf. Scientific Report. Falkland Islands Government Fisheries Department, Stanley.

Brookes S, Boxshall G, Kattel and Flower R. 2005. Aquatic Invertebrates Collected from Inland Waters of the Falkland Islands (online) http://www.ecrc.ucl.ac.uk/fibril/inverts.htm.

Brothers N, Cooper J and Lokkeborg S. 1999. The incidental catch of seabirds by longline fisheries: worldwide review and technical guidelines for mitigation. FAO Fisheries Circular No. 937. Rome: Food and Agriculture Organization of the United Nations.

Broughton DA. 1999. A review of the shrub taxa and associated dwarf shrub heathlands of the Falkland Islands. MPhil Thesis. The Queens University of Belfast, Belfast.

Broughton DA. 2000a. A new broad habitat classification for the Falkland Islands. Report to Falklands Conservation and the Environmental Planning Department. The Queens University of Belfast, Belfast.

Broughton DA. 2000b. A note on the status of comb-fern in the Falkland Islands. The Falkland Islands Journal 7: 1-2

Broughton DA. 2002. An action plan for the threatened vascular flora of the Falkland Islands. Falklands Conservation, Stanley.

Broughton DA and Ingham RJ. 2002. Management plan for the Hill Cove Mountains National Park, West Falklands. A report to the Falkland Islands Government by Falklands Conservation, Stanley.

Broughton DA and McAdam JH. 1999. A preliminary atlas of the vascular flora of the Falkland Islands. Report to Falklands Conservation. The Queens University of Belfast, Belfast.

Broughton DA, McAdam JH and Brannstrom, R. 2000. A combined checklist and ecogeographic conspectus for the vascular flora of Saunders Island, Falkland (Malvinas) Islands. Anales del Instituto de la Patagonia, Series Ciencias Naturales 28: 57-88.

Broughton DA and McAdam JH. 2002a. A red data list for the Falkland Islands vascular flora. Oryx 36: 279-287.

Broughton DA and McAdam JH. 2002b. The non-native vascular flora of the Falkland

Islands. Botanical Journal of Scotland 54: 153-190.

Broughton DA and McAdam JH. 2002c. The vascular flora of the Falkland Islands: An annotated checklist and atlas. Report to Falklands Conservation. The Queens University of Belfast, Belfast.

Broughton DA and McAdam JH. 2003a. A guide to the ferns and clubmosses of the Falkland Islands. Report to Falklands Conservation. The Queens University of Belfast, Belfast.

Broughton DA and McAdam JH. 2003b. The current status and distribution of the Falkland Islands Pteridophyte flora. Fern Gazette 17: 21-38.

Brown D, Chadderton L and Brown K. 2001. Rat eradication programme. A report to Falklands Conservation, Stanley.

Burger J. 2002. Tourism and ecosystems. In: Douglas I. (Ed.), Encyclopaedia of Global Change. Volume 3, Causes and consequences of global environmental change. John Wiley and Sons, Chichester, pp. 597-609.

Campagna C, Piola AR, Marin MR, Lewis M and Fernandez T. 2006. Southern elephant seal trajectories fronts and eddies in the Brazil/Malvinas Confluence. Deep-Sea Research online.

Canziani OF and Diaz S. 1997. Chapter 6 - Latin America. In: Watson RT, Zinyowera MC and Moss RH. (Eds.). IPCC Special report on the regional impacts of climate change - an assessment of vulnerability.

Carwardine M. 1995. Whales, Dolphins and Porpoises, Dorling Kindersley, London.

Cassini MH, Szteren D and Fernadez-Juricic E. 2004. Fence effects on the behavioural responses of South American fur seals to tourist approaches. Journal of Ethnology 22: 127-133.

Catry P, Campos A, Segurado P, Silva M and Strange I. 2003. Population census and nesting habitat selection of thin-billed prion *Pachyptila belcheri* on New Island, Falkland Islands. Polar Biology 26: 202-207.

Catry P, Silva MC, MacKay S, Campos A, Masello J, Quillfeldt P and Strange IJ. 2006. Can thin-billed prions *Pachyptila belcheri* breed successfully on an island with introduced rats, mice and cats? The case of New Island, Falkland Islands. Polar Biology 30: 391-394.

Cawkell EM and Hamilton JE. 1961. The birds of the Falkland Islands. Ibis 103: 1-27.

Cawkell MBR, Maling DH and Cawkell EM. 1960. The Falkland Islands. Macmillan and Co Ltd. St Martins Press, New York.

Cherel Y, Pütz K and Hobson KA. 2002. Summer diet of king penguins (*Aptenodytes patagonicus*) at the Falkland Islands, southern Atlantic Ocean. Polar Biology 25: 898-906.

Christie D and Munro G. 2005. Report on island restoration and rat eradication to date and recommendations for future work through 2005-6. Falklands Conservation, Stanley.

Clark F. 2006. The red-backed buzzard. Print Shop: Stanley.

Clark R, Cooper EA, Macfadyen A, Shipp T, Simpson MN and Wilson P. 1990. The Cumbria and Lancashire Falklands expedition 1989. The Falkland Islands Journal 5: 5 - 15.

Clark R, Wilson P, Simpson N and Nolan R. 1994. Some recent earth science and ecological studies in Falkland Islands. The Falkland Islands Journal 6: 10 – 25.

Clark R, Macfadyen A, Simpson N and Wilson P. 1997. Aspects of Falkland Islands earth science and ecology. The Falkland Islands Journal 7: 57 – 78.

Clausen A. 2002. Manual of information and methods for the Falkland Islands Seabird Monitoring Programme. Falkland Island Seabird Monitoring Programme Report, Falkland Islands Conservation, Falkland Islands.

Clausen A and Pütz K. 2002. Recent trends in diet composition and productivity of gentoo, Magellanic and rockhopper Penguins in the Falkland Islands. Aquatic Conservation: Marine Freshwater Ecosystem 12: 51-61.

Clausen A and Huin N. 2003. Status and numerical trends of king, gentoo and rockhopper penguins breeding in the Falkland Islands. Waterbirds 26: 389-402.

Clausen A and Pütz K. 2003. Winter diet and foraging range of gentoo penguins (*Pygoscelis papua*) from Kidney Cove, Falkland Islands. Polar Biology 26: 32-40.

Clausen AP, Arkhipkin AI, Laptikhovsky VV and Huin N. 2005. What is out there: diversity in feeding of gentoo penguins (*Pygoscelis papua*) around the Falkland Islands (southwest Atlantic). Polar Biology 28: 653-662.

Clayton M. 2003. Report to the Shackleton Scholarship Fund by Professor Margaret Clayton, Monash University, Australia on research conducted during 4 weeks from 27 December 2002 - 25 January 2003.

Cobley ND and Shears JR. 1999. Breeding performance of gentoo penguins (*Pygoscelis papua*) at a colony exposed to high levels of human disturbance. *Polar Biology* 21: 355-360.

Cohen DM, Inada T, Iwamoto T, Scialabba N. 1990. FAO species catalogue. V.10. Gadiform fishes of the world (Other Gadiformes). An annotated and illustrated catalogue of cods, hakes, grenadiers and other gadoid fishes known to date. FAO, Rome, Italy.

Coscarella MA, Hoelzel R, Crespo EA and Loizaga de Castro R. 2007. Population genetic structure of Commerson's dolphin along the continental Patagonian coast based on mtDNA. 21st Conference of the European Cetacean Society. April 22-25 2007.

Cotton AD. 1915. Cryptogams from the Falkland Islands collected by Mrs. Vallentin and described by A.D. Cotton. Journal of Linnaean Society of Botany 43: 137-231.

Crespo EA, Pedraza SN, Dans SL, Alonso MK, Reyes LM, Garcia NA and Coscarello M. 1997. Direct and indirect effects of the high seas fisheries on the marine mammal populations in the northern and central Patagonian coast. Journal of Northwest Atlantic Fisheries Science 22: 189-207.

Crofts S. 2006a. Preliminary assessment: seabird interactions in the pelagic southern blue-whiting surimi fishery in the Falkland waters – December 2006. Falklands Conservation, Stanley.

Crofts S. 2006b. Seabird interactions in the Falkland Islands *Loligo* trawl fishery 2005/2006. Falklands Conservation, Stanley.

Croxall JP and Wood AG. 2002. The importance of Patagonian Shelf top predator species breeding at South Georgia. Aquatic Conservation: Marine Freshwater Ecosystem 12: 101-118.

Croxall JP, McInnes SJ and Prince PA. 1984. The status and conservation of seabirds at the Falkland Islands. In Croxall, J.P, Evans, P. G.H, and Schreiber, R.W. (Eds) Status and Conservation of the Worlds Seabirds. 271-293 ICBP Publication No 2 Cambridge.

Croxall JP, Prince PA, Baird A and Ward P. 1985. The diet of the southern rockhopper penguin, *Eudyptes chrysocome chrysocome*, at Beauchêne Island, Falkland Islands. Journal of Zoology London 206: 485-496.

Cruickshank JG. 2001. Falkland soils – origins and prospects. A report to Falkland Islands Government by the Department of Agriculture of Northern Ireland.

Dalby DL. 2000. Falkland lichens – richness on rocks. Warrah 18: 2-3.

Dartnall HJG and Hollwedel W. 2007. A limnological reconnaissance of the Falkland Islands; with particular reference to the waterfleas (Arthropoda: Anomopoda). Journal of Natural History 41: 1259-1300.

Davies W. 1938. The grasslands of the Falkland Islands. Falkland Island Government Printing Office.

Davies TH and McAdam JH. 1989. Wild Flowers of the Falkland Islands. Falkland Islands Trust.

Dawson N. 2006. Falklands Conservation study of Orcas, *Orcinus orca* feeding around Sea Lion Island 2006. A report to Falklands Conservation.

Department of Agriculture. 2006. Biennial Report July 2004 to June 2006. Falkland Island Government, Stanley.

Department of Conservation. 2005. New Zealand large Galaxias Recovery Plan 2003 - 2013. Threatened Species Recovery Plan 55. Wellington, New Zealand.

Derraik JGB. 2002. The pollution of the marine environment by plastic debris: a review. Marine Pollution Bulletin 44: 842–852.

de Villiers MS, Cooper J and Ryan PG. 2005. Individual variability of behavioural response by wandering albatrosses to human disturbance. Polar Biology 28: 255-260.

de Villiers M, Bause M, Gisese M and Fourie A. 2006. Hardly hard-hearted: heart rate responses of incubating northern giant petrels (*Macronectes halli*) to human disturbance on sub-Antarctic Marion Island. Polar Biology 29:717-720.

Douse AFG. 1987. The impact of sheldgoose grazing on reseeded pasture in the Falkland Islands. Report to the Overseas Development Administration, London.

Engel JJ. 1990. Falkland Island s hepaticae and anthocerotophyta: a taxonomic and phytogeographic study. Fieldiana Botany 25: 1-209.

Environment & Resource Technology Ltd. 1996. Assessment of environmental sensitivity to seismic operations offshore Falkland Islands. Final Report. Environment & Resource Technology Ltd., UK for Shell E and P South West Atlantic BV, Amerada Hess (Falkland Islands) Ltd and LASMO International Ltd.

Environmental Planning Department. 2005. Environmental Impact Assessment (EIA) for proposed wind farm at Peat Bog Paddock, Sand Bay, East Falkland. Falkland Islands Government, Stanley.

Environmental Planning Department. 2007. Gypsy Co ve Management Plan 2007 – 2013. FIG Environmental Planning Department, Stanley.

Fabiani A, Hoezel AR, Galimberti F and Muelbert MMC. 2003. Long-r ange paternal gene flow in the southern elephant seal. Science 299: 676.

Falkland Islands Development Corporation. 2002. Aquaculture Desktop Study. Report prepared by the Centre for Marine Environmental and Economic research, Victoria University of Wellington, New Zealand, for the Falkland Islands Development Corporation, December 2002.

Falkland Islands Development Corporation. 2006. National Aquaculture Strategy Part 1 . Proposed Programme for Developing Aquaculture in the Falkland Islands. Falkland Islands Development Corporation, Stanley.

Falkland Islands Development Co rporation. 2007. Falkland Islands Aquaculture Information Sheets. Falkland Islands Development Corporation, Stanley.

Falkland Islands Fisheries Department. 2000. Scientific report fisheries research cruise ZDLH1-11-1999. Falkland Islands Government, Stanley.

Falkland Islands Fisheries Department. 2003. Fish and invertebrate species caught

within Falkland Islands waters - FIFD Observer Manual. Falkland Islands Government, Stanley.

Falkland Islands Fisheries Department. 2004. Identification guide and biology of the Falkland Islands skates. Falkland Islands Government, Stanley.

Falkland Islands Fisheries Department. 2006. Fishery Statistics Volume 10 (1996 – 2005). Falkland Islands Government, Stanley.

Falkland Islands Government. 1995. A draft town plan for Stanley. Falkland Islands Government, Stanley.

Falkland Islands Government. 1998. National Oil Contingency Plan. Falkland Islands Government, Stanley.

Falkland Islands Government. 2004a. Falkland Islands Structure Plan. Written Statement 2001 – 2015. Falkland Islands Government, Stanley.

Falkland Islands Government. 2004b. National Plan of Action – Longlining. Falkland Islands Government and Falklands Conservation, Stanley and Royal Society for the Protection of Birds, UK.

Falkland Islands Government. 2004c. National Plan of Action – Trawling. Falkland Islands Government and Falklands Conservation, Stanley and Royal Society for the Protection of Birds, UK.

Falkland Islands Government. 2004d. Stanley Town Plan. Falkland Islands Government, Stanley.

Falkland Islands Government. 2006. Falkland Islands Census Statistics 2006. Falkland Islands Government, Stanley.

Falkland Islands Tourist Board 2002. Part One - Trends and changes in Falklands tourism 1995-2001 and Part Two – Tourism strategy 2002-2006. Falkland Islands Tourist Board, Stanley.

Falkland Islands Tourist Board. 2007a. FITB Report 2006/07 Cruise ship tourism. Falkland Islands Tourist Board, Stanley.

Falkland Islands Tourist Board. 2007b. Report to Chief Executive – Land-based visitor activity. Falkland Islands Tourist Board, Stanley.

Falklands Conservation. 2004. Assessment directive for Falkland Islands *Illex* jigging. Falklands Conservation, Stanley.

Falklands Conservation. 2006a. Albatross and Petrels in the South Atlantic: Conservation Priorities. Proceedings of an International Meeting for UK Overseas Territories. Falklands Conservation, Stanley.

Falklands Conservation. 2006b. Important Bird Areas in the Falkland Islands. Falkland Conservation, Stanley.

Farmer's Association. 1994. Proceedings of the first farmer's forum on tussac grass and sand grass planting in the Falkland Islands. Farmer's Association and Department of Agriculture, Stanley.

Fathala MV, Calio C and Iniguez M. 2002. Observaciones preliminaries sobre el delfin austral al norte de Puerto San Julian, provincial de Santa Cruz, Argentina. Abstract of the 10th Reunion of Marine Mammalogy, Ecuador.

Ferguson J and Ferguson S. 1998. The consequences of fox predation. Wool Press March 1998. FIG Department of Agriculture, Stanley.

Ferreira SM, van Aarde RJ and Wassenaar TD. 2006. Demographic responses of house mice to density and temperature on sub-Antarctic Marion Island. Polar Biology 30: 83-94.

Food and Agriculture Organisation. 1985. FAO Species identification sheets for fishery purposes: Southern Ocean Volume 1. Food and Agriculture Organisation, Rome.

Food and Agriculture Organisation. 1995. FAO Code of Conduct for Responsible Fisheries. FAO, Italy.

Food and Agriculture Organisation. 1999. International Plan of Action-Seabirds. FAO, Italy.

Flower RJ. 2005. A taxonomic and ecological study of diatoms from freshwater habitats in the Falkland Islands, South Atlantic. Diatom Research 20: 23-96.

Forcada J and Robinson SL. 2006. Population abundance, structure and turnover estimates for leopard seals during winter dispersal combining tagging and photo-identification data. Polar Biology 29: 1052 - 1062.

Forster I. 2007. A review of the effects of invasive rats and mice on plant and invertebrate population structures, and the implications for eradication programmes in the Falklands. Falklands Conservation, Stanley.

Fortoser Ltd. 1986. The potential for a fishery of *Paralomis granulosa* in the Falkland Islands: Biologists Report, Oct 1986. A report to the Falkland Islands Development Corporation.

Franklin WL. 2005. Penguins, dolphins and guanacos: an adventure to the Falkland Islands. International Camelid Quarterly 4: 2 – 9.

Franklin WL and Grigione MM. 2005. The enigma of guanacos in the Falkland Islands: the legacy of John Hamilton. Journal of Biogeography 32: 661-675.

Freilich S, Hoezel AR and Choudhury SR. 2005. Genetic diversity and population genetic structure in the South American sea lion (*Otaria flavescens*). Durham Anthropology Journal 13: online.

Frere E, Gandini P and Boersma PD. 1998. The breeding ecology of Magellanic penguins at Cabo Virgenes, Argentina: what factors determine reproductive success. Colonial Waterbirds 21: 205-210.

Fuller J. 1995. Studies on the invertebrate fauna of tussac grass communities in the Falkland Islands. PhD thesis, details unknown.

Gales R. 1998. Albatross Populations - Status and Threats. In Albatross Biology and Conservation (Eds. Robertson G and Gales R). Pp. 20-45. Surrey Beatty and Sons: Chipping Norton.

Galimberti F. 2002. Power analysis of population trends: an application to elephant seals of the Falklands. Marine Mammal Science 18: 557-566.

Galimberti F. and Boitani L. 1999. Demography and Breeding Biology of a small, localized population of southern elephant seals (*Mirounga leonina*). Marine Mammal Science 15: 159-178

Galimberti F. and Sanvito S. 2003. Southern elephant seals of Sea Lion Island: A long-term research project. Elephant Seal Research Group Report, Milan, Italy.

Galimberti F, Sanvito S, Boitani L and Fabiani A. 2001. Viability of the southern elephant seal population of the Falklands Islands. Animal Conservation 4: 81-88.

Galloway DJ. 1988. Plate tectonics and the distribution of cool temperate Southern Hemisphere macrolichens. Biological Journal of the Linnean Society 96: 45-55.

Gandini P, Boersma PD, Frere E, Gandini M, Holik T and Lichtschein V. 1994. Magellanic penguins (*Spheniscus magellanicus*) affected by chronic petroleum pollution along the coast of Chubut, Argentina. Auk 111: 20-27.

Garcia-Borboroglu P, Dee Boersma PD, Ruoppolo V, Reyes L, Rebstock GA, Griot K, Rodrigues, Heredia S, Corrado Adornes A and Pinho da Silva R. 2006. Chronic oil pollution harms Magellanic penguins in the Southwest Atlantic. Marine Pollution Bulletin 52: 193–198.

Gardline Surveys. 1998a. Benthic environmental baseline survey of the sediments around the exploration 14/19-A well February 1998. A report to the Falkland Islands Operators Sharing Agreement.

Gardline Surveys. 1998b. Benthic environmental baseline survey of the sediments around the exploration 14/23-A well February 1998. A report to the Falkland Islands Operators Sharing Agreement.

Gardline Surveys. 1998c. Benthic environmental baseline survey of the sediments around the exploration 'Little Blue-A' well February 1998. A report to the Falkland Islands Operators Sharing Agreement.

Gardline Surveys. 1998d. Benthic environmental baseline survey of the sediments around the exploration B1 well February 1998. A report to the Falkland Islands Operators Sharing Agreement.

Gardline Surveys. 1998e. Benthic environmental baseline survey of the sediments around the exploration well 14/24 'Braela' March 1998. A report to the Falkland Islands Operators Sharing Agreement.

Gardline Surveys. 1998f. Benthic environmental baseline survey of the sediments around the exploration well 14/13-B 'Minke' June 1998. A report to the Falkland Islands Operators Sharing Agreement.

Gardline Surveys. 1998g. Post-drill environmental survey of the sediments around the exploration well 'Little Blue-A' October 1998. A report to the Falkland Islands Operators Sharing Agreement.

Gardline Surveys. 1998h. Taxonomic identification of epifaunal specimens from the Falkland Islands. Gardline Surveys Ltd, UK.

Garland L. 2005. Weddell Island bird survey, Nov 2004 – Feb 2005. A report to Falklands Conservation.

GHK. 2007. Costing Biodiversity Priorities in the UK Overseas Territories. A report to RSPB by GHK Consulting Services.

Gill JA. 2007. Approaches to measuring the effects of human disturbance on birds. Ibis 149: 9-14.

Gillon KW, White RW and Black AD. 2000. Seabird and marine mammal surveys between Stanley, Falkland Islands, and Punta Arenas, Chile, 1999-2000. Unpublished JNCC report to the Falkland Islands Government and Falklands Conservation.

Glorioso PD. 2002. Modelling the southwest Atlantic. Aquatic Conservation and Freshwater Ecosystems 12: 27 – 37.

González-Solis J, Croxall JP, Wood AG. 2000. Foraging partitioning between giant petrels *Macronectes spp*. and its relationship with breeding population changes at Bird Island, South Georgia. Marine Ecology Progress Series 204: 279-288

Goodall RNP. 1978. Report on the small cetaceans stranded on the coasts of Tierra del Fuego. Scientific Report of the Whale Research Institute 30: 197-230.

Goodall RNP. 2002. Peale's Dolphin - *Lagenorhynchus australis*. In: Encyclopaedia of marine mammals (Perrin WF, Würsig B and Thewissen JGM, Eds.). Academic Press, San Diego.

Gray AP. 1997. Growth and ecology of the blue mussel in the Falkland Islands. University of Wales Bangor PhD Thesis.

Green RJ and Higginbottom K. 2000. The effects of non-consumptive wildlife tourism on free-ranging wildlife: a review. Pacific Conservation Biology 6: 183-197.

Greene DM. 1986. A conspectus of mosses of Antarctica, South Georgia, the Falkland Islands, and Southern South America. British Antarctic Survey, Cambridge

Gremillet D, Wilson RP, Wanless S and Chater T. 2000. Black-browed albatrosses, international fisheries and the Patagonian Shelf. Marine Ecology Progress Series 195: 269-280.

Gulland FMD and Hall AJ. 2007. Is Marine Mammal Health Deteriorating? Trends in the Global Reporting of Marine Mammal Disease. Ecohealth 4: 135-150.

Halcrow and Partners Ltd. 1998. Falkland Islands Waste Disposal. A report to the Falkland Islands Government.

Hall JR, Woods RW, Brooke M de L and Hilton GM. 2002. Factors affecting the distribution of land birds on the Falkland Islands. Bird Conservation International 12: 151-167.

Hardy AC. 1928. The work of the RRS "Discovery" in the Dependencies of the Falkland Islands. The Geographical Journal 72: 209-227.

Harris CM. 2005. Aircraft operations near concentrations of birds in Antarctica: The development of practical guidelines. Biological Conservation 125: 309-322.

Harte M and Barton J. 2007a. Balancing local ownership with foreign investment in a small island fishery. Ocean and Coastal Management 50: 523-537.

Harte M and Barton J. 2007b. Reforming management of commercial fisheries in a small island territory. Marine Policy 31: 371-378.

Heinrich S. 2006. Ecology of Chilean dolphins and Peale's dolphins at Isla Chiloe, southern Chile. PhD thesis, University of St Andrews, UK.

Henderson AC, Arkhipkin AI and Chtcherbich JN. 2005. Distribution, Growth and Reproduction of the white-spotted skate *Bathyraja albomaculata* (Norman, 1937) around the Falkland Islands. Journal of Northwest Atlantic Fisheries Science 35: 79-87.

Hepburn I, Oldfield S and Thompson K. 1992a. UK Dependent Territories Ramsar Study Stage 1. Submitted to the Department of the Environment, European and International Habitat Protection Branch by the International Waterfowl and Wetlands Research Bureau and NGO Forum for Nature Conservation in the UK Dependent Territories.

Hepburn I, Oldfield S and Thompson K. 1992b. UK Dependent Territories Ramsar Study: Stage 1 Supplement. Submitted to the Department of the Environment, European and International Habitat Protection Branch by the International Waterfowl and Wetlands Research Bureau and the NGO Forum for Nature Conservation in the UK Dependent Territories.

Hershkovitz MA. 2006. Ribosomal and chloroplast DNA evidence for diversification of western American Portulacaceae in the Andean region. Gayana Botanical 63: 13-74.

Hevia M, Iñiguez M, Tossenberger V and Cipriano F. 2005. Genetic divergence between Commerson's dolphin subpopulations in southern Argentina. Marine Mammal Society Conference. San Diego, California.

HMSO. 1994. Biodiversity: The UK Action Plan. HMSO, UK.

HMSO. 1999. White Paper on the UK Overseas Territories: Partnership for Progress and Prosperity. HMSO, UK.

Hilton GM, Thompson DR, Sagar PM, Cuthbert RJ, Cherel Y and Bury SJ. 2006. A stable isotope investigation into the causes of decline in a sub-Antarctic predator, the rockhopper penguin *Eudyptes chrysocome*. Global Change Biology 12: 611-625.

Hirst AG and Rodhouse PG. 1996. Report on the assessment of the effects of seismic operations on squid fisheries in the Falkland Islands conservation zones. British Antarctic Survey, UK.

Hiscock K. 1990. Marine Nature Conservation Review: Methods. Nature Conservancy Council, CSD Report, No 1072. Marine Nature Co nservation Occasional Report MNCR/OR/05. Nature Conservancy Council, Peterborough.

Hoerschelmann H, Pol zhafer K, Figge K and Ballschmiter K. 197 9. Organo chlorine pesticides and poly chlorinated biph enyls in bird eggs from the Falkland Islands and North Germany. Environmental Pollution 13: 247-269. (English abstract only).

Hoggarth DD. 1993. The life history of the Lithoid crab, *Paralomis granulosa*, in the Falkland Islands. ICES Journal of Marine Science 50: 405-424.

Hucke-Gaete R. 2000. Review on the conservation status of small cetaceans in southern South America. UNEP/CMS Secretariat, Bonn, Germany.

Huin N. 2000. Aspect s of the bre eding biology and foraging ecology of the black-browed albatross *Diomedea melanophris* in the Falkland Islan ds. British Antarctic Survey, Cambridge.

Huin N. 20 01. Censu s of the black-browed albatross p opulation of the Falkland Islands 2000/2001. Falklands Conservation, Stanley.

Huin N. 2002a. Foraging distribution of the black- browed albatross, *Thalassarche melanophris*, breeding in the F alkland Islands. Aqu atic Conservation: Marine and Freshwater Ecosystems 12: 89-99.

Huin N. 20 02b. Year round use of the so uthern oceans by the black-browed albatross breeding in the Falkland Islands. Falkland Conservation, Stanley.

Huin N. 20 03. Falklan d Island Seabird Monitoring Programme Annu al Report 2002/2003. Falklands Conservation, Stanley.

Huin N. 2007a. Falkland Islands Penguin Census. Falklands Conservation, Stanley.

Huin N. 2007b. Falkland Island Seabird Monitoring Programme Annual Report 2003/2004 and 2004/05. Falkland Conservation, Stanley.

Huin N and Reid T. 2007. Census of the black- browed albatross population of the Falkland Islands. Falklands Conservation, Stanley.

Inchausti P, Guinet C, Koudil M, Durbec JP, Barbraud C, Weimerskirch H, Cherel Y and Jouventin P. 2003. I nter-annual variability in the breedi ng performance of se abirds in relation to oceanographic anomalies that affect the Crozet a nd the Kerguelen sectors of the Southern Ocean. Journal of Avian Biology 34: 170–176.

Ingham RJ. 1998. A review of the Falkland I slands seabird monitoring programme 1986-1998. Falklands Conservation, Stanley.

Ingham R. 2000. Environmental impact statem ent on the extraction of calcified seaweed at Spring Point, West Falklands. A Falklands Conservation report to Falkland Islands Development Corporation, Stanley.

Ingham RJ and Summers D. 2002. Falkland I slands Cruise Ship Tou rism: an overview of the 1999-2000 season and the way f orward. Aquatic Conservation: Marine Freshwater and Ecosystems 12: 145-152.

Ingram Hendley N. 193 7. The plankton diatoms of the southern seas. Discovery Reports XVI: 151-364.

Iñiguez MA, Hevia M, Gasparrou C, Tomsin AL and Secchi ER. 2003. Preliminary estimate of incidental mortality of Commerson's dolphins in an artisanal net fishery in La Angelina Beach and Ria Gallegos, Santa Cruz, Argentina. Latin American Journal of Aquatic Mammals 2: 87-94.

Iniguez MA and Tossenberger VP. 2007. Commerson's dolphins (*Cephalorhynchus commersonii*) off Ria Deseado, Patagonia, Argentina. Aquatic Mammals 33: 276 – 285.

International Species Survival Commission. 2006. Global Invasive Species Database.

Jackson JE. 2004. Tasmanian Galaxiidae Recovery Plan 2004-2008. Inland Fisheries Service, Hobart.

Jalink LM and Nauta MM. 1993. The mycoflora of the Falkland Islands: 1 Introduction and preliminary results. In Petrini O and Laursen GA. (eds.) Arctic and Alpine Mycology 3. Bibliotheca Mycologica 150: 105-212.

John DM, Titley I, Lawson GW and Pugh PJA. 1994. Distribution of seaweed floras in the Southern Ocean. Bot. Mar. 37: 235-239.

Joint Nature Conservation Committee. 2004. Guidelines for minimising acoustic disturbance to marine mammals from seismic surveys, April 2004. Joint Nature Conservation Committee.

Jones AG. 2004. Insects of the Falkland Islands. Falklands Conservation, UK.

Jones AG. 2008a. Falkland Islands Invertebrate Conservation Project Report: Volume 1. Invertebrate Practical techniques for invertebrate survey, species identification and collection curation. Falklands Conservation, UK.

Jones AG. 2008b. Falkland Islands Invertebrate Conservation Project Report: Volume 2. Invertebrate Conservation: Necessity and Strategy.

Jones AG. 2008c. Falkland Islands Invertebrate Conservation Project Report: Volume 3. Invertebrate conservation strategy. Falklands Conservation, UK.

Jones AG, Chown SL and Gaston KJ. 2002. Terrestrial invertebrates of Gough Island: an assemblage under threat? African Entomology 10: 83-91.

Jouventin P, Cuthbert RJ and Ottvall R. 2006. Genetic isolation and divergence in sexual traits: evidence for the northern rockhopper penguin *Eudyptes moseleyi* being a sibling species. Molecular Ecology 15: 3413 – 3423.

Kerr JA. 2002. Environmental and management factors affecting the sustainability of native pastures under sheep grazing in the Falkland Islands. PhD thesis. Queens University of Belfast.

Keville D. 1997. A study of the vegetation on Saunders Island, West Falklands. The Queens University of Belfast, Belfast.

Keymer IF, Malcolm HM, Hunt A and Horsley DT. 2001. Health evaluation of penguins (Sphenisciformes) following mortality in the Falklands (South Atlantic). Diseases of Aquatic Organisms 45: 159-169.

Knox GA. 1977. Antarctic polychaete fauna: its characteristics, distribution patterns, and evolution. In Llano GA. (Ed). Adaptions within Antarctic ecosystems. Proceedings of the third SCAR Symposium on Antarctic Biology, Washington, USA.

Lamey CS. 1995. Chick loss in the Falkland skua *Catharacta antarctica*. Ibis 137 231-236.

Lamey TC. 1990. Snares crested penguin in the Falkland Islands. Notornis 37: 78.

Lamey TC. 2003. Territorial aggr ession, timing of egg loss, and eg g-size differences in rockhopper penguins, *Eudyptes c. chrysocome*, on New Island, Falkland Islands. Oikos 66: 293-297.

Laptikhovsky V. 2004. The survival rates of rays discard ed by the s quid-targeting bottom trawl fishery off the Falkland Islands. Fishery Bulletin 102: 757-759.

Laptikhovsky V and Brickle P. 2005. The Patagonian toothfish fishery in Falkland Islands' waters. Fisheries Research 74: 11-23.

Laptikhovsky V, Arkhipkin A and Brickle P. 2006a. Distribution an d reproduction of the Patagonian toothfish *Dissostichus eleginoides* Smitt around the Falkland Islands. Journal of Fish Biology 68: 849–861.

Laptikhovsky V, Pomp ert J and Brickle P. 2006b. Fishery discard management and environmental impact in Falkland Islands Fisher ies. Paper submitted to ICES Conference 2006.

Lavery A. 2004. Falkland Islands spiders, harvestmen and pseudoscorpions. A preliminary report to Falklands Conservation.

Lavery A. 2007. Introduced spiders on the Falkland I slands. A report to Falklands Conservation.

Lawton K, Robertson G, Valencia J, Wienecke B and Kirkwood R. 2003. The status of black-browed albatrosses *Thalassarche melanophrys* at Diego de Almagro Isla nd, Chile. Ibis 145:502–505.

Learmouth JA, MacLeod CD, Santos MB, Pierce GJ, Crick HQP and Robinson RA. 2006. Potential effects of climate change on marine mammals. Oceanography and Marine Biology: An annual review 44:431-464.

Lescrauwaet A, Gibbons J, Guzman L and Schiavini A. 2000. Abundance estimate of Commerson's dolphin in the eastern area of the Strait of Ma gellan – Chile. Revista Chilean de historia natural 73:

Lewis PN, Riddle MJ, Smith SDA. 2005. Assisted passage or passive drift: a comparison of alternative transport mechanisms for non-indigenous coa stal species into the Southern Ocean. Antarctic Science 17: 183-191.

Lewis Smith RI and Prince PA. 1985. The natu ral history of Beauchêne Island. Biological Journal of the Linnaean Society 24: 233-283.

Learmouth JA, MacLeod CD, Santos MB, Pierce GJ, Crick HQP and Robinson RA. 2006. Potential effects of climate change on marine mammals. Oceanography and Marine Biology: An annual review 44:431-464.

Lichter AA. 1986. Records of the beaked whales (Ziphiidae) from the western south Atlantic. Scientific Report of the Whale Research Institute 37: 109-127.

Low AJ and Kerr JA. 2004. Shelter belt trials in the Falkla nd Islands. Scottish Forestry 58: 21 - 30.

MacKay S and Strange I. 2001. Conducting systematic surveys of black-browed albatross (*Diomedea melanophris*) at the Settlement Colony, New Island, Falkland Islands. New Island South Conservation Trust.

MacLeod CD, Perrin WF, Pitman R, Barlow J, Balance L, D'Amico A, Gerrodette T, Joyce G, Mullin KD, Palka DL and Waring GT. 2006. Known and inferred distributions of beaked whale species. Journal of Cetacean Research and Management 7: 271-286.

Madge S and Burn H. 1988. Wildfowl. An identification guide. Helm, London.

Marchant S and Higgins PJ. 1990. Handbook of Australian, New Zealand and Antarctic Birds: Volume 1: Ratites to Ducks. Oxford University Press, Melbourne.

Marin M, Kusch A, Oehler D and Drieschman S. 2006. Distribution, breeding and status of the striated caracara Phalcoboenus australis in southern Chile. Anales Instituto Patagonia (Chile) 34: 65-74.

Matias R. 2005. Rockhopper penguins and some of its predators on New Island, Falkland Islands, Contributions to the knowledge of a globally threatened species. University of Lisbon (Portugal) Biology Degree thesis.

McAdam JH. 1980. Ecological and agronomic studies carried out in the Falkland Islands from 1976 – 1978. Overseas Development Administration, London.

McAdam JH. 1984. The introduction of *Holcus lanatus* by direct drilling following burning of native grassland in the Falkland Islands. Research and Development in Agriculture 1: 165-169.

McAdam JH. 1996. The current status, threats to and conservation of the flora of the Falkland Islands. Aspects of Applied Biology 44: 419-424.

McAdam JH and Walton DWH. 1990. Ecology and agronomy of tussac grass. The Queens University of Belfast, Belfast.

McAdam JH and Broughton DA. 2008. The current status of and threats to the vascular flora of the Falkland Islands, South Atlantic. Anales del Instituto de la Patagonia in press.

McCann TS. 1985. Size, status, and demography of southern elephant seals (*Mirounga leonina*) populations. In Ling, J.K. and Bryden, M.M (Eds.). Studies of sea mammals in southern latitudes. South Australian Museum, Adelaide, South Australia.

McClung MR, Seddon PJ, Massaro M and Setiawan AN. 2004. Nature-based tourism impacts on yellow-eyed penguins *Megadyptes antipodes*: does unregulated visitor access affect fledging weight and juvenile survival? Biological Conservation 199: 279–285.

McCormack C, La milla J, San Martín MJ and Stehmann MFW. 2007. *Bathyraja griseocauda*. 2007 IUCN Red List of Threatened Species.

McDowall RM. 2005. Falkland Islands biogeography: converging trajectories in the South Atlantic Ocean. Journal of Biogeography 32: 49-62.

McDowall RM, Allibone RM and Chadderton WL. 2001. Issues for the conservation and management of Falkland Islands freshwater fishes. Aquatic Conservation: Marine and Freshwater Ecosystems 11: 473-486.

McDowall RM, Allibone RM and Chadderton WL. 2005. Falkland Islands freshwater fishes - a natural history. Canterbury University Press, N.Z.

McLellan I.D. 2001. *Falklandoperla kelper* new genus a nd species of Gripopterygidae (Plecoptera) from the Falkland Islands. Aquatic Insects 23: 153 - 160.

McMahon CR, Bester MN, Burton HR, Hindell MA and Bradshaw CJA. 2005. Population status, trends and a re-examination of the hypotheses explaining the recent decline s of the southern elephant seal *Mirounga leonina*. Mammal Review 35: 82 - 100.

Meiburg JA. 2006. The biogeo graphy of striated car acaras Phalcoboenus australis. University of Texas (USA) Thesis.

Mein B. 1992. Co ntribution to the kno wledge of Antarctic starfishes (Asteroidea, Echinodermata). Mitteilungen aus dem Hamburgischen Zoologischen Museum und Institut 89: 239-259.

Middleton, DAJ, Arkhipkin Al a nd Grzebielec R. 2 001. The biology and fishery of *Macruronus magellanicus* in Falkland Islands waters. Workshop on h oki and southern blue whiting, Chile, 3-7th July 2001.

Miller S. 1998. Fox control on Weddell Island. Wool Press March 1998. FIG Department of Agriculture, Stanley.

Moore DM. 1968. T he vascular flora of th e Falkland Islands. British Antarctic Surve y Report No. 60, Cambridge.

Moors PJ. 2004. Abundance and population trends of mollymawks on Campbell Island. Science for Conservation Report No. 242. New Zealand Department of Conservation , Wellington

Moreno CA, Arata J, Rubilar P and Hucke-Gaete R. 2003. Interacción de la pesquería del bacalao de profundidad con mamíferos y aves marinas. Proyecto FIP No. 20 01 – 31. Universidad Austral de Chile, Valdivia, Chile.

Moreno, C. A., R. Castro, L.J. Mújica and P. Reyes. 2008. A new fishing gear in the Chilean Patagonian too thfish fishery to minimise interactions with toothed whales with associated benefits to seabird conservation. CCAMLR Science in press.

Morrison M, Henry A and Woods RW. 2005. Rare and va grant birds in the Falkland Islands 2005. Wildlife Conservation in the Falkland Islands 5:12 - 14.

Munro G. 2005. Waste discard management in the Falkland Islan ds Trawl Fishery. A report by Falklands Conservation and Falkland Islands Fisheries Department, Stanley.

Munro G. 2007. Outbreak of avian pox virus in gentoo penguins in the Falklands, February 2006. Falklands Conservation, Stanley.

New Island Conservation Trust. 2007. New Island Falkland Islan ds. A South Atlantic Wildlife Sanctuary for conservation manageme nt. New Island Conse rvation Trust, New Island.

Nicholson RA and Harrison I. 2001. An in vestigation into the crude oil contamination of the gentoo penguin colony on Saunders Island, F alkland Islands. British Geologica l Survey Technical Report No 6776/1.

Nisbet ICT. 2000. Disturbance, habituation, and mana gement of water bird colonies. Waterbirds 23: 312-332.

Nolan CP and Liddle GM. 2000. Interactions between killer whales (*Orcinus orca*) and sperm whales (*Physeter macrocephalus*) with a longline fishing vessel. Marine Mammal Science 16: 658-664.

Noon P. 2002. Falkland Islands - Biodiversity Research in Lakes. Sediments in freshwater lakes and ponds. Results of a survey undertaken in February and March 2001. British Antarctic Survey, Cambridge, UK.

Nyegaard M, Arkhipkin A and Brickle P. 2004. Variation in the diet of *Genypterus blacodes* (Ophidiidae) around the Falkland Islands. Journal of Fish Biology 65: 666–682.

Ochyra R and Broughton DA. 2004. New moss records from the Falkland Islands. Journal of Bryology 26: 231-236.

Oldfield S and Sheppard C. 1997. Conservation of biodiversity and research needs in the UK Dependent Territories. Journal of Applied Ecology 34: 1111-1121.

Olsson O. 1997. Effects of food availability on fledging condition and post-fledging survival in king penguin chicks. Polar Biology 18: 161-165.

Otley H. 2006. Nature-based tourism: experiences at the Volunteer Point penguin colony in the Falkland Islands. Marine Ornithology 33: 181-187.

Otley H. and Ingham R. 2003. Marine debris surveys at Volunteer Beach, Falkland Islands, during the summer of 2001/02. Marine Pollution Bulletin 46: 1534 – 1539.

Otley H, Clausen A, Christie D and Pütz K. 2004. Aspects of breeding biology of the Magellanic penguin in the Falkland Islands. Waterbirds 27: 396-405.

Otley H, Clausen A, Christie D and Pütz K. 2005. Aspects of breeding biology of the gentoo penguin in the Falkland Islands. Marine Ornithology 32: 167-171.

Otley H, Shcherbich Z and Arkhipkin A. 2006. The social structure of stranded pods of long-finned pilot whales in the Falkland Islands. A report to Falkland Islands Fisheries Department and Antarctic Research Trust.

Otley H, Clausen A, Christie D, Huin N and Pütz, K. 2007a. Breeding patterns of king penguins from the Falkland Islands. Emu 107: 156-164.

Otley H, Reid T and Pompert J. 2007b. Seabird mortality associated with Patagonian toothfish longliners in the Falkland Islands 2002 – 2004. Marine Ornithology 35: 47 – 55.

Otley H, Munro G, Clausen A and Ingham B. 2008. Falkland Islands State of the Environment Report 2008. Falkland Islands Government and Falklands Conservation, Stanley.

Noon P. 2002. Falkland Islands - Biodiversity Research in Lakes. Sediments in freshwater lakes and ponds. Results of a survey undertaken in February and March 2001. British Antarctic Survey, Cambridge, UK.

Palmer S. 2004. Far from moderate. An account and appraisal of some aspects of the human involvement with the natural environment of the Falkland Islands and South Georgia. A thesis submitted in partial fulfilment of the requirements for the award of the degree of Doctor of Philosophy of the University of Portsmouth.

Park YH, Gamberoni L and Charriaud E. 1993. Frontal structure, water masses, and circulation in the Crozet Basin. Journal of Geophysical Research 98: 12361-12385.

Parker DE, Alexander LV and Kennedy T. 2004. Global and regio nal climate in 2003. Weather 59: 145-152.

Patterson KR. 1986. The Polish fishery for southern blue whiting in the FICZ from July to October 1985. Falkland Islands Fisheries Department Report, Stanley.

Payne AG, Agnew DJ and Brandao B. 2005. Preliminary assessment of the F alklands Patagonian toothfish population: use of recruit ment indices and e stimation of unr eported catches. Fisheries Research 76: 344-358.

Pearce-Higgins JW, Finney SK, Yalden DW and Langston RHW. 2007. Testing the effects of recreational disturbance on to upland breeding waders. Ibis 149: 45-55.

Perry B. 2007. Effect s of non-na tive salmonids on nat ive fish fauna in Chile and the Falkland Islands. MSc Thesis. Department o f Biological Sciences, University of Wales Swansea, UK.

Pfeiffer S and Peter H-U. 2004. Ecological studies toward the management of an Antarctic tourist landing site (Penguin Island, South Shetland Islands). Polar Record 40: 1-9.

Philip E. 2005. Observations of Patagonian fox predation on moulting gentoo penguins and Magellanic penguins. A report to Falklands Conservation, Stanley.

Phillips RA, Catry P Silk JRD, Bea rhop S, Mc Gill R, Afan asyev V and Strange IJ. 2007. Movements, winter distribution and activity patterns of Falkland and brown skuas: insights from loggers and isotopes. Marine Ecological Progress Series 345: 281-291.

Piatkowski U, Pütz K and Heinemann H. 2001. Cephalopod p rey of king penguin *Aptenodytes patagonicus* breeding at Volunteer Beach, F alkland Islands, during austral winter 1996. Fisheries Research 52: 79-90.

Pimper LE, Remis, MI, Baker CS, Olavarria C and Goodall RNP. 20007. The mitochondrial DNA diversity and pop ulation structure of Commerson's dolphin in t heir southern most distribution. 17th Biennial Conference on the Biology of Marine Mammals Poster. Cap e Town December 2007. Society of Marine Mammalogy.

Pitman RL. 2002. Mesoplodont whales. In: Encyclopaedia of marine mammals (Perrin WF, Würsig B and Thewissen JGM, Eds.) Academic Press, San Diego.

Plantlife. 2004. Identifying and protecting the world's most important plant areas. Plantlife International, UK.

Poncet S. 1998. Eradicating foxes from Bea ver Island. Wool Press March 1998. FI G Department of Agriculture, Stanley.

Poncet S. 2003. Sout h Georgia – land and visitor management report. A South Georgia Environmental Baseline Survey Re port to the Government of South Georgia and South Sandwich Islands. South Georgia Surveys, Stanley.

Poncet S, Robertson G, Phillips RA, Lawton K, Phalan B, Trathan PN and Croxall JP. 2006. Status and distribution of wandering, black-browed and grey-headed albatrosses breeding at South Georgia. Polar Biology 29: 772-781.

Prince PA. 1981. The black-browed albatross *Diomedea melanophris* population at Beauchêne Island, Falkland Islands. Comite National Francais des Reserches Antarctiques 51: 111-117.

Pugh PJA and Scott B. 2002. Biodiversity and biogeography of non-marine Mollusca on the islands of the Southern Ocean. Journal of Natural History 36: 927 - 952.

Purves MG, Agnew DJ, Balguerias E, Moreno CA and Watkins B. 2004. Killer whale *Orcinus orca* and sperm whale *Physeter macrocephalus* interactions with longline vessels in the Patagonian toothfish fishery at South Georgia, South Atlantic. CCAMLR Science 11: 1-14.

Pütz K. 2002. Spatial and temporal variability in the foraging areas of breeding king penguins. The Condor 104: 528-538.

Pütz K and Cherel Y. 2005. The diving behaviour of brooding king penguins (*Aptenodytes patagonicus*) from the Falkland Islands: variation in dive profiles and synchronous underwater swimming provide new insights into their foraging strategies. Marine Biology 147: 281-290.

Pütz K, Ingham RJ and Smith JG. 2000a. Foraging movements of Magellanic penguins *Spheniscus magellanicus* during the breeding season in the Falklands. Aquatic Conservation: Marine and Freshwater Ecosystems 12: 75-87.

Pütz K. Ingham RJ and Smith JG. 2000b. Satellite tracking of the winter migration of Magellanic penguins *Spheniscus magellanicus* breeding in the Falkland Islands. Ibis 142: 614-622.

Pütz K, Ingham RJ and Smith JG. 2001. Population trends, breeding success and diet composition of gentoo *Pygoscelis papua*, Magellanic *Spheniscus magellanicus* and rockhopper *Eudyptes chrysocome* penguins in the Falkland Islands. Polar Biology 24: 793-807.

Pütz K, Ingham R.J, Smith JG and Luthi BH. 2002. Winter dispersal of rockhopper penguins *Eudyptes chrysocome* from the Falkland Islands and its implications for conservation. Marine Ecology Progress Series 240: 273-284.

Pütz K, Clausen AP, Huin N and Croxall JP. 2003a. Re-evaluation of historical rockhopper penguin population data in the Falkland Islands. Waterbirds 26: 169-175.

Pütz K, Smith JG, Ingham RJ and Luthi B. 2003b. Satellite tracking of male rockhopper penguins *Eudyptes chrysocome* during the incubation period at the Falkland Islands. Journal of Avian Biology 34: 139-144 .

Pye T and Bonner WN. 1980. Feral brown rats, *Rattus norvegicus*, in South Georgia (South Atlantic Ocean). Journal of Zoology London 192: 237-255.

Quillfeldt P, Masello JF and Strange IJ. 2003. Breeding biology of the thin-billed prion *Pachyptila belcheri* at New Island, Falkland Islands: egg desertion, breeding success and chick provisioning in the poor season 2002/2003. Polar Biology 26: 746-752.

Quillfeldt P, Strange IJ and Masello JF. 2005. Escape decisions of incubating females and sex ratio of juveniles in the Upland Goose *Chloephaga picta*. Ardea 93: 171-178.

Quillfeldt P, Masello JF, Strange IJ and Buchanan KL. 2006. Begging and provisioning of thin-billed prions *Pachyptila belcheri* are related to testosterone and corticosterone. Animal Behaviour 71: 1359-1369.

Quillfeldt P, Strange IJ, Segelbacher G and Masello JF. 2007a. Male and female contributions to provisioning rates of thin-billed prions *Pachyptila belcheri* in the South Atlantic. Journal of Ornithology online.

Quillfeldt P, Strange IJ and Masello JF. 2007b. Sea surface temperatures and behavioural buffering capacity in thin-billed prions: breeding success, provisioning and chick begging. Journal of Avian Biology 38: 298-308.

Quillfeldt P, Schenk I, McGill RAR, Strange IJ, Masello JF, Gladbach A, Roesch V and Furness RW. 2008. Introduced mammals coexist with seabirds at New Island, Falkland Islands: abundance, habitat preferences, and stable isotope analysis of diet. Polar Biology 31: 333-349.

Quintana F and Dell'Arciprete OP. 2002. Foraging grounds of southern giant petrels (*Macronectes giganteus*) on the Patagonian shelf. Polar Biology 25: 159-161.

Rayner NA, Parker DE, Norton EB, Folland CK, Alexander LV, Rowell DP, Kent EC and Kaplan A. 2003. Globally complete analyses of sea surface temperature, sea ice and night marine air temperature, 1871-2000. Journal of Geophysical Research 108: 4407

Reeves RR, Smith BD, Crespo EA and Notarbartolo di Sciara G. (Compilers). 2003. Dolphins, Whales and Porpoises: 2002–2010 Conservation Action Plan for the World's Cetaceans. IUCN/ SSC. Cetacean Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK.

Reid T and Catry P. 2006. The white-chinned petrel population of the Falkland Islands. Falklands Conservation and New Island South Conservation Trust, Stanley.

Reid T and Edwards E. 2005. Consequences of the introduction of tori lines in relation to seabird mortality in Falkland Islands trawl fishery, 2004/05. Falklands Conservation, Stanley.

Reid T and Huin N. 2005. Census of the southern giant petrel population of the Falkland Islands. Falklands Conservation, Stanley.

Reid TA, Sullivan BJ, Pompert J, Enticott JW and Black AD. 2004. Seabird mortality associated with Patagonian toothfish (*Dissostichus eleginoides*). Emu 104: 317-325.

Reid T, Yates O and Crofts S. 2006. Interactions between seabirds and jigging vessels in the Falkland Islands and on the high seas. Falklands Conservation, Stanley.

Reid T, LeCoq M and Catry P. 2007. The white-chinned petrel *Procellaria aequinoctialis* population of the Falkland Islands. Marine Ornithology 35: 57 – 60.

Reinhart K, Hahn S, Peter UH and Wemhoff H. 2000. A review of the diets of southern hemisphere skuas. Marine Ornithology 28: 7-19.

Renewable Resources Assessment Group. 2006. The Falkland Islands Fisheries Research: 21 March 2006. Imperial College, London.

Reynolds JW and Jones AG. 2006. The earthworms of the Falkland Islands. Megadrilogica 10: 75 - 86.

Robertson G, Moreno CA, Lawton K, Kirkwood G and Valencia J. 2008. Comparison of census methods for black-browed albatrosses breeding at the Ildefonso Archipelago, Chile. Polar Biology 31: 153-162.

Robineau D, Goodall RNP, Pichler F and Baker CS. 2007. Description of a new subspecies of Commerson's dolphin, , inhabiting the coastal waters of the Kerguelen Islands. Mammalia 71: 172 – 180.

Robinson G. 1984. Insects of the Falkland Islands: a checklist and bibliography. Dorest Press, UK.

Rodhouse PG, Symon C and Hatfield EMC. 1992. Early lifecycle of cephalopods in relation to the major oceanographic features of the southwest Atlantic Ocean. Marine Ecology Progress Series 89: 183-195.

RSP Energy. 2006. Environmental impact assessment for offshore drilling the Falkland Islands to Desire Petroleum PLC. RPS Group Plc, UK.

RSP Energy. 2007. Seabird and marine mammal observations during 2D seismic survey in south Falklands basin Survey No: FOGL06 (N &S). RPS Energy Group Plc, UK.

Sacau M, Pierce GP, Wang J, Arkhipkin AI, Portela J, Brickle P, Santos MB, Zuur AF and Cardoso X. 2005. The spatio-temporal pattern of Argentine shortfin squid *Illex argentinus* abundance in the southwest Atlantic. Aquatic Living Resources 18: 361-372.

Scarpaci C, Parsons E CM and Luck M. 2007. Recent advances in whale watching research: 2006-2007. Paper presented at the 59th meeting of the International Whaling Commission Scientific Committee.

Scott J. 1998. Weddell Island shore-bird surveys, February 1998. Tasmania, Australia.

Shaw PW. 2006. Genetic relationships within groups of long finned pilot whales involved in mass strandings in the Falkland Islands: a test of molecular genetic marker systems for suitability to address this issue. Environmental and Evolutionary Biology Research Group, School of Biological Sciences, Royal Holloway, University of London.

Shumway SE, Allen SM and Boersma PD. 2003. Marine birds and harmful algal blooms: sporadic victims or under-reported events? Harmful Algae 2: 1-7.

Silva MC, Boersma PD, MacKay S and Strange I. 2007. Egg size and parental quality in thin-billed prions *Pachyptila belcheri*: effects on offspring fitness. Animal Behaviour 74: 1403-1412.

Simeone A and Schlatter RP. 1998. Threats to a mixed-species colony of *Spheniscus* penguins in southern Chile. Colonial Waterbirds 21: 418-421.

Simmonds MP and Issac SJ. 2007. The impacts of climate change on marine mammals: early signs of significant problems. Oryx 41: 19-26.

Simpson B and Hellstorm J. 2004. Biosecurity for the Falkland Islands. Biosecurity Limited, New Zealand.

Skottsberg C. 1913. A botanical survey of the Falkland Islands. Kungliga Svenska Vetenskapsakademiens Handlingar 50: 1-129.

Slip DJ, Hindell MA and Burton HR. 1994. Diving behaviour of southern elephant seals from Macquarie Island, An overview in Elephant Seals, Population Ecology, Behaviour and Physiology, edited by Le Boeuf, B.J. and Laws, R.M. University of California Press

Smith JG. 1998. Oiled Seabirds in Falkland Waters. The Warrah 14: 8-9.

Smith J and Otley H. in prep. Beaked whale records in the Falkland Islands.

Standring KT. 1982. Application of the Ramsar Convention to the Falkland Islands. NCC Report, UK.

Standring KT. 1995. A new look at nature conservation law in the Falkland Islands. Report for Falklands Conservation.

Stary J. and Block W. 1996. Oribatid mites (Acari: Oribatida) of the Falkland Islands, South Atlantic and their zoogeographical relationships. Journal of Natural History 30: 523 - 535.

Stock JH a and Platvo et D. 1991 . The freshwater Amp hipoda of the Falkland Islands. Journal of Natural History 25: 1469 - 1491.

Stone P and Aldiss D. 2000. Th e Falkland Islands. Re ading the r ocks – a geological travelogue. NERC and FIG, Stanley.

Stone P, Merriman RJ and Kemp SJ. 2003. The calcifie d seaweed (maerl) deposits of th e Falkland Islands. British Geological Survey Internal Report, UK.

Strange IJ. 1980. The thin-billed prion, *Pachyptila belcheri*, at New Island, Falkland Islands. Gerfaut 70: 411-445.

Strange IJ. 1982. Breeding ecolog y of the roc khopper penguin (*Eudyptes crestatus*) in the Falkland Islands. Gerfaut 72: 137-188.

Strange IJ. 1989. Conservation and Environmental Assessment Report. Report for the Falkland Islands Government.

Strange IJ. 1990. Th e impact of tourism on the Falklands environment and wildlife. A report to FIG.

Strange IJ. 1992. A field guide to the wildlife of the Falkland Islands and South Georgia . Harper and Collins, London.

Strange IJ. 1996. The striated car acara *Phalcoboenus australis* in th e Falkland Islands. New Island South Conservation Foundation and Trust, Stanley.

Strange IJ. 2001. Black-browed albatross (*Diomedea melanophris*) population census, New Island South. Penguin News, New Island South Con servation Trust Supplement 3, Noember 2, 2001.

Strange IJ, Parry CJ, Parry MC and Woods RW. 1988. Tussac gr ass in the Falkland Islands. Falkland Islands Project Report.

Sullivan B. 2004. Colour marking of fle dgling black-browed albatross. Falklands Conservation, Stanley.

Sullivan BJ, Brickle P, Reid TA, Bo ne TG and Middleton DAJ. 2006a. Mitigation of seabird mortality on factory trawlers: trials of three d evices to re duce warp cable strike s. Polar Biology 29: 745-753.

Sullivan BJ, Reid TA and Bugoni L. 2006b. Seabird mortality on factory trawlers in the Falkland Islands and beyond. Biological Conservation 131: 495-504.

Summers D. 2000. E xpedition Cruise Ship Passenger M anagement Techniques in the Falkland Islands 1999-2000. Falklands Conservation Report, Stanley.

Summers B. 2007. South Atlantic Invasive Species Report Background Report: Falkland Islands. South Atlantic Invasive Species Project, RSPB, UK.

Summers RW and McAdam J. 1993. The Upland Goose. Bluntisham Books, UK.

Sutherland WJ. 2007. Future directions in disturbance research. Ibis 149: 120-124.

Tasker ML, Webb A, Harrison NM and Pienkowski MW. 1990. Vulnerable concentrations of marine birds west of Britain. Nature Conservancy Council, Peterborough

Thompson D and Moss S. 2001. Foraging Behaviour of South American Fur Seals (*Arctocephalus australis*) in the Falkland Islands. NERC Sea Mammal Research Unit, University of St Andrews.

Thompson D, Duck CD, McConnell BJ and Garrett J. 1998. Foraging behaviour and diet of lactating female southern sea lions (*Otaria flavescens*) in the Falkland Islands. Journal of Zoology London 246: 135-146.

Thompson D, Moss S and Lovell P. 2003. Foraging Behaviour of South American Fur Seals *Arctocephalus australis*: extracting fine scale foraging behaviour from satellite tracks. Marine Ecology Progress Series 260: 285-296.

Thompson D, Strange I, Riddy M and Duck CD. 2005. The size and status of the population of southern sea lions *Otaria flavescens* in the Falkland Islands. Biological Conservation 121: 357-367.

Thompson KR. 1992. Quantitative analysis of the use of discards from squid trawlers by black-browed albatrosses *Diomedea melanophris* in the vicinity of the Falkland Islands. Ibis 134: 11-21.

Thompson KR. 1993. Variation in Magellanic penguins (*Spheniscus magellanicus*) diet in the Falkland Islands. Marine Ornithology 21: 57-67.

Thompson KR and Riddy MD. 1995. Utilisation of offal discards from finfish trawlers around the Falkland Islands by black-browed albatross *Diomedea melanophris*. Ibis 137: 198-206.

Thompson KR and Rothery P. 1991. A census of the black-browed albatross *Diomedea melanophrys* population on Steeple Jason Island, Falkland Islands. Biological Conservation 56: 39-48.

Tingley G, Saunders G, Harries D and King J. 1996. The first shallow marine survey around the Falkland Islands. IC Consultants Ltd and Brown and Root Environmental, UK.

Towns DR, Atkinson IAE and Daugherty CH. 2006. Have the harmful effects of introduced rats on islands been exaggerated? Biological Invasions: 1-29.

Uhart M, Karesh W, Cook R, Huin N, Lawrence, K and Guzman L. 2004. Paralytic shellfish poisoning in gentoo penguins from the Falkland (Malvinas) Islands. Proceedings AAZV, WDA Joint Conference.

UK Biodiversity Group. 1998. Tranche 2 Action Plans: Vol II – Terrestrial and Freshwater Habitats, 86pp. Peterborough. English Nature.

United States National Research Council (USNRC). 2003. Oil in the Sea III: Inputs, Fates and Effects. National Academy Press, Washington, DC.

Upson R. 2007. Important Plant Areas: A Study of their Appropriateness for Plant Conservation in the Falkland Islands. Unpublished report, Royal Botanic Gardens, Kew.

Upton J and Shaw CJ. 2002. An overview of the oceanography and meteorology of the Falkland Islands. Aquatic Conservation and Freshwater Ecosystems 12: 15-25.

van Heezik Y and Seddon PJ. 1990. Effect of human disturbance on beach groups of jackass penguins. South African Journal of Wildlife Research 20: 89-93.

van Polanen Petel TD, Terhune JM, Hindell MA and Giese MA. 2006. An assessment of the audibility of sound from human transport by breeding Weddell seals (*Leptonychotes weddelli*). Wildlife Research 33: 275-291.

Varham K. 2006. Non-native species in UK Overseas Territories: a review. JNCC Peterborough.

Vaz Ferriera R. 1981. South America sea lion. In: Ridgway SH, Harrison RJ (eds.) Handbook of Marine Mammals. Academic Press, San Diego.

Viddi FA and Lescrauwaet A-K. 2005. Insights on habitat selection and behavioural patterns of Peale's dolphins (*Lagenorhynchus australis*) in the Strait of Magellan, southern Chile. Aquatic Mammals 31: 176-183.

Votier SC, Furness RW, Bearhop S, Crane JE, Caldow RWG, Catry P, Ensor K, Hamer KC, Hudson AV, Kalmach E, Klomp NI, Pfeiffer S, Phillips RA, Prieto I and Thompson DR. 2004. Changes in fisheries discard rates and seabird communities. Nature 427: 727-730.

Walker BG, Boersma PD and Wingfield JC. 2006. Habituation of adult Magellanic penguins to visitation as expressed through behaviour and cortosterone secretion. Conservation Biology 20: 146-154.

Wanless S. and Harris MP. 1991. Diving patterns of full-grown and juvenile rock shags. The Condor 93: 44-48.

Wanless, RM, Angel A, Cuthbert RJ, Hilton GM and Ryan PG. 2007. Can predation by invasive mice drive seabird extinctions? Biology Letters: 3: 241-244.

Watling R. 2000. Report on the fungi of the Falklands. Caledonian Mycological Enterprises.

Watling R. 2002. Report on the fungi of the Falklands - 2. Caledonian Mycological Enterprises.

Watson RT, Zinyowera MC and Moss RH. 1997. IPCC Special report on the regional impacts of climate change. An assessment of vulnerability. IPCC report, UK.

Weimerskirch H. 2004. Diseases threaten Southern Ocean albatrosses. Polar Biology 27: 374 – 379.

Weimerskirch H, Stahl JC and Jouventin P. 1992. The breeding biology and population dynamics of king penguins *Aptenodytes patagonicus* on the Crozet Islands. Ibis 134: 107-117.

Westermeier H and Patino D. 1999. Characterisation of seaweeds populations inhabiting the Falkland Islands. Research Institute Unknown (Chile?).

White RW and Clausen AP. 2002. Rockhopper *Eudyptes chrysocome chrysocome* x macaroni *E. chrysolophus* penguin hybrids apparently breeding in the Falkland Islands. Marine Ornithology 30: 40–42.

White RW, Reid JB, Black AD and Gillon KW. 1999. Seabirds and marine mammal dispersion in the waters around the Falkland Islands 1998-1999. JNCC, Peterborough.

White RW, Gillon, KW, Black AD and Reid JB. 2001. Vulnerable concentrations of seabirds in Falkland Islands waters. JNCC, Peterborough.

White RW, Gillon KW, Black AD and Reid JB. 2002. The distribution of seabirds and marine mammals in Falkland Island waters. JNCC, Peterborough

Whitehead J. 2008. Priorities for Control: A Risk Assessment of Introduced Species on the Falkland Islands. A RSPB Report to the South Atlantic Invasive Species Project. RSPB, Scotland.

Williams 1995. The Penguins. University Press, Oxford

Wilson P, Clark R, McAdam JH and Cooper EA. 1993. Soil erosion in the Falkland Islands. Applied Geography 13: 329 – 352.

Winter M. 1991. Birdwatching in the Mare Harbour area of East Falkland. *Sea Swallow* 40:13-15

Woods RW. 1970. Great shearwater *Puffinus gravis* breeding in the Falkland Islands. Ibis 112: 259-260.

Woods RW. 1975. The birds of the Falkland Islands. Anthony Nelson, Shropshire.

Woods RW. 1984. A Census of Breeding Falkland Islands Passerines in Tussac Grass. Privately published report on the Avian Ecology Expedition of 1983, to The Royal Society of London, National Geographic Society, Washington, DC, Royal Geographical Society, London etc. and copied to Stanley Library.

Woods RW. 1988. Guide to birds of the Falkland Islands. Anthony Nelson, Shropshire.

Woods RW. 1993. Cobb's wren *Troglodytes cobbi* of the Falkland Islands. Bulletin of the British Ornithologists' Club 113: 195-207.

Woods RW. 2000a. Flowering plants of the Falkland Islands. Falklands Conservation, London.

Woods RW. 2000b. Update on Cobb's wren. The Warrah 17.

Woods RW. 2001. A survey of the number, size and distribution of islands in the Falklands archipelago. The Falkland Islands Journal 7: 1-25.

Woods RW. 2007a. Distribution and abundance of the striated caracara *Phalcoboenus australis* in the Falkland Islands 2006. Falklands Conservation, Stanley.

Woods RW. 2007b. Felton's flower is not a Falkland endemic plant. Wildlife Conservation in the Falkland Islands 8:15.

Woods RW and Smith JG. 1999. The distribution and abundance of the striated caracara *Phalcoboenus australis* in the Falkland Islands, 1997-1998. Falkland Conservation, Stanley.

Woods RW and Woods A. 1997. Atlas of breeding birds of the Falkland Islands. Anthony Nelson, Oswestry, England.

Woods RW and Woods A. 2006. Birds and Mammals of the Falkland Islands. WILDGuides, UK.

Woodworth PL, Pugh DT, Meredith MP and Blackman DL. 2005. Sea level changes at Port Stanley, Falkland Islands. Journal of Geophysical Research 110: 1-22.

Yates O and Brickle P. 2007. On the relative abundance and distribution of sperm whales

(*Physeter macrocephalus*) and killer whales (*Orcinus orca*) in the Falkland Islands longline fishery. Journal of Cetacean Research and Management 9: 65 – 71.

Yates O, Black A and Palavecino P. 2004. Initial survey of killer whales (*Orcinus orca*) at Sea Lion Island. A report to Falklands Conservation.

Yorio P, Frere E, Gandini P and Schiavini A. 2001. Tourism and recreation at seabird breeding sites in Patagonia, Argentina: current concerns and future prospects. Bird Conservation International 11: 231–245.

Zapata S, Travaini A, Delibes M, and Martínez-Peck R. 2005. Food habits and resource partitioning between grey and culpeo foxes in southeastern Argentine Patagonia. Studies on Neotropical Fauna and Environment 40: 97-103.

Zyryanov VN and Severov DN. 1979. Water Circulation in the Falkland-Patagonian region and its seasonal variation. Oceanology 19: 518-522.