

Marion Island Killer Whales 2006-2013

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Mammal Research Institute





National Research Foundation Thutuka Programme

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Ryan Reisinger: p 15, p 24

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Other:

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Introduction

It's almost as if Marion Island doesn't exist. Scan a world map or globe and you won't easily find it, if it is indicated at all. The Prince Edward Islands – consisting of Prince Edward Island (45 km²) and the larger Marion Island (300 km²) – are a couple of pinpricks in the vast, frigid Southern Ocean. The remote islands lie some 1,700 km south east of Cape Town and the nearest terra firma – 950 km to the east - is the equally isolated Crozet Archipelago. Yet such islands are vital to millions of seals and seabirds which are drawn there by the physical necessity of breeding ashore. The Prince Edward Islands support breeding populations of thousands of southern elephant seals, Antarctic fur seals and Subantarctic fur seals as well as hundreds of thousands of king, macaroni, rockhopper and gentoo penguins. Drawn in turn by these predators are the oceans' apex predators: killer whales.

Killer whales are among the most widespread mammals on earth, having been recorded in every ocean and sea. Globally, they predate on a massive variety of animals and over 140 species have made it into a killer whale stomach somewhere. Among the most remarkable aspects of their ecology is their ability to adapt their behaviour, both social and hunting, to exploit available prey. Their massive size (the heaviest killer whale recorded weighed 6,600 kg; males measure up to 9 m long, females up to 7.7 m), mobility, large energy requirements

and diverse diet means they potentially exert a very strong influence on marine ecosystems.

Killer whales are most abundant at Marion Island during the summer when seals and penguins breed on the island. The whales patrol up and down the leeward eastern coast, their presence occasionally betrayed by their large black dorsal fins or loud blows as they breathe. They regularly swim as shallow as they can, rubbing right up against the rocky shore. The adult males are easily recognised by their huge, spike like dorsal fins which can grow up to 1.8 m tall and tower above the water surface. The whales presumably prefer elephant seals for their high fat, and thus energy, content, but they also take Subantarctic fur seal pups (although they seem to ignore adults entirely) as well as king, rockhopper and macaroni penguins.

Killer whales frequent the island in small groups; most often 3 individuals. Their residence patterns vary from whales seen regularly throughout the year to those seen mainly in summer but most individuals are sighted year after year. Nine whales have been photographed around the Crozet Islands as well as at Marion.

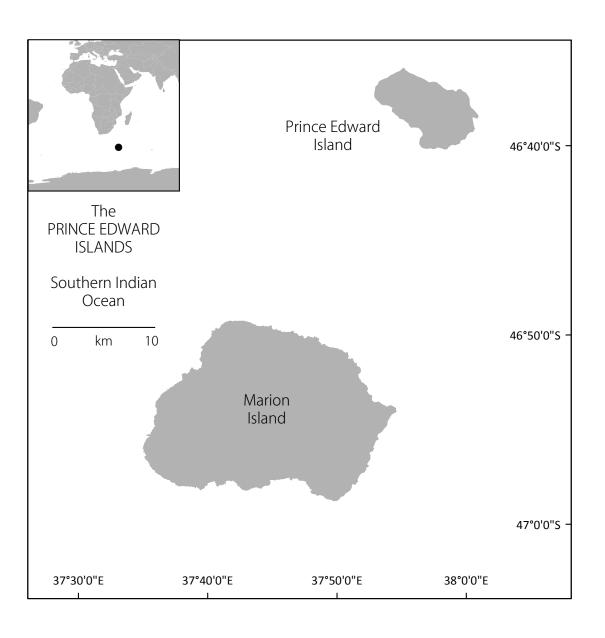
Group composition is quite stable; a result of their highly matrilineal society. In certain populations a female's offspring (up to 2 or 3 generations) will remain associated with her for their entire lifetimes. However, groups which feed on mammalian prey have energetic constraints on their group size resulting from their diet, which forces some individuals in

a matriline to disperse for long periods, or permanently. Their close, stable associations offer benefits such as cooperative hunting. Hunting behaviours seem to represent culture transmitted through social learning as evidenced by such unique hunting behaviours as washing seals off ice floes in the Antarctic or carousel feeding on herring in the North Atlantic. An adaptive feeding strategy which is causing headaches among fisherman is stealing fish off longlines. Within the Crozet Islands' Exclusive Economic Zone, killer whales are estimated to steal about 27% of Patagonian toothfish off longlines with fish losses adding up to millions of Euros. A small number of these whales are sighted inshore at Marion Island where they probably take other prey as well, representing a remarkable range of feeding strategies.

The late Michael Biggs's insight in the 1970s that killer whale individuals could reliably be identified by characteristics (such as scars, mutilations and colouring) of their dorsal fins was a game changer. For the first time scientists could relatively easily start collecting long-term datasets on individual whales. Yet research on killer whales at Marion was relatively sporadic and opportunistic until 2006 when a comprehensive photographic catalogue was started by the Mammal Research Institute, helped greatly by the widespread advent of digital photography. The catalogue now includes 56 individuals and represents the massive field efforts of dedicated Sealers and Whalers - field assistants of the Mammal Research Institute who spend a year on the island, braving isolation and foul weather to regularly photograph

individuals. The resulting photo-ID dataset is the foundation of a growing research programme and the metaphorical spotlight illuminating killer whale ecology at Marion. Besides providing context for several research aspects (mentioned below) the dataset has already been used to estimate the size of the population at Marion and is currently being used to elucidate their social organization; some of these preliminary results are presented as social networks in this catalogue. Years down the line this dataset will be used to investigate the population's demography and facilitate comparisons with other populations. For instance, resident killer whales in the Northeast Pacific reach ages of 80-90 and survive for decades post-reproductively.

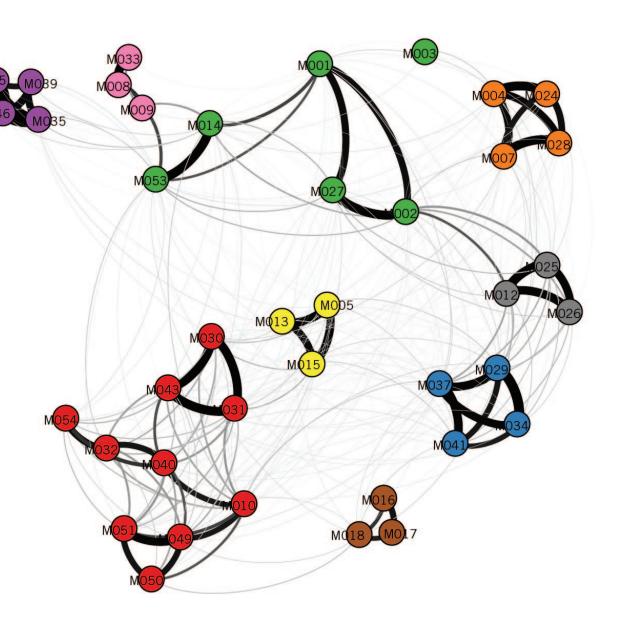
Quite unusually (and fortunately, given the ferocious temperament of the Southern Ocean) all killer whale work at the island is shore-based. The difficulties of studying such cryptic, deep-diving and far-ranging animals have inspired some creative technology and thinking among marine mammalogists. To address questions about the diet, movement patterns and population structure of killers at Marion, the Mammal Research Institute is currently also remotely deploying satellite tags on whales and collecting biopsy samples for stable isotope, fatty acid and genetic analyses. Still, questions about their ecology offshore are particularly vexing: where do killer whales go when they aren't at Marion, and do they switch prey there?



Association

Each node (coloured circle) represents an animal and each vertex (line between two nodes) represents the association between two animals. Thicker lines mean animals are more associated. Individuals are divided into social units (indicated with colours) using a community detection algorithm. Animals seen fewer than 5 times are not included. (Reisinger et al. in prep.)

network



Key

Dorsal fin ID image

..... Unique ID

Age-sex class

Year of birth and death

An M prefix indicates Marion Island. Eight individuals have been sighted at the Crozet Islands as well as Marion; they addtionally have a Crozet ID, indicated with a C prefix.

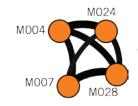


que ID M004
Name Dot
ex class Adult female

Known (solid line) or presumed (dashed line) mother-offspring relationship



M024 David Juvenile 2008-2012



Sub-network representing the social unit.

Each node (coloured circle) represents an animal and each vertex (line between two nodes) represents the association between two animals. Thicker lines mean animals are more associated. The complete network is shown on p 11. Animals seen fewer than 5 times are not included.

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M001 Halfmoon Subadult male



M002 Linus Adult female



M003



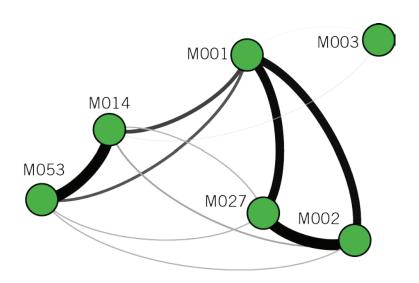
M014 Scratches



M053 -Juvenile



M027 Seabiscuit Juvenile 2008-





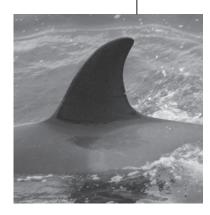
M004 Dot Adult female



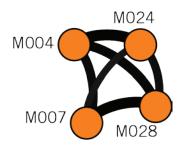
M007 Max Adult male



M028 Ink Adult female



M024 David Juvenile 2008-2012





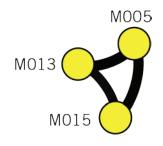
M005 Atlas Adult male



M013 Blade Adult female



M015 Clymene Adult female





M010 Bruce Adult male



M032 -Adult female



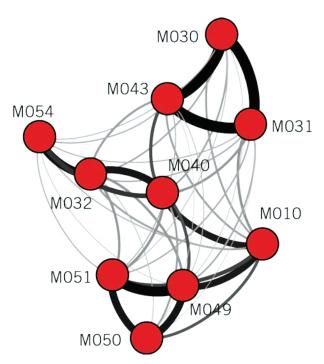
M040 Bullseye Juvenile



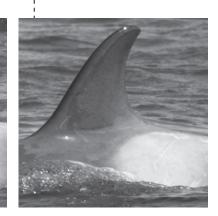
M049 Angle Fin Adult female



M054 -Juvenile

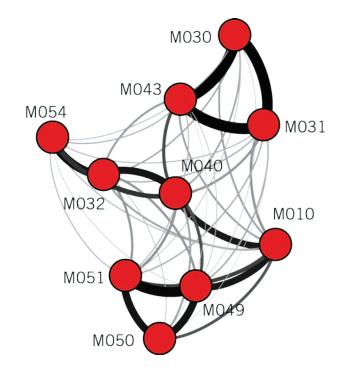






M051 -Juvenile

^{*} Continued on next page





M030 Top Notch Subadult male



M031 Bent Adult female



M043 BJ Juvenile



M012 Valentine Adult female



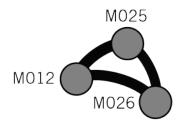
M025 Agent 25 Juvenile



M026 O'Neill



M060 Griffin Juvenile 2013-



^{*} Not included in the graph at right



M029 Ebony Adult female

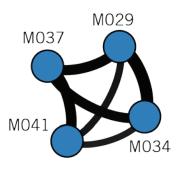
M037 Titus Adult female





M034 lvory Juvenile 2008-

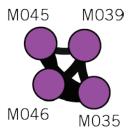
M041 Magnum Juvenile





M035 Supernova Adult female

M045 Sirius Adult female







M039 Nova Juvenile 2011-

M046 Jackson Juvenile





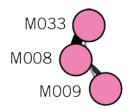
M008 / C134 Poseidon Adult male

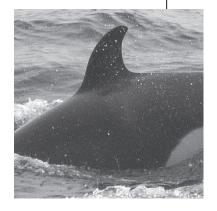


M009 / C159 Razor



M033 / C160 Phoenix Adult female





M048 Jasper Juvenile 2012-

^{*} Not included in the graph at left



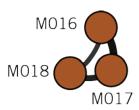
M016 / C025 Hercules Adult male



M017 / C127 Xena Adult female



M018 / C119 -Adult female





M058

Juvenile 2013-



M042 / C188

Juvenile 2009-

^{*} Not included in the graph at left

^{*} Not included in the graph at left





M006 Harriet Adult female



M011 Michael Adult male



M019 -Adult male



M020 -Adult female



M021 -Juvenile



M022 -Adult female



M023 / C012 -Adult female



M036 Rake



M047 -Adult female



M055 -Adult female



M038 -Juvenile 2008-



M056 -Juvenile





M057 -Adult male

M059 Delta Adult female

Index of individuals

ID	Class	Name	Page	ID	Class	Name	Page
M001	SAM	Halfmoon	16	M030	SAM	Topnotch	20
M002	AF	Linus	16	M031	AF	Bent	20
M003	-	-	16	M032	AF	=	19
M004	AF	Dot	17	M033	AF	Phoenix	25
M005	AM	Atlas	18	M034	J	lvory	22
M006	AF	Harriet	28	M035	AF	Supernova	23
M007	AM	Max	17	M036	-	Rake	29
M008	AM	Poseidon	25	M037	AF	Titus	22
M009	-	Razor	25	M038	J	-	29
M010	AM	Bruce	19	M039	J	Nova	23
M011	AM	Michael	28	M040	J	Bullseye	19
M012	AF	Valentine	21	M041	J	Magnum	22
M013	AF	Blade	18	M042	J	-	26
M014	-	Scratches	16	M043	J	BJ	20
M015	AF	Clymene	18	M045	AF	Sirius	23
M016	AM	Hercules	26	M046	J	Jackson	23
M017	AF	Xena	26	M047	AF	-	29
M018	AF	-	26	M048	J	Jasper	25
M019	AM	-	28	M049	AF	Angle Fin	19
M020	AF	-	28	M050	J	-	19
M021	J	-	28	M051	J	-	19
M022	AF	-	29	M053	J	-	16
M023	AF	-	29	M054	J	-	19
M024	J	David	17	M055	AF	-	29
M025	J	Agent 25	21	M056	J	-	29
M026	-	O'Neill	21	M057	AM	-	30
M027	J	Seabiscuit	16	M058	J	-	26
M028	AF	Ink	17	M059	AF	Delta	30
M029	AF	Ebony	22	M060	J	Griffin	21

