Expert advice on the releasability of the rescued killer whale (*Orcinus orca*) Morgan

Dolfinarium Harderwijk- SOS Dolfijn

Date: 14th November 2010

Contributing experts:

Kees Camphuysen
John Ford
Christophe Guinet
Mardik Leopold
Christina Lockyer
James McBain DVM
Fernando Ugarte

Author: Niels van Elk

Content

Prologue

This document is written to facilitate a careful and transparent choice on whether a juvenile successfully rescued killer whale should be released or remain under human care.

The Dolfinarium has a longstanding history, since 1967, of rehabilitating toothed cetaceans of various species (recently reorganised and tasked to the association SOS Dolfijn). It is therefore well acquainted with the problems that surround rehabilitation and release. In 2003 a document was written which outlined the strategy and protocols for rehabilitation and release of harbour porpoises, which are the vast majority of animals rescued[27].

Before 1987 killer whales were part of the collection of marine mammals of the Dolfinarium in Harderwijk and some expertise on handling this species was still present when Morgan arrived. We did however not have any biologists with specific expertise on this species amongst us.

Magnus Wahlberg was therefore approached. He is a field biologist and member of the scientific committee of Compagnie des Alpes. He often works in northern latitudes and it was estimated he would know biologists with expertise that could help. He proposed Christina Lockyer and Fernando Ugarte. Kees Camphuysen was asked as he is very knowledgeable on cetaceans and on the prevalence and life history of cetaceans in Dutch waters. Andrew Foote of the North Atlantic Killer Whale ID group proposed Professor John Ford, who is one of the worlds leading authorities on killer whale biology. James McBain has helped with veterinary advice and as he has a lifetime experience with killer whales under human care, was acquainted with the inns and outs of Morgan's case, and had involvement with the only successfully rehabilitated and released killer whale so far, was asked to contribute as well. The Ministry of Agriculture proposed Mardik Leopold. Fabienne Delfour who is also a member of the Scientific Committee of Compagnie des Alpes suggested Christophe Guinet as a contributor.

All contributors have gathered their expertise while doing field work on cetaceans or worked with killer whales during field research or in marine mammal parks. Some have been closely involved in the release attempts of killer whales in the past.

The contributors were asked to give their opinion on whether release was a feasible option. They were free to give their contribution in whatever form they chose. They were unaware of each other's identity as we wanted individual and independent opinions. In order for the author to be able to write an analysis and come to a conclusion the contributions would have to be clear in the answer they provided. In case opinions were to be divided a round table conference was meant to follow this round of consultations.

The introduction was written to provide basic knowledge on killer whales so outsiders can become familiar with the problems that are involved when considering the release of a killer whale. Available information on killer whales in the North East Atlantic, where this killer whale's roots must somewhere be present was summarized.

Furthermore the rescue and particulars of this killer whale are provided. These facts are important for making a choice.

The three historic cases where release of a killer whale has been considered or executed have been described in short as they are exemplary of the potential of failure, success and related problems that have been experienced in the past.

This document was compiled by Niels van Elk who also wrote the introduction, analysis and conclusion. Niels van Elk is a marine biologist and veterinarian who works for the Dolfinarium since 1998. He is the supervising veterinarian of the rehabilitation centre and co-author of the document that outlines the Dolfinarium (SOS Dolfijn)'s strategy for helping stranded cetaceans (see reference 27).

Acknowledgements

The generous help of the contributors is kindly acknowledged. Our gratitude also goes to Andrew Foote for helping with the DNA analysis and his continuous advice. Finally we would like to voice our tremendous appreciation for Filipa Samarra, Anne-Valérie Duc and Patrick Miller of St Andrew's University SeaMammal Research Unit for their help in gathering and analysing the vocal repertoire of Morgan.

Introduction

The question at hand

SOS Dolphin has rehabilitated a debilitated killer whale in cooperation with the Dolfinarium Harderwijk. The killer whale is approaching physical health and normal weight.

It is the policy of SOS dolphin and the Dolfinarium to release successfully rehabilitated animals on the condition that release is harmless to the environment and the released animal has a similar chance of survival as any member of its species in the wild.

The question this document aims to answer is if release of the rescued killer whale should be attempted bearing in mind the welfare and survival chances of the animal once released.

At the Dolfinarium and SOS Dolfijn expertise on harbour porpoises (the most common rescued species) is present and for this species criteria are set which a release candidate has to fulfil in order that release is attempted[27].

For killer whales such expertise is not present.

Professionals with expertise of cetaceans, and killer whales in particular, have been approached and asked to give their opinion on the question whether release should be attempted. They have gathered their expertise by field research or their work in a zoological garden or involvement with previous rescue and release attempts of killer whales or all of the above.

The rescue

During the afternoon of the 23rd of June the patrol vessel “de Krukel” of the Ministry of Agriculture, Nature and Food Quality called the Dolfinarium for advice on a cetacean that seemed lost in the shallow Waddenzee. Pictures were sent and Kees Camphuysen, a Dutch biologist and expert on cetacean identification confirmed it was an *Orcinus orca.* The size of the animal indicated this was a very juvenile specimen which had no hope of survival if left on its own.
The Dolfinarium offered to send out a rescue team to attempt to catch the killer whale which was subsequently determined to be female, and take her to Harderwijk for rehabilitation. The Ministry supported this intervention and declared it was according to the permit the Dolfinarium holds for rescue and rehabilitation of toothed cetaceans.
In the early evening the team boarded “de Krukel” and was transported to the area where the killer whale was. A Zodiac was with the animal which did not dive anymore. By the time the team was on the Zodiac she was swimming in about 125 cm of water. She let herself be caught easily and did not show any distress or reaction to being pulled alongside the Zodiac and walked to deeper water where we could meet up with “de Krukel”. After an uneventful transport aboard the ship and later on the truck, she was transferred to one of the pools of the Dolfinarium.
Initial treatment consisted of saline infusions and broad spectrum antibiotics. Blood analysis revealed an inflammatory reaction, microcytic regenerative anaemia and mild dehydration. Upon admission she was offered a few fish which she took. Clinical inspections during the initial period after her admission including multiple advanced research techniques for viral and bacterial diagnostics of multiple organ systems (respiratory, digestive, and renal) revealed no other gross pathology than dermatitis and severe malnourishment. In the first week after admission, faeces mainly containing algae were found multiple times.
Dead fish was thrown into the pool and within an hour she started to take these fish. Her appetite was ravenous and her daily ration was increased over a week to 32.5 kg daily. She started to gain weight and during the first two and half months her weight increased from 430 kg to 690 kg. The latter weight is considered more or less normal for an animal of her size according to Jim McBain.

General information on killer whales

Taxonomy

The killer whale, or *Orcinus orca*, is the largest member of the family of *Delphinidae*. This family belongs to the suborder of the *Odontoceti* (toothed whales) which is part of the order *Cetacea*. Cetaceans belong to the class of mammals.

There is an ongoing debate about whether the killer whale is a single species or if this group of animals should be divided into different species. Recent genetic analysis together with observations on the different ecological specializations and behaviour of killer whales suggest at least three different species of killer whale exist. One species consists of ice-associated killer whales in the Antarctic, another species is the mammal-eating killer whales of the northwest coast of the American continent and the third species is the remaining killer whales. In this third species subspecies can be differentiated and further taxonomic classification may occur when additional data become available. Pacific mammal-eating killer whales, known as transients, have diverged from the other killer whales around 700,000 years ago, two ice-associated killer whale types diverged from a common ancestor around 150,000 years ago[1].

Different species of killer whales are present in the same area but predate on different prey and are socially and genetically completely isolated. [1,2]

Abundance and distribution

Killer whales are found in all major ocean basins but tend to concentrate at higher latitudes more particularly near cold water upwelling were food is abundant. Global population is estimated at 40,000 to 60,000 animals[3].

Life history

Females reach sexual maturity and give birth for the first time around the age of 14 years. Male killer whales begin to mature around 14 years and reach physical maturity around 20 years.

Calves at birth are around 2.5 m long and weigh 120 to 160 kg[5]. Mortality rate is quite high among calves, over 40% in their first year. A typical female produces 4 to 6 surviving offspring over a period of 25 years and then stops reproducing. Post-reproductive females may live for an additional 20 years after giving birth for the last time. Average life span for females is around 50 years and for males around 29 years[2].

Calf development

Calves are gradually weaned during their first three years of life.[4] Male and female calves stay with their mother at least until they are sub-adults in marine mammal-eating killer whales and longer up to their mother's death in fish-eating killer whales in the northeast Pacific[6,2].

Vocal development starts within days of birth, but sound production is shaped with age. A calf's first vocalizations are "screams"- loud, high-pitched calls that bear no resemblance to adult-type calls. At about two months, a calf produces its first pulsed calls with similarities to adult type calls. Vocal

behaviour appears not to be genetically determined. Calves learn which calls to make and under what circumstances. From two to six months a calf's repertoire increases.

Calves learn to hunt. In Argentina, killer whales intentionally beach themselves in order to capture southern sea lions and southern elephant seals. Juveniles of 1 to 6 years old were trained by their mother in this hunting tactic. They were not successful in capture at these ages and the mother was less successful in capture when training her siblings as compared to when she was hunting alone[7]. For other types of hunting it is unclear how old a calf has to be until it can participate successfully. For marine mammal hunters in the northeast Pacific ages 4 to 5 have been mentioned[8].
A lone juvenile fish-eating killer whale of approximately 2 years of age managed to survive for 5 months before being caught and rehabilitated. Upon capture this animal was 330 cm long and weighed 563 kg. She was dehydrated, malnourished and had a foul breath and skin condition. Another juvenile fish-eating killer whale separated from its natal pod before being 20 months old, managed to survive for five years on its own before being lethally hit by a boat. Both killer whales displayed unnatural behaviour. They refused to leave a small area, and searched for contact with boats and inanimate objects (sticks) [9].

Social organization

Killer whales live in groups. The only exceptions are male marine mammal hunting killer whales which may temporarily live on their own[6].

The advantage of living in groups comes from cooperative hunting for fish or marine mammals [6,13] and more successful location of fish prey [14]. Other advantages which have been speculated are protection from attacks upon neonates or juveniles by other killer whales, group knowledge on variation of prey occurrence and cooperative hunting techniques. In this respect the extraordinary occurrence of a long life phase after reproduction has ceased, in females, is speculated to be justified by the increased group fitness because of their contribution to group knowledge on matters of prey abundance[8].
Killer whales appear not to be territorial animals but nevertheless, on a few occasions displacement from a food resource of one group by another has been observed, as have antagonistic actions from fish-eating killer whales towards marine mammal-eating killer whales[8].

Most knowledge on the social organisation comes from research done on the killer whale communities of the northeast Pacific. Research on populations in other parts of the world indicate the principles are the same but local variations to the general patterns observed do exist or cannot be excluded[10,11,12].

The basic social unit in killer whales is the matrilineal group, or the mother with her offspring.

In fish-eating killer whales offspring stay with their mother until the mother dies. If offspring reproduce they stay with their mother and many matrilineal groups consist of three and some of four generations.

A sub-pod is a social unit containing one or more matrilineal groups that typically travel together at all times.

A pod is a social unit consisting of sub-pods that tend to travel preferentially with one another but may separate for periods of weeks or months. Pods of up to 50 animals occur.

A clan is the next level of social structure above the pod and is comprised of pods that have similar vocal dialects. All pods within a clan have likely descended from a common ancestral pod through a process of growth and fragmentation. Related dialects of clan members seem to be a vocal reflection of common ancestry.

A community is the top level of social structure and consists of pods that have been observed together at least once. The two fish-eating killer whale communities in front of the Canadian west coast have overlapping ranges but pods of different communities have never been observed together[2].

Marine mammal-eating killer whales have a more loosely organised social structure. Male offspring remain with their mother their entire lives or disperse. Female offspring seems to disperse around the time of reaching sexual maturity. Average pod size is 2.4 animals[6].

Female dispersal from marine mammal eating pods occurs around their sexual maturity and their acceptance in a new pod is speculated to be related to the reproductive potential they offer for males. In terms of group size their acceptance is a negative fact as marine mammal hunting groups profit from a small size due to the prey distribution that has to occur among members[6]. Fish-eating killer whales prey mostly on schooling fish and therefore group size poses little or no problems with respect to individual food intake.

Social life is extremely important for killer whales and an essential requirement for their well being. Biologist Alexandra Morton, who has studied wild transient killer whales in the Broughton Archipelago for decades once stated: “More than mating, more than food, more than home territories it is family around which a killer whale’s world revolves[17].”

Killer whales in the North East Atlantic

The North East Atlantic is a large area which stretches from Greenland to the Scandinavian coasts. Four surveys done in the period 1987 to 2001 give varied estimates of abundance in the area ranging from 4,413 to 26,774 animals[15].
Populations are linked to Norway, Iceland, Faroe Islands, Hebrides, Northern Islands and the North Sea[30]. Populations appear to have a high site fidelity which is linked to prey resource migration, or the migration of herring from its spawning grounds to its wintering grounds. Subsets of killer whales that feed on the Icelandic Summer Spawning (ISS) herring stock also feed on harbour seal pups around the Northern Isles. Subsets of individuals from the mackerel-eating population and Norwegian Spring Spawning (NSS) herring eating population predate on seals as well[16]. Communities are intrinsically isolated due to the resources they follow. Photo-identification data showed no movement between the Norwegian Spring Spawning herring stock and the Icelandic Summer Spawning herring stock (Foote et al. 2010). However, genetic analysis using polymorphic microsatellites indicates this is a single panmictic population. Additionally, vocal dialects are partly shared which indicates the separation might be an artefact or a recent happening which may have been caused by major migration changes of the herring stocks during the twentieth century[10]. Based on the similarity between their prey choice, hunting strategies, phenotype and acoustic behaviour, Simon et al. suggested that the killer whales in Icelandic and Norwegian waters belong to the same ecotype, which they called Scandinavian herring-eating killer whales[29].
Due to the enormous size of the area and the large off coast migrations of the populations of killer whales, information on their social structure, detailed information on matrilines, pods and family relations is not comparable to information present on the populations of killer whales along the west coast of Canada or the United States.

Killer whales associated with Norway

DNA analysis of Morgan indicates she likely originates from the population of killer whales associated with the Norwegian herring hunting population. An Icelandic origin cannot be excluded completely due to lack of available samples from Iceland. The complete mitogenome (16,400 base pairs) from one sample from Iceland analysed differed by 2 base pairs from the DNA sequence of Morgan. Additional samples from Icelandic killer whales may help resolve this ambiguity.

The most intensely studied population of killer whales around Norway is the population that hunts the Norwegian Spring Spawning herring. The herring used to winter inside Tysfjord and Ofotfjord and so

provided for twenty years good access to this population of killer whales. The size of the population has been estimated using mark-recapture of photo-identification data at 400-800 individuals in 2003[20]. From 1990 to 1993 39 pods were identified. Pod behaviour varied with some pods being observed only in winter, some only in summer and one pod year round. 7 pods were observed in summer in the spawning grounds of the herring of Møre[21].

For nine photo identified killer whale pods of northern Norway pod-specific call repertoires have been published[23]. In general the vocal repertoire of the Norwegian killer whales is far less researched and known then for killer whales around British Columbia[24].

Since 2007 the killer whales are not entering the fjords anymore on an annual basis during the winter months. Research effort has decreased. Current field research in Norwegian waters is a spring cruise in 2009 of one month duration. Three groups of killer whales were sighted[25]. During 2010 a similar research effort was done, weather conditions were less optimal and no killer whales were sighted (F Samara personal communications). Occasional pods are sighted within fjords in spring.

The most up to date information on the whereabouts of the Norwegian Spring Spawning Herring from Leif Nottestad, principal scientist of the Institute of Marine Research Nordnes, Bergen, Norway is that:

1. NSS herring has one major and some smaller wintering grounds, not all of which are exactly known. The pod we are looking for may be in any of these wintering grounds.
2. The main wintering ground is several thousand square kilometers large and is positioned up to 200 to 300 nautical miles offshore west of Vesteråen in Northern Norway.
3. Weather conditions are prevailing very rough, inhibiting the smaller coastal vessels to fish in this area in autumn and winter. A release would have safety aspects that need very careful considerations and a large vessel.
4. From October to January it is almost or completely dark.
5. The herring swim to its wintering grounds during September and leaves in January for spawning along a huge coastline in Norway from 60°N to 68°N, and spread out over the entire Norwegian Sea in early spring and summer for feeding purposes.

Previous releases and abandoned juveniles

In the expert contributions ample attention is paid to three relevant killer whales with which reintroduction to the wild was planned and two times attempted.

Luna was a male juvenile killer whale that was found alone in Nootka Sound, west coast of Canada, at the age of 25 months. Luna stayed initially in a very small area of the bay and later ventured out around the bay. In the four years he stayed in Nootka Sound he never attempted to relocate his pod despite human encouragement to do so. He developed a worrisome habit of approaching and playing with boats and water planes in a manner that it was becoming a safety concern both for the animal and the boaters. He once hijacked a party of sports-fishermen, who had run out of gas, for a full night before another vessel could set them free from Luna's playful attention. After 4 ½ years Luna was lethally hit by the propeller of a tug boat.

Springer is a female juvenile killer whale that was abandoned following the death of her mother when she was 18 to 24 months old. Although she temporarily travelled with another pod in her community, she ended up alone in Puget Sound, outside of the normal range of her community. Here observations indicated she was undernourished had a skin affliction and a foul breath possibly due to a respiratory infection. It was decided to intervene and she was caught, and treated and relocated over a distance of some 600 km. Her natal pod was known and also the time could be predicted when her natal pod would come close to the coast. Springer was held in a coastal netted pen for two days until the pod was located in the vicinity. She was then released and did manage to be accepted by her pod and continue her life in the wild[9], albeit after initial harassment in which she was covered with rake marks.

Keiko was a male adult killer whale that was caught at around 2 years of age and hence spent 16 years in several Aquaria. The last 11 years he spent alone in an aquarium in Mexico City. In 1996 a reintroduction program was started which involved his transfer to a larger concrete enclosure in Oregon and two years later he was put into a bay pen near Vestmannaeyar, Iceland close to the region he originated from. During the summers of 2000, 2001 and 2002 he was trained to follow his caretaker's boat and take open ocean swims. In the summer of 2002 Keiko swam to Norway where he arrived after being beyond observation for 27 days. Stomach samples taken just previous to his trip to Norway during a period he mingled with other killer whales, failed to demonstrate food remains and thus successful hunting. During his trip from Iceland to Norway dives were logged. These data did not allow any conclusions on the successfulness of Keiko's foraging. His veterinarian was convinced, based on the excellent condition of Keiko upon his arrival in Norway that the whale had been successfully feeding himself. Despite having had intermittent contact with wild killer whales Keiko never managed to integrate into a wild pod of killer whales. Finally Keiko swam into a fjord following a boat with humans and started to beg for food and became inactive. His caretakers and local authorities stopped the contact between the whale and outsiders and began to take care of Keiko again. In December 2003 he died of pneumonia[18,19].

Morgan's case specific information

1. Age estimated at 18 to 24 months upon admission (length upon admission 343 cm).

2. Caught without a group of killer whales being sited within hundreds of kilometres in the adjoining time frame despite the weather being very calm. Closest sighting was a lone killer whale in the east sea (on the other side of the Skagerrak, Denmark), source Kees Camphuysen, NIOZ Texel Netherlands.

3. Caught in an area where normally no killer whales are present, the last killer whale observed off the Dutch coast was in 1963.

4. No gross pathology detectable beside skin abrasions and inflammation and severe undernourishment.

5. Attempt at photo ID with the North Atlantic Killer whale ID group has failed (Andrew Foote, University of Copenhagen, and NAKID).

6. Genetic analysis indicated Morgan is related to the Norwegian sub-population of killer whales. It cannot completely be excluded Morgan originates from the Icelandic sub-population of killer whales. (Andrew Foote).

7. Analysis of her vocal repertoire indicates she originates from the killer whale population that hunts the Norwegian Spring Spawning Herring.

8. Morgan was admitted on 24th of June. In the event that it is decided that release is feasible, then the organisation needed, which includes permits, funding, organisation at site of release and development of a contingency plan in case Morgan's release creates severe problems for her, makes it unlikely for the release to take place before next spring (2011).

9. Imprinting on humans has taken place and was unavoidable as she has to be handled and as she, being a very juvenile killer whale, needs social contact and activity for her psychological well being.

10. Vocal data again indicated Morgan originated from the Norwegian population of killer whales that hunt for Norwegian Spring Spawning herring. She is likely closely related to the "NP"pod although not originating from this pod based on present data. Due to lack of data on the vocal repertoires of this population it is not possible to give more detail on her origin than the entire population of NSS hunting killer whales (Patrick Miller, personal communication)[28]

Literature

1. Complete mitochondrial genome phylogeographic analysis of killer whales (*Orcinus orca*) indicates multiple species. Philip A Morin et al. Genome research 2010 20: 908-916

2. Killer Whales the Natural History and Genealogy of *Orcinus orca* in British Columbia and Washington State. John KB Ford et al UBC Press Vancouver 1994 ISBN 0-7748-0469-6

3. Worldwide distribution and abundance of killer whales. Forney, K. A. and P. Wade. 2006. Pages 145-162 *in* J. A. Estes, R. L. Brownell, Jr., D. P. DeMaster, D. F. Doak, and T. M. Williams (editors). Whales, whaling and ocean ecosystems. University of California Press, Berkeley, California.

4. Retrospective characterization of ontogenic shifts in killer whale diets via $\delta^{13}C$ and $\delta^{15}N$ analysis of teeth. Seth D Newsome et al. Marine Ecology Progress series 2009 374: 229-242

5. Killer Whales info booklet. Available online at: http://www.seaworld.org/animal-info/info-books/killer-whale/index.htm

6. Social organization of mammal-eating killer whales: group stability and dispersal patterns. Robin W Baird, H Whitebread Canadian Journal of Zoology 2000 78: 2096-2105

7. Killer whale predation on marine mammals at Punta Norte, Argentina; food sharing, provisioning and foraging strategy. A Rus Hoelzel Behavioural ecology and socio-biology 1991 29: 197-204

8. Killer Whales Robin W Baird. Colin Baxter Photography Ltd, Granton-on-Spey, Scotland 2002 ISBN 1-84107-103-X

9. Operation Orca Daniel Francis and Gil Hewlett. Harbour Publishing, Madeira Park, BC, Canada 2007 ISBN 978-1-55017-426-7

10. Movement, site fidelity and connectivity in a top marine predator, the killer whale. Andrew D Foote et al. Evolutionary ecology 2010 24:803-814

11. Studies of the social ecology of Norwegian killer whales (*Orcinus orca*) Anne Bisther, D Vongraven *in* Whales, seals, fish and man eds Arnoldus Schytte Blix, Lars Walloe, Oyvind Ulltang 1995 Elsevier ISBN: 978-0-444-82070-9

12. The social organization of resident-type killer whales (*Orcinus orca*) in Avacha Gulf, Northwest Pacific, as revealed through association patterns and acoustic similarity. Tatiana Ivkovich et al. Mammalian biology 2010 75: 198-210

13. Killer whales (*Orcinus orca*) feeding on schooling herring (*Clupea harengus*) using underwater tail-slaps: kinematic analyses of field observations. Paolo Domenici et al. The Journal of Experimental Biology 2000 203: 283-294

14. Foraging behaviour and social group dynamics in Puget Sound killer whales. A Rus Hoelzel 1993 Animal Behaviour 45: 581-591

15. Distribution and abundance of killer whales in the North East Atlantic AD Foote et al. International Whaling Committee 2007 Report to the Scientific Committee 59 SM5

16. Ecological, morphological and genetic divergence of sympatric North Atlantic killer whale populations Andrew D Foote et al. Molecular Ecology 2009 18: 5207-5217

17. Listening to Whales: What the Orcas Have Taught Us. Alexandra Morton Ballantine Books New York 2002 ISBN 0-345-43794-2

18. News from Keiko's veterinarian. Cornell L 2002 available at http://www.keiko.com/news2.html

19. From captivity to the wild and back: An attempt to release Keiko the killer whale. Malene Simon et al. Marine Mammal Science 2009 25(3): 693-705

20. Population dynamics of killer whales (*Orcinus orca*) off Northern Norway. Scientific Committee report SC/59/SM13 International Whaling Committee Anchorage Kuningas S 2007

21. Occurrence and diet of killer whales in northern Norway: seasonal patterns relative to the distribution and abundance of Norwegian spring-spawning herring. T Similä et al. 1996 Canadian Journal of Fisheries and Aquatic Science 53: 769-779

22. Sighting surveys in the Northeast Atlantic in July 1988: distribution and abundance of cetaceans. Øien N. 1990 *Report of the international whaling commission* 40: 499-511

23. Pod-specific call repertoires and compound calls of killer whales, *Orcinus orca* Linnaeus, 1758, in the waters of northern Norway. Hanne Strager 1995 Canadian Journal of Zoology 73: 1037-1047

24. Sounds produced by Norwegian killer whales, *Orcinus orca,* during capture. Sofie M. Parijs et al. 2004 Journal of the Accoustic Society of America 116 (1)

25. FFI report 2009/01140 to be found on internet at: http://rapporter.ffi.no/rapporter/2009/01140.pdf

26. Foote et al. in press Genetic differentiation among North Atlantic killer whale populations. Molecular Ecology

27. Opvang en rehabilitatie op het Dolfinarium Doel, beleid en knelpunten, 21 januari 2002 internal document Dolfinarium Harderwijk (in Dutch). Available upon request at info@dolfinarium.nl

28. Filipa I. P. Samarra, Anne-Valérie Duc and Patrick J. O. Miller **Identification of Morgan's discrete stereotyped call repertoire and matching to sounds recorded from wild North**

Atlantic killer whales Sea Mammal Research Unit, Scottish Oceans Institute, University of St Andrews, St Andrews Fife KY16 8LB, United Kingdom 5th November 2010 Report available upon request at pm29@st-and.ac.uk

29. The relationship between the acoustic behaviour and surface activity of killer whales (*Orcinus orca*) that feed on herring (*Clupea harengus*). Simon M et al 2007 Acta ethologica 10: 47-53

30. Hammond,P.S. and C.Lockyer. 1988. Distribution of killer whales in the eastern North Atlantic. *Rit.Fiskideildar* 11:24-41.

Expert contributions

Kees Camphuysen

Prospects for post-rehabilitation release of a juvenile Killer Whale stranded in The Netherlands
CJ Camphuysen, Royal NIOZ
A single, young immature killer whale *Orcinus orca* was captured in the Wadden Sea (Netherlands) and transported to Harderwijk for care, treatment and rehabilitation. Question now is: what next?

1909	Noordwijk aan Zee	M	450	young male, skeleten preserved	Van Deinse 1931
1918	Egmond aan Zee			probably young female	Van Deinse 1931
1918	Zandvoort			no details	Van Deinse 1931
1921	Vliehors, Vlieland			TL500 (no tail), tooth collected	Van Deinse 1931
1921	Wieringen	M	600	badly decomposed	Van Deinse 1931
1926	op zee gevonden, Vlaardingen	M		found in sea, dragged by ship to Vlaardingen	Van Deinse 1931
1931	Terschelling p10	M	575	harbour porpoises in stomach	Van Dieren 1931
1935	Wissekerke, N Beveland	M	390	young male	Van Deinse 1946
1936	Noordwijk aan Zee (7km Nv)	F	520	badly decomposed	Van Deinse 1946
1937	Texel p16	F	500	skull ZMA, tooth Ecomare	Van Deinse 1946
1937	Ameland Noordzeestrand	M	650	as two strandings in Schultz 1967	Van Deinse 1946
1943	Terschelling p18	F	535	pregnant female, live stranding, embryo 125 cm TL	Van Deinse 1944
1943	Terschelling p19			related to earlier stranding of pregnant female?	Van Deinse 1944
1945	Noordwijk aan Zee		600	no details	Van Deinse 1946
1947	Schiermonnikoog p12	M	578	no details	Van Deinse 1948
1953	Texel De Koog p16-17		500	old skeleton, not recent?	Van Deinse 1954
1958	Terschelling			in letter to Van Deinse, not fully confirmed	Kompanje 1995
1959	Zoutkamp Lauwerszee		600	afloat for 63 days, than washes up	Van Deinse 1960
1961	Goeree	F	550	lungs full of feathers	Van Deinse 1962
1963	Texel p23-24	M	550	well documented stranding	Van Deinse 1964
1963	Noordwijk aan Zee	F	500	last known stranding	Van Deinse 1964
2009	Scheveningen			dark brown skull, not recent	Naturalis

Killer Whales in the southern North Sea

The arrival of a young killer whale in The Netherlands was the first properly documented case of any sightings or strandings in the southern North Sea (The Netherlands or Belgium) since 1963 (excluding the recovery of a subfossil skull in 2009; Kompanje 1995, Camphuysen & Peet 2006, Van der Meij & Camphuysen 2006).

The most recent sighting dates back to 4 August 1947, when two killer whales were sightings by fishermen north of the Wadden Sea islands (Camphuysen & Peet 2006). This brings us to a period of over 60 years without a reliable sighting of a Killer Whale in the Southern North Sea, despite extensive surveys for seabirds and marine mammals since the mid 1970s (Reid & Camphuysen 1998, Reid *et al.* 2003).

Killer Whales in the NE Atlantic Although killer whale numbers in the North Atlantic appear to be greatest in sub-Arctic and Arctic waters, the distribution of this species extends south to the Azores, Canaries, NW Africa, and western Mediterranean. Killer whales are common around Iceland, off NW Norway, around the Faeroe Islands, and in the northernmost part of the North Sea. Sightings around Orkney and Shetland are frequent and substantial numbers are found within the Minch (W Scotland), off the Outer Hebrides, within the Irish Sea, off Ireland and in the Bay of Biscay. Sightings in the central North Sea and within the English Channel are extremely rare (Reid *et al.* 2003).

Group structure and social interactions. Many odontocetes tend to group together in structural social groups, characterized by long-term association among individuals (Berta & Sumich 1999). The size of the school may vary with species, location, season and activity patterns. Although the composition of schools may fluctuate even over the course of a day, many associations are relatively long-term. The mother-calf bond may persist for many years.
In killer whales, individuals exist in small stable units known as pods. These pods are characterized by their specific dialects, foraging strategies, as well as by their individual members (Baird 2002). Killer whale pods are matrilineal social groups consisting of an older mature female, her male and female offspring, and the offspring of the second generation's mature females. The mother-offspring bond remains strong into adulthood for some male (and less often for female) offspring (Baird & Whitehead 2000). Mature males remain with the pod into which they were born, and in resident killer whales off Vancouver Island, movement or exchange of individuals among pods has not been documented (Briggs *et al.* 1990). Some males from transient killer whale populations off Vancouver Island disperse from their maternal pod and appear to become "roving" males, spending some of their time alone, and occasionally associating with groups that contain potentially reproductive females (Baird & Whitehead 2000). These males appear to have no strong or long-term relationships with any individuals. Females that disperse from their natal pod appear to be gregarious but socially mobile. Differences in social organization from the sympatric fish-eating resident killer whales (where no dispersal of either sex occurs) likely relate to differences in foraging ecology. Transient killer whales maximize per capita energy intake by foraging in groups of three individuals, whereas no such relationship has been documented for resident killer whales. The typical size of groups consisting only of adult and subadult whales that were engaged primarily in foraging activities confirms that these individuals are found in groups that are consistent with the maximization of energy intake hypothesis. Larger groups may form for (1) the occasional hunting of particularly large prey, for which the optimal foraging group size is probably larger than three; and (2) the protection of calves and other social functions.

Discussion The origin of the stranded, young whale is not known. The northern North Sea (Norwegian or Scottish waters) may seem the most likely area where this whale came from, but this is pure speculation and would require verification from DNA analysis. Unfortunately, killer whales within Europe have not been particularly well studied until recently and our knowledge on pod structure and local, more or less discrete (ecologically distinct) populations is very incomplete. With knowledge obtained mostly in the NE Pacific (studies of resident and transient killer whales around Vancouver Island), it is clear that the social structure of pods is such that a successful release of a young, dependent whale into the wild is possible *only* when a pod would be prepared to accept this individual as a group member. From an expert in this field:
Bob Pitman (in litt 17 Sep 2010) *"Unless you have a suitable group of killer whales to reintroduce this animal into, I don' think it will have much chance if it is released in the wild. There was a calf in British Columbia some time ago that got separated from its pod so it became attached to people and boats - very social animals. A tugboat backed over it and killed it. It would be better to keep this animal in captivity, as an ambassador, unless some effort is made to determine which ecotype of killer whale it is (mammal-eaters have died in oceanaria rather than eat fish) and perhaps relocate its original family group. Not easy but perhaps doable."* Robert L. Pitman Protected Resources Division Southwest Fisheries Science Center National Marine Fisheries Service National Oceanic and Atmospheric Administration 8604 La Jolla Shores Drive La Jolla, California 92037
The (female) animal was young when it came ashore and would have been still dependent for years to come. A release into the wild away from a social group of killer whales would be the same as euthanasia, except that it would die probably unseen somewhere at sea. Apart from logistic difficulties and excessive costs to transport this whale into an area where killer whale pods occur more or less frequently, its chances seem utterly remote with regard to acceptance within such a unit. We don't even consider that practical difficulties to bring the whale near some pod in the open sea! Finally, treatment and care will or at least *may* have changed this whale such that it is now attached to people and perhaps boats. The experiences with "Free Willy" have demonstrated what could happen in such

a condition (frequent entries of harbours and attending ships, incapable of efficient self-feeding, no pod attachment; leading to death).

Given the fact that “dolphinariums” as cetacean zoos are acceptable conditions to keep and display cetaceans for a large human audience, this whale could perhaps better be seen as an appropriate “ambassador” and kept in captivity for the rest of its live, in the best possible conditions (space, accommodation, other killer whales).

Baird R.W. 2002. Killer whales of the world: natural history and conservation. Colin Baxter & Voyageur Press.
Baird R.W. & L.M. Dill 1996. Ecological and social determinants of group size in transient killer whales. Behavioral Ecology 7: 408-416.
Baird R.W. & H. Whitehead 2000. Social organization of mammal-eating killer whales: group stability and dispersal patterns. Can. J. Zool. 78: 2096-2105.
Berta A. & Sumich J.L. 1999. Marine Mammals: Evolutionary Biology. Academic Press, San Diego.
Bigg M.A., Olesiuk P.F., Ellis G.M., Ford J.K.B. & Balcomb III K.C. 1990. Social organization and genealogy of resident Killer Whales (Orcinus orca) in the coastal waters of British Columbia and Washington state. In: Hammond P.S., Mizroch S.A. & Donovan G.P. (eds). Individual recognition of cetaceans: use of photo-identification and other techniques to estimate population parameters. SC/A88/ID39, Special Issue 12: 383-405. International Whaling Commission, Cambridge.
Camphuysen C.J. & Peet G. 2006. Whales and dolphins of the North Sea. Fontaine Uitgevers, Kortenhoef.
Kompanje E.J.O. 1995. Strandings of killer whales Orcinus orca in the Netherlands between 1783 and 1995 with some remarks on skeletal and dental pathology (Mammalia, Cetacea, Odontoceti). Deinsea 2: 67-82.
Meij S.E.T. van der & C.J. Camphuysen 2006. Distribution and diversity of whales and dolphins (Cetacea) in the Southern North Sea: 1970-2005. Lutra 49(1): 3-28.
Reid J. & Camphuysen C.J. 1998. The European Seabirds at Sea database. In: Spina S. & Grattarola A. (eds). Proceedings of the 1st meeting of the European Orn. Union. Biol. Cons. Fauna 102: 291.
Reid J.B., Evans P.G.H. & Northridge S.P. (eds) 2003. Atlas of cetacean distribution in north-west European waters. Joint Nature Conservation Committee, Peterborough, 76pp.

John Ford

Comments on options for the future of the juvenile killer whale ‘Morgan’

John K.B. Ford
Cetacean Research Program
Pacific Biological Station
Fisheries and Oceans Canada
Nanaimo, BC

November 10, 2010

The following highlights some of the key issues that I believe are important in considering whether the juvenile killer whale Morgan is a viable candidate for release to the wild, based on two similar cases in British Columbia (A73 ‘Springer’ and L98 ’Luna’), as well as from my experience studying both captive and wild killer whales. Although reunification of the whale with its group in the wild would be desirable, there are important concerns that must be considered in order to determine whether attempting a release would be in the whale’s best interest.

Social group identity: Killer whales are a highly social group-living species and are seldom found alone. The survival and psychological well being of an individual reintroduced to the wild is dependent on its acceptance into a social group.

Rehabilitation of juvenile killer whales back to the wild is possible but it’s complicated by the social structure of the species. Killer whales generally live in stable matrilineal groups with limited dispersal from the natal unit (mother and siblings). In at least some populations (e.g. the fish-eating ‘residents’ in

NE Pacific), individuals stay in the natal group (pod or matriline) for life - such groups are thus closed both to immigration and emigration. In other populations (e.g. mammal-eating 'transients' in NE Pacific), females may disperse upon reaching reproductive age (12-15 yrs) and join other groups for extended periods of time.

As a result of this social system, a juvenile killer whale released back to the wild is most unlikely to be accepted into an unrelated social group. Population and/or group identity is encoded in dialects (distinctive group-specific calls) that are learned by young whales growing up in the natal group. These dialects appear critical for population and kin recognition. A released whale is only likely to be recognized and potentially accepted by a social group if it has a full-formed vocal repertoire. The juvenile killer whale Springer travelled briefly with an acoustically unrelated pod in her community but this did not persist and she was found alone some months later.

Genetic analysis suggests that the juvenile killer whale Morgan is from a population of herring-eating killer whales found in the Norwegian Sea. Recent comparisons of Morgan's vocalizations with calls recorded from killer whales in this region support this suggestion. This population appears to have group-specific dialects and is likely to have a social structure with long-term stable matrilines with minimal dispersal. Although Morgan's calls closely resemble those produced by one or two groups in this population, it is not clear if either of these or some other group contains her natal matriline.

Habituation: It is important for successful rehabilitation to the wild that the animal is not habituated to humans. In the case of the successful rehabilitation of the juvenile whale Springer to its pod, considerable efforts were made to minimize contact with people especially when the whale was fed prior to release. This reduced the chance of the whale associating people with provisioning and avoided the development of social dependency on people. In contrast, the solitary killer whale Luna became dependent on people for social interaction and in so doing became a nuisance and threat to human safety by its vigorous contact with small boats. Such interactions proved extremely difficult to manage and escalated over time. This ultimately led to the accidental death of Luna through contact with a ship's propeller. Having been socialized and provisioned by humans, it is highly likely that Morgan, should she be released to the wild, would be similarly attracted to people in boats for food and social contact.

Hunting skills: Dietary specialization is common in killer whale populations and appears to be learned behavioural traditions. In other words, killer whales are not born with a predisposition to forage for particular prey types (e.g. mammals or fish) but instead learn prey preferences and specialized hunting tactics from others in the natal group. This learning process likely starts at weaning and is facilitated by cooperative foraging and food sharing within the matrilineal unit. It is probably important but not necessarily critical to survival of a released juvenile killer whale that it has learned adequate hunting skills prior to becoming separated from its natal group. The whale Luna, separated from his pod at less than 2 years of age, was able to survive by catching fish that were not typical of its natal group's or population's diet. It is unknown whether Morgan would be able to catch sufficient food to survive on her own if released. However, as she was highly emaciated when rescued it seems likely that she was unable to adequately feed herself.

Summary and recommendation

In my opinion there is a low probability that Morgan could be successfully rehabilitated back to the wild. Successful rehabilitation would require reunification with her natal group or long-term acceptance and integration into another group. Although her probable population of origin and potentially related pods have been identified, her natal group is not known. Given the current distribution patterns of this population in mostly offshore waters of the Norwegian Sea, the chances of locating these related pods then coordinating her transport and release in their presence appear to be remote and logistically unfeasible. Even if she was to be released in the vicinity of these pods and these pods do contain her natal group, reunification would not be guaranteed. Unlike Springer, Morgan has spent considerable time in human care in an aquarium setting, which no doubt have altered her natural behaviour and potentially her acceptability to her group or a related group. It is also unlikely that she would be accepted into an unrelated killer whale group due to generally closed nature of the species' social structure. It is highly probable that her current dependency on humans for social interaction and food would continue post-release and she would be strongly attracted to people and boats, with its attendant risks.

Releasing Morgan to the wild in the hope that she finds and reunites with her natal group or integrates into another killer whale group would involve substantial risk and would clearly not be in her best interest. She has already shown that she is likely incapable of provisioning herself adequately and she would probably suffer and die alone. The best option for this whale is to be cared for in an appropriate facility with the highest standards of animal husbandry, preferably in the company of other killer whales in order to meet her social needs.

Christophe Guinet

According to my knowledge on killer whale biology, social behaviour and foraging ecology I can affirm you that the release of such young individual without any knowledge on its original social unit and community will be equivalent to a death penalty.

- most killer whales are unable to forage efficiently by themselves, and it is even more true in the case of a young killer whales which do not master properly some indispensable foraging skills for its survival in the wild. From the work we conducted on Crozet we were able to show that 5-Year old Killer whales were still requiring the assistance of a pod member to be able to forage efficiently (catch seal). Those foraging skills are learned through social transmission.

- Furthermore we found that for pods which had a group size of 1 to 2, tend to associate much more to other killer whales pods of the same population. Many pods had their pod size reduced due to sur-mortality associated with illegal fishing. In pods for which only one or two individuals survived, they tended to always be observed associated with other pods however these associations are not long term. These individuals associate with many different groups over periods of time ranging from days to weeks. The fact that we don't see pods with less than 2 individuals by themselves suggest that they are unable to forage efficiently and to maintain a sufficient foraging efficiency (likely) they have to associate with other pods, but the fact that they always change their association pattern compare to the other pods which are extremely stable over time suggest that they are only "tolerated" in a pod for a limited amount of time.

So it is unlikely that this young killer whale will be able to find its original family and we have no idea to which community she belongs, so the chances of success (as observed in British Columbia in one case and in which an orphan killer whales were adopted by its aunt after being separated from its original pod for several weeks) are nil in this case.

So either this whale should have been left originally, but currently the only options are either to maintain her in captivity or in semi captivity but it will be necessary to feed her.

Please don't hesitate to contact me if you have any further question. But honestly I think that this point of view will be shared by any killer whale specialist who has a long experience with these animals.

Mardik Leopold

Orca Morgan: finder's keepers?

Mardik Leopold, IMARES

Killer whales are very rare visitors to the central and southern North Sea, south of 58°N (Reid et al. 2003). Yet, a live specimen turned up in the Dutch Wadden Sea in June 2010. Killer whales are rare in the Netherlands, but not extremely rare: Camphuysen & Peet (2006) mention 30 earlier cases (mostly before 1960). Most “Dutch” killer whales however, were dead and stranded; life killer whales are very

rare and very few (if any) killer whales that reached our country alive survived their visit. Most stranded animals had been dead for some time before they finally stranded on the Dutch coast and probably originated from the northern North Sea (Camphuysen & Peet 2006). This would be in agreement with the fact that killer whales are found more frequently in Scotland, Norway and Denmark, both alive and dead.

People living near the Dutch coast were usually quick to kill any live whale that came their way, including killer whales. In contrast to these old habits, the killer whale that approached our coast in 2010 was saved and ferried to the Dolfinarium in Harderwijk. The animal was a very weak, emaciated young female, named Morgan shortly after arrival in Harderwijk. Dutch law on wild animals taken into captivity states that such animals should be released into the wild again after they are considered healthy, unless release is clearly not in the best interest of the animal. This would be the case if such an animal would be unable to survive in the wild. Release should be done in such a way, that would give the animal a fair chance of survival, e.g. by bringing the animal back to its former home range. Keeping animals in prolonged captivity should be done in such a way that would facilitate natural behaviour and that would mimic natural environmental conditions as closely as possible. In the case of a killer whale, a highly social animal of the open ocean, this would imply keeping her in the company of one or more conspecifics, in a suitably large holding facility (a very large tank). At present, such a facility is not available in the Netherland, and neither are conspecifics. The question thus arises: what should be done with Morgan when (if) she is proclaimed healthy again?

Considerations on the population ecology of killer whales

Killer whales occur in all of the world's oceans. Several "forms", "ecotypes", "morphotypes" or even full species of killer whale have been proposed to exist (Pitman & Ensor 2003, LeDuc et al. 2008; Foote et al. 2009a, Morin et al. 2010; Pitman et al. 2010). At least two different types (Eastern North Atlantic types ENA1 and ENA2) are found between Iceland, Scotland and Norway (Morin et al. 2010). Morgan seems to be a ENA Type 1 killer whale; given the facts that her eye patch has a parallel orientation to the body axis, that the anterior end of the eye patch is in front of the blowhole, the apparent beginning of tooth wear and the number of 12 teeth in the lower jaws visible on photographs published by the Harderwijk Dolfinarium (cf Foote et al 2009a, Supporting information).

Photo-ID studies have shown that animals regularly move between Iceland and Scotland, but such evidence for movement between these two regions and Norway is still poor. Information on shared "dialects" suggest that killer whales across northern Europe do in fact regularly meet, possibly in winter, offshore, somewhere between Iceland and Norway (Foote et al. 2009b). Offshore, winter diet may partly consist of fish scavenged behind fishing trawlers (Couperus 1994) but which killer whales are involved and how social interaction works in winter is not yet known. Norwegian killer whales are probably largely fish-eaters (e.g. Similä et al. 1996), but Icelandic animals may switch between seasonal fish-eating in Iceland, and seasonal seal hunting in Scotland (Bolt et al. 2009; Foote et al. 2009b). There is very little information on population integrity, population sizes or trends in numbers, but there is also little evidence that killer whales in Europe are endangered (Reid et al. 2003).

Killer whale Morgan has been separated from her natal population, or separated herself. Morgan would have died if she had not been taken into captivity and was thus effectively removed from her population. Extra-limital wanderings, strandings and mortality are part of natural killer whale biology (as evidenced by recurrent strandings outside the normal range of the species). That some whales get out of their normal range and die, is thus a fact of live. Clearly, the species/ecotype concerned will not go extinct, or even suffer significant population decline, without Morgan returning.

Considerations on the genetics and social biology of killer whales

Killer whale Morgan most probably originates from Norway but an Icelandic origin could not be excluded (based on DNA analysis by Andrew Foote; Niels van Elk in *litt.*). A more precise georeference is unlikely to be achieved in the near future. There is thus a very high degree of uncertainty as to the former home range of Morgan. No match has been found between Morgan and pictures kept in photo-ID databases that would allow linking Morgan to a specific pod or home range. It is thus impossible to release Morgan with any degree of certainty into her former home range or natal pod.

Killer whales are highly social animals. Especially young females are very unlikely to leave their natal pod and survive. Across-pod mating probably regularly occurs, but females show a strong tendency to remain with their natal pod. Releasing Morgan into the wild, but not into her former pod would thus not be the same as giving her back her former live, as there is no guarantee (or even a good probability) that she would find back her former pod. Previous cases of setting captive killer whales free, even when the former home range was known, have not been biologically successful (e.g. Simon et al. 2009 on the release of "Keiko"). Admittedly, Keiko that had been taken into captivity at approximately the same age as Morgan had been kept for many more years than are intended for Morgan, should she be released. On the other hand, Keiko had received years of training aimed at providing her with a good chance of at-sea survival, and such a long training would not be available for Morgan as animals taken from the wild in the Netherlands should be released within one year after capture.

Questions have been raised in the Dutch Parliament (Partij voor de Dieren, 24-06-2010), asking the government not to equip Morgan with a tracking device after release. The answer by the appropriate Dutch Minister (Verburg, 13-07-2010) states that there are no plans for putting a transmitter on Morgan. Without such a device, and without clear markings (put) on the animal that would allow later photo-ID evidence of successful restoration into the wild, setting the animal free somewhere at sea, would be a step into the complete unknown.

Considerations on the health status of Morgan

A lone, young female killer whale far removed from her probable natal area, is remarkable. Killer whales and especially young females, are not supposed to get away from their natal pod. Killer whales are very social, and very vocal animals, that live in a world of sound (Hoyt 1990) that allows communication over considerable distances. Even though individuals might leave pods temporarily they should have no trouble finding back their pod. Reasons for permanent separation may be that the lone animal is not healthy (e.g. deaf or physically unable to keep up with the pod), mortality of the whole pod but the remaining loner, or severe disturbance, e.g. acoustic disturbance separating the loner from the pod permanently. Should Morgan be deaf, or otherwise be physically or socially unable to team up with conspecifics, it would be unfeasible to set her free, hoping she might find back and subsequently live with her natal pod. The same is true should the remaining pod members all be dead but it seems impossible to establish this possibility. The same unfortunately is probably true for the possibility to assess if pod separation happened through severe (human) disturbance such as excessive underwater noise production near Morgan's former pod.

Considerations on the logistics of prolonged captivity

The tank in which Morgan is currently kept is best considered as a first-aid facility. It is too small and unsuitable for prolonged captivity. Thus, should Morgan be kept in the Netherlands, a larger, fully suitable holding facility should be built. Given that killer whales live their normal lives in the company of other killer whales, a mate should be made available for Morgan. There is no other captive killer whale in the Netherlands, so an additional animal should be important from abroad, to provide company for Morgan. Capturing a healthy wild killer whale for this purpose is out of the question and waiting for another stranding to happen will probably take "for ever". The scenario of keeping Morgan in the Netherlands should therefore be considered as not very realistic. Moreover, although personnel in Harderwijk have ample experience with keeping various cetaceans, experience with keeping killer whales is largely lacking. Keeping killer whales is not entirely free of certain risks to the trainers involved and keeping captive killer whales alive and well is an art that has taken the leading companies in this field decades to achieve (if at all). Apart from the need to acquire another killer whale, there would probably be a need to attract trainers from abroad, with the necessary experience.

If both options of setting Morgan free and keeping Morgan in the Netherlands are deemed unrealistic, a third option would be to ship her out to another killer whale keeper. Killer whales are kept in captivity in a limited number of facilities around the world that at least can muster more experience with keeping these animals than can the Dutch. Shipping Morgan out to a facility abroad would also solve the problem of giving her company. It would probably also improve her living conditions in captivity, compared to conditions here. When brought in contact with other captive killer whales, she might eventually breed and in doing so, add further variation to the gene pool of captive killer whales. All this seems to add up to a better situation for Morgan than would be possible in the Netherlands where conditions for prolonged captivity are less than ideal. On the other hand, many people would consider

setting Morgan free the most natural, and thus the best option. Given the considerable and likely unsolvable problems with restoring Morgan to her natal pod and former healthy (?) wild condition, setting this killer whale free probably will not work for her. In a final response to sentiments that demand Morgan to be set free and let nature have its course, it should be noted that the most natural way to deal with Morgan would have been to leave her to die in the Wadden Sea, when she first arrived. If all three scenarios (setting her free; keeping her in the Netherlands or shipping her out to another facility) are considered impossible or undesirable, the only remaining option is to put her down. This would, however, be a tragic end to her and a waste of good intentions and resources. Putting her down after nursing her back to health would mean that she should not have been taken into captivity in the first place. Even the very possibility of this fourth scenario should be an incentive to consider future cases of rescuing exotic marine mammals.

References:

Bolt H.E., Harvey P.V., Mandleberg L. & Foote A.D. 2009. Occurrence of killer whales in Scottish inshore waters: temporal and spatial patterns relative to the distribution of declining harbour seal populations. Aquatic Conserv.: Mar. Freshw. Ecosyst. 19: 671-671.

Camphuysen K. & Peet G. 2006. Walvissen en dolfijnen in de Noordzee / Whales and dolphins in the North Sea. Fontaine Uitgevers BV, 's Graveland / Stichting De Noordzee, Utrecht, 159 pp (Dutch edition).

Couperus A.S. 1994. Killer Whales *Orcinus orca* scavenging on discards of freezer trawlers north east of the Shetland islands. Aquatic Mammals 20: 47-51.

Foote A.D., Newton J., Piertney S.B., Willerslev E. & Gilbert M.T.P. 2009a. Ecological, morphological and genetic divergence of sympatric North Atlantic killer whale populations. Molecular Ecology 18: 5207-5217.

Foote A.D., Similä T., Víkingsson G.A. & Stevick P.T. 2009b. Movement, site fidelity and connectivity in a top marine predator, the killer whale. Evol. Ecol. doi:10.1007/s10682-009-9337-x.

Hoyt E. 1990. Orca: the whale called killer. E.P. Duttan, New York 291 pp.

LeDuc R.G., Robertson K.M. & Pitman R.L. 2008. Mitochondrial sequence divergence among Antarctic killer whale ecotypes is consistent with multiple species. Biol. Lett. 4: 426-429.

Morin P.A., Archer F.I. Foote A.D., Vilstrup J., Allen E.E., Wade P., Durban J., Parsons K., Pitman R., Li L., Bouffard P., Abel Nielsen S.C., Rasmussen M., Willerslev E., Gilbert M.T.P. & Harkins T. 2010. Complete mitochondrial genome phylogeographic analysis of killer whales (*Orcinus orca*) indicates multiple species. Genome Research 20: 908-916.

Pitman R.L., Durban J.W., Greenfelder M., Guinet C., Jorgensen M., Olson P.A., Plana J., Tixier P. & Towers J.R. 2010. Observations of a distinctive morphotype of killer whale (*Orcinus orca*), type D, from subantarctic waters. Polar Biol. doi:10.1007/s00300-010-0871-3.

Pitman R.L. & Ensor P. 2003. Three forms of killer whales (*Orcinus orca*) in Antarctic waters. J. Cetacean Res. Manage. 5: 131-139.

Reid J.B., Evans P.G.H. & Northridge S.P. 2003. Atlas of cetacean distribution in north-west European waters. JNCC, Peterborough, 76 pp.

Similä T., Host J.C. & Christensen I. 1996. Occurrence and diet of Killer Whales in northern Norway: seasonal patterns relative to the distribution and abundance of Norwegian spring-spawning herring. Can. J. Fish. Aquat. Sci. 53: 769-779.

Simon M., Hanson M.B., Murrey L., Tougaard J. & Ugarte F. 2009. From captivity to the wild and back: an attempt to release Keiko the killer whale. Marine Mammal Science 25: 693–705.

Christina Lockyer

My own personal opinion, taking into account all the above points under *Morgan's case specific information*, is that this animal is not a candidate for release back into the wild - if we are considering it from the viewpoint of the animal's welfare and likely survival. From a purely scientific viewpoint one could argue for a VHF- and satellite tagging of the animal pre-release to conduct an experiment to see if such releases are ultimately viable. However, I am not sure this is ethical really. The big question is therefore, where she can be housed - possibly for many years (killer whales can live 30+ yr). Clearly she would need company of other killer whales (not necessarily her own tribe - if we even knew), and also space enough in a pool for full mobility. I am willing to continue discussion on this last point.

Additional comments:
In view of the imprinting on humans while in captivity, Morgan is very likely to associate with boats if release takes place. This behaviour is unnatural for a free-living animal, and also is likely to increase dependence on humans for food supplements rather than develop foraging skills which may be poor in the light of her young age when rescued, and also hinder possible contact with other killer whales. As it has been reported for many cetaceans that become sociable or associate with boats, the probability of a serious accident – both to boat and whale – is very likely at some point (Lockyer, C. 1990. Review of incidents involving wild, sociable dolphins, worldwide. In, *The bottlenose dolphin* eds J. S. Leatherwood and R. Reeves, pp.337-53, Academic Press).

I reiterate my opinion that Morgan is not a likely candidate for release. I would therefore prefer to contribute to any discussion in the future on how and where Morgan can be maintained. She might make a suitable animal for participation in research because of her now familiarity with humans, and thus contribute in a useful way to understanding some issues regarding for example, growth and maturity of killer whales. Other acoustical and behavioural experiments may be possible in the future with training. The main issue is where she can be housed.

As a final comment and after thought, even though we may be able to assign Morgan to a population from genetical and acoustical analyses, we have absolutely no information regarding her original family pod. Although unlikely, perhaps Morgan became alone because something fatal happened to some or all of the rest of the pod members.

James McBain

The subject of this letter is a killer whale, known as “Morgan,” currently being rehabilitated by the Harderwijk Aquarium. The whale was found weak and malnourished in the waters off the coast of the Netherlands. The rescue staff collected her from the sea on June 23, 2010 and transported her to the Harderwijk Aquarium for health assessment and medical treatment. Morgan was determined to be a female ~350 cm overall length and weighed ~ 450 kg. Based on data from captive born killer whales, the length is typical of a 1-2 year old. This same data suggests that Morgan was grossly underweight which confirms the onsite observations of Dr. Niels van Elk. Morgan is currently undergoing rehabilitation at the aquarium and is responding well to therapy.

Once Morgan has her health restored, the time will come to make a decision regarding what is best for her future. Based on what I am told regarding the lack of knowledge of Morgan’s pod, my experience with killer whales and the results of the very few attempts to reintroduce killer whales to the wild; I believe the best outcome for her is to remain in the care of man. Young killer whales have been shown to readily adapt to life in an oceanarium. She could have the opportunity to live with other killer whales and integrate into an oceanarium pod as others have done. Granted, her life in the care of man would be different from life in the wild but we can make it a good life. Morgan’s life in the wild was most certainly over without human intervention. Humans can continue to provide her with a good life without the threat of starvation. If we wish to examine alternative plans, the remaining option is reintroduction to the wild. There are three apparent possibilities for reintroduction: 1) return to her natal pod; 2) return to any pod that will accept her; 3) return to the sea and let her find her own way.

I would like to dispense with the last plan immediately. In general, killer whales are a social species and should not be expected to thrive while living alone. If there is no reasonable certainty that Morgan could be accepted by a pod, reintroduction has little chance of success. Returning Morgan to the sea and expecting her to survive without a pod is not acceptable. She failed the first time; there is no reason to believe that she will succeed the second time without the support of a pod. There are those who hold the belief that it is better for an animal like Morgan to die in the wild than to live in the care of man. As a veterinarian that has worked with killer whales for the better part of 30 years, I find that kind of thinking reprehensible. I also doubt that Morgan would agree with that proposal. There is an additional concern which we must keep in mind. Morgan was starving when she was rescued. She

has received medical assistance and food from humans in the process of her rehabilitation. If she was alone at sea looking for food or companionship, there is every possibility that she would seek humans. This behavior would have significant potentially negative ramifications for her as well as the humans.

The case of a young male killer whale in British Columbia known as L-98 or "Luna" is worthy of review if we wish to understand the problems of a young lone wild killer whale that has an affinity for humans. L-98 was an approximately 2 – 3 year old male killer whale that had become separated from his pod and found himself alone in the waters of the west coast of Vancouver Island. In his apparent search for social interaction, he developed an affinity for humans and boats of all sizes. He was friendly to people and destructive to small boats frequently damaging rudders and depth sounders. He would often surprise boaters by pushing their boats around and in some cases nearly capsizing them. There was a fear that he may some day cause loss of human life through his antics. Intervention and reintroduction was considered because his pod of origin was well known and easily accessed in the San Juan Islands of the State of Washington. For political reasons, no action was undertaken other than volunteers trying to keep boaters away from the areas where he was known to be. In the end, L-98's affinity for boats got him killed as he was caught by the propeller of a large tugboat. Intervention had offered the best chance for saving his life. If reintroduction had been considered unreasonable, there was still the option to move him to an oceanarium where his affinity for and interest in humans would have been a positive. It is unfortunate that Luna (L-98) was not given that chance.

Let us consider the possibility of reintroduction of Morgan to her natal pod and her mother if she still survives. The case of A-73 has some similarities to Morgan's and some significant differences that are essential to understand.

A-73, also known as "Springer," is to my knowledge the only rescued and rehabilitated killer whale successfully reintroduced to the wild. The story of A-73 varies from that of Morgan in some significant ways. I was personally involved in the A-73 case so I have more than a passing familiarity. Like Morgan, A-73 was a 1 to 2 year old female killer whale. She had become separated from her natal pod by several hundred kilometres. She was malnourished but not as severely underweight as Morgan. How did a young female killer whale become alone and so far from her pod? A-73s pod is well known to researchers that have long studied the pods of Puget Sound, the coast of British Columbia, and Alaska. It was known that A-73 was with her mother when they were seen separated from their pod. The disappearance of A-73's mother after separating from the pod leads me to believe that illness caused her mother's separation from the pod and was responsible for her later disappearance. Upon the death of her mother, A-73 was alone without her mother or her pod. She was later reportedly observed with an animal from another pod but was again found alone in the waters near Seattle, Washington in the USA. This put her far from the home range usually frequented by her pod. In contrast, I am told that we know virtually nothing about Morgan's history prior to her appearance off the Netherlands coast. So, we are missing the information that proved to be critical to the successful reintroduction of A-73. We had the additional benefit of knowing the probable location of A-73's pod during the summer months. As luck would have it, A-73 was found in reasonable but declining health in an area that had abundant resources for rehabilitation and reintroduction. A-73's rehabilitation and health assessment was short, lasting only a few weeks. With knowledge of her pod identity and its location, she was transported over 600 kilometres to a pre-release holding facility in the area of her natal pod's summer range. Within days, A-73's pod was near the pre-release facility so she was released to interact with them. She was ultimately accepted by her natal pod and in the years following her reintroduction, A-73 has often been seen in the company of her pod. During her time alone at sea, A-73 had gained an affinity for small boats. There was a concern that this behavior could cause problems after her reintroduction. There have been incidents reported where a whale known to be her aunt has been seen steering her away from potential contact with humans. This maternal intervention by her aunt may be an important factor in the ultimate success of the reintroduction of A-73. When Springer was accepted by her natal pod, many including me believed it was a miracle. With so many things that could have gone wrong, everything went right. A-73's reintroduction will become biologically significant when she gives birth to a healthy offspring.

It is easy to see that the differences between A-73 and Morgan become significant when it comes to planning and executing a reintroduction. The knowledge of A-73's natal pod and its location, as well as the availability of a safe pre-release holding facility in the area frequented by her pod, made the attempted reintroduction feasible. In the case of A-73 with all those advantages, I still considered the outcome a miracle. Based on my own experience and what we learned from the reintroduction of A-

73, I do not consider it realistic to plan the reintroduction of Morgan to the wild unless the A-73 model can be reasonably duplicated. There is the question, however, of the possibility that she might be accepted by another pod.

The well reported case of Keiko the killer whale was an attempt to return a long term captive killer whale to the wild. It is useful to acknowledge that this attempted reintroduction had strong political motivation and was not necessarily conceived to determine what would be best for Keiko. This case is not a perfect match to Morgan but there are lessons in the story. Some may point to this attempted reintroduction as a successful model. Upon examination, the case of Keiko is not an example of successful reintroduction. It points up the pitfalls associated with attempting to return a single killer whale to the wild without knowledge of pod of origin. It was known that Keiko originated from the seas around Iceland. Since Keiko's pod of origin was not known, it was initially thought that his joining any pod would be considered a success. In the end, it was decided that if Keiko could survive in the wild as a lone animal without a pod that would also be considered a success. Best estimates are that the attempted reintroduction cost in excess of twenty million US dollars. Given numerous opportunities involving contact with wild killer whales, Keiko never joined a pod. He demonstrated that he preferred to remain in the care of humans. Since there was good evidence that he could catch adequate food to maintain his body condition, Keiko was eventually abandoned (released) to fend for himself. Observations after his release indicated that he was feeding but did not join a pod. Keiko swam from Iceland to Norway where he again made contact with humans. He chose to remain where there were people; it could be assumed that his past experience had taught him that people were a dependable source of food and interaction. It should be noted that there were extensive prerelease efforts to remove his dependence on humans for food. Eventually his caretakers moved him to a site in Norway where public access was controlled. Shortly after the move, he became ill and died. He was buried with out a post-mortem examination into the cause of his death. Keiko was an example of a release, not a reintroduction. In the end it was not a success but it still contains many useful lessons. I would hope that we all have something better planned for Morgan.

If reintroduction is our plan for Morgan, it is important for us to remember what we have learned from L-98, Keiko, and A-73. Morgan's acceptance into any pod is ultimately not up to us, the decision would be made by members of the pod and Morgan. We cannot force them to do what they do not want to do. Morgan has apparently already begun to thrive in her new home at the Harderwijk Aquarium so it is my opinion that she should remain there until she is completely healthy. Once she receives a clean bill of health and her caretakers believe she is ready for a new challenge, I would recommend that she be moved to an oceanarium facility where she can live in the company of other killer whales. In my judgement, the introduction to other killer whales should be undertaken as soon as she is deemed ready by the staff at the Harderwijk Aquarium but certainly prior to her fourth birthday.

I have written this letter with brevity in mind so many of the points made lack extensive discussion. I would be happy to discuss further, any questions that arise regarding details of the letter or future plans for Morgan. I hope to be able to contribute to a positive outcome.

James McBain DVM

Fernando Ugarte

I can not see how a release attempt, given the circumstances, could be successful. Furthermore, it is likely that the experience of being released will be unpleasant for the whale, since in order to learn to feed and take care of herself, she would undoubtedly experience hunger and fear.

If the welfare of the animal is the main priority, the focus should be on finding the best solution for a healthy and active life under human care. A large sea-pen is probably the best option, especially given the large size of adult killer whales.

A perfect sea-pen in the shallow and exposed North Sea would probably require some design involving digging and building structures. There must be plenty of naturally suitable bays and fjords in places such as Scotland, Ireland or Norway.

Analysis and conclusion

All contributors are opposed to a release into the wild of Morgan. (Ford; Camphuysen; Leopold; Guinet; Lockyer; Ugarte; McBain)

Concerns over successful introduction and acceptance of Morgan into a pod in the wild were mentioned by most contributors (Ford, Camphuysen, Leopold, Guinet and McBain).

Lack of hunting skills and capability to successfully forage were mentioned by four contributors (Ford, Ugarte, Guinet, McBain).

Habituation to humans was seen as a potential problem by four authors (Ford, Camphuysen, Lockyer and McBain).

Leopold mentioned the possibility that a catastrophic event with Morgan's pod or a mental or physical health problem of Morgan may have caused her separation from the pod.

Camphuysen touched upon the concern that Norway with its killer whales mainly located off-shore presents an extremely difficult environment for a release attempt.

In conclusion, no data are present on the history or identity of Morgan's pod. The killer whales of the region where she may originate from are currently not monitored in a structural and scientific manner. There is no knowledge on the cause of her being found alone. No disease has been found which may explain her separation. She was emaciated and defecated algae during the first week besides demonstrating a huge appetite, indicating she had been extremely hungry and unable to feed herself. Acceptation into a pod is of paramount importance for her welfare and survival chances. Only her natal pod is a potential candidate that provides an acceptable chance of introducing her successfully given what is known about the social structure of killer whales.

Research on her DNA and vocal repertoire indicate she originated from the population of killer whales that hunt the Norwegian Spring Spawning herring. This population consists of 400 to 800 animals. Two issues now have to be considered.

The first is that Morgan's natal pod has not been identified. Her specific vocal repertoire has no match in historic records. Identification is only possible by finding the pod that has the exact same vocal repertoire as Morgan and identifying this pod visually. Only in winter does this population of killer whales gather in still a fairly large and poor defined area offshore. However in winter it is, due to poor light conditions and rough weather, extremely difficult to impossible to visually identify animals that have been recorded by hydrophone. An added difficulty is multiple groups may be recorded together making even more difficult to match a recorded vocal repertoire to a specific pod (Patrick Miller personal communication).

Second the location of release would most probably then have to be offshore as this is where most of the pods spend most of their time. Transporting and releasing her to

a once found and followed pod would be hazardous to impossible (especially in rough winter weather conditions) and a contingency plan to help her if she is not accepted by the selected pod is hard to imagine, unless she was trained to follow boats which would make the risk of her interfering with other boats and humans after an attempted release very high and could lead to unacceptable and dangerous situations.

Morgan therefore can not be released and a proper location and setting for keeping her under human care has to be arranged.

Appendix 1 Information on experts and author (including selected publications)

C.J. Camphuysen

NIOZ Royal Netherlands Institute for Sea Research
Landsdiep 4
1797 SZ 't Horntje (Texel)
The Netherlands

Personal	
Family name	Camphuysen
First name(s)	Cornelis Jan (Kees)
Date of birth	25 May 1959
Place of birth	Amsterdam, The Netherlands
Education	
	Autodidact
1978	Athenaeum B, Scholengemeenschap Buitenveldert, Amsterdam
Prizes & Grants	
1993	Received Herman Klomp award in 1993, for 150 publications written as an amateur to that date, but particularly for two papers on seabirds and fisheries interactions[3, 17], from NOU, SOVON and Vogelbescherming Nederland.

Mr Camphuysen is associated with the Royal Netherlands Institute for Sea Research (Royal NIOZ) since 1992, first to assess the effects of fisheries on seabirds. Later work has focussed mainly on natural aspects underlying the distribution of seabirds at sea, which has culminated in EC funded projects in which complicated models of foraging decisions of seabirds were parameterised and tested (see below for further details)

Formed his consultancy in 1995 (CSR Consultancy), closely associated with Royal NIOZ and IBN-DLO/Alterra (currently Wageningen IMARES) in which applied scientific questions are addressed, such as environmental impact assessments in the North Sea and Wadden Sea for governmental bodies, NGOs and oil companies. Consultancy was discontinued in 2006 because of a permanent research position at Royal NIOZ.

Apart from a general interest in seabirds and marine mammals (and also in the further trophic levels of the marine food web), his research has mostly had an emphasis on the foraging ecology of marine top-predators and of the interactions between species while at sea. Extensive boat surveys, following standard protocols, in most parts of the North and South Atlantic, including the North Sea, formed the basis of this interest and this has culminated into more detailed studies of the foraging behavior and foraging whereabouts of seabirds and cetaceans at sea. In more recent projects, it is his aim to link reproductive and demographic parameters of breeding seabirds with food availability, prey selection and energetic constraints (foraging range, profitability of feeding, energetic demands of parents and offspring). In these projects, emphasis is on two species of gulls: *Larus fuscus* and *Larus argentatus*.

Since 1977, the effects of oil pollution on seabirds has been an important topic of study, including impact assessments of major spills, a monitoring programme of oiled beached seabirds in

The Netherlands, and necropsies of beached seabirds to evaluate the effects of pollution, but also to study moult, growth, condition, and diet of seabirds at sea

Studies on cetaceans commenced in 1982 and have culminated into several publications on the identification and distribution of marine mammals. Recent work is mainly aiming at the integration of studies of important top-predators in marine ecosystems, mainly seabirds and cetaceans. A Marine mammal database was established in 1987 and has been maintained as a database manager for the Dutch Seabird group and this database is now the primary and most accessible source of information for the occurrence and relative abundance of cetaceans in the southern North Sea. Personal experience with 42 taxa of cetaceans; personal records: 19,889 individual whales and dolphins (as at March 2007). Author of two field guides, one published in Norwegian, one in Dutch, and several papers on the identification of whales and dolphins. Author of a book on whales and dolphins in the North Sea (2006). Conducted mass autopsies of Harbour Porpoises stranded in The Netherlands in 2006 and 2007 and published the results as a report (NIOZ/IMARES project).

Publications refereed:

Scott B.E., J. Sharples, O.N. Ross, J. Wang, G.J. Pierce & **C.J. Camphuysen** 2010. Sub-surface hotspots in shallow seas: fine scale limited locations of marine top-predator foraging habitat indicated by tidal mixing and sub-surface chlorophyll. Mar. Ecol. Progr. Ser. in press.
Camphuysen C.J., S. Schouten & A. Gronert 2011. Mystery spill of Polyisobutylene (C4H8)n off the Dutch coast affecting seabirds in March 2010. *Seabird*, under review.
Camphuysen C.J., Bao, R., Fortin M., Roselaar, C.S. & Heubeck, M. 2011. Post-mortem examination of Great Northern Divers Gavia immer killed in the Prestige oil spill, Galicia, Spain 2002-3. *Seabird*, under review.
Camphuysen C.J. 2010. Declines in oil-rates of stranded birds in the North Sea highlight spatial patterns in reductions of chronic oil pollution. Mar. Poll. Bull. *In press*.
Camphuysen C.J., P. de Boer, W. Bouten, A. Gronert & J. Shamoun-Baranes 2010. Mammalian prey in Laridae: increased predation pressure on mammal populations expected. Lutra *in press*.
Camphuysen C.J., H.J.P. Vercruijsse & A.L. Spaans [submitted, under review]. Colony- and age-specific seasonal dispersal of Herring Gulls Larus argentatus breeding in The Netherlands. Submitted *Ardea*, 26 October 2009, *under review*.
(Garthe S., **Camphuysen C.J**., Fureness R.W. & Kubetzki U. [submitted, under review] Food consumption by seabirds in the North Sea. *Ices Journal of Marine Science*)
(**Camphuysen C.J**. [reviewed, provisionally accepted, awaits re-submission] Intra-specific competition and other factors leading to far-ranging foraging flights in Northern Gannets *Morus bassanus*. British Birds)
Camphuysen C.J., C. Smeenk, M.J. Addink, H. van Grouw & O.E. Jansen 2008. Cetaceans stranded in the Netherlands from 1998 to 2007. Lutra 51(2): 87-122.
Camphuysen C.J. & M.F. Leopold 2008. Drieteenmeeuw vestigt zich op meerdere platforms in Nederlandse wateren. Limosa 80: 153-156.
Barrett R.T., C.J. **Camphuysen**, T. Anker-Nilssen, J.W. Chardine, R.W. Furness, S. Garthe, O. Hüppop, M.F. Leopold, W.A. Montevecchi, R.R. Veit 2007. Diet studies of seabirds: a review and recommendations. ICES J. Mar. Sc. 64: 1675-1691.
Camphuysen C.J. 2007. Foraging humpback whale (Megaptera novaeangliae) in the Marsdiep area (Wadden Sea), May 2007 and a review of sightings and strandings in the southern North Sea, 2003-2007. Lutra 50(1): 31-42.
Camphuysen C.J. 2007. Where two oceans meet: offshore interactions of Great-winged Petrels *Pterodroma macroptera* and Leach's Storm petrels *Oceanodroma leucorhoa* off southern Africa. J. Ornithol. 148: 333-346.
Camphuysen C.J., D.C. Camphuijsen & T.M. van Spanje 2006. Het voedsel van de Kleine Mantelmeeuwen van het Wormer- en Jisperveld. Limosa 78: 145-154.
Ens B.J., Kats R. & **Camphuysen** C.J. 2006. Waarom zijn Eiders niet massaal gestorven in de winter van 2005/2006? Limosa 79: 95-106.
Meij S.E.T. van der & C.J. **Camphuysen** 2006. Distribution and diversity of whales and dolphins (Cetacea) in the Southern North Sea: 1970-2005. Lutra 49(1): 3-28.
Camphuysen C.J. 2005. Assessing age and breeding origin of wrecked Little Auks *Alle alle*: the use of biometrics and a variable underwing pattern. Atlantic Seabirds 7(2): 49-70.
Camphuysen C.J. 2005. Seabirds at sea in summer in the NW North Sea. British Birds 98: 2-19.

Camphuysen C.J. 2005. The Tricolor oil spill: an incident that should have been prevented. Atlantic Seabirds 6(3): 81-84.
Camphuysen C.J. & F. de Vreeze 2005. De Drieteenmeeuw Rissa tridactyla als broedvogel in Nederland. Limosa 78(2): 65-74.
Camphuysen C.J. & J. van der Meer 2005. Wintering seabirds in Western Africa: foraging hot-spots off Western Sahara and Mauritania driven by upwelling and fisheries. African J. Mar. Sc. 27(2): 427-437.
Camphuysen C.J. & M.F. Leopold 2005. The Tricolor oil spill: characteristics of seabirds found oiled in The Netherlands. Atlantic Seabirds 6(3): 109-128.
Ouwehand J., Leopold M.F. & **Camphuysen** C.J. 2005. A comparative study of the diet of Guillemots *Uria aalge* and Razorbills *Alca torda* killed during the Tricolor oil incident in the south-eastern North Sea in January 2003. Atlantic Seabirds 6(3): 147-164.
Camphuysen C.J. 2004. Notes on seabirds 78. Deposition rates of carcasses on the beach in The Netherlands. Atlantic Seabirds 6(2): 79-80.
Camphuysen C.J. 2004. The return of the harbour porpoise (*Phocoena phocoena*) in Dutch coastal waters. Lutra 47(2): 113-122.
Camphuysen C.J. & Garthe S. 2004. Recording foraging seabirds at sea: standardised recording and coding of foraging behaviour and multi-species foraging associations. Atlantic Seabirds 6(1): 1-32.
Leopold M.F., Bruin C.J.W., **Camphuysen** C.J., Winter C.J.N. & Koks B.J. 2004. Waarom is de Visarend *Pandion haliaetus* in Nederland geen zeearend? Limosa 76: 129-140.
Camphuysen C.J. 2003. Characteristics of Atlantic Puffins *Fratercula arctica* wrecked in The Netherlands, January-February 2003. Atlantic Seabirds 5(1): 21-30.
Heubeck M., **Camphuysen** C.J., Bao R., Humple D., Sandoval A., Cadiou B., Bräger S. & Thomas T. 2003. Assessing the impact of major oil spills on seabird populations. Mar. Poll. Bull. 46: 900-902.
Camphuysen C.J. 2002. Post-fledging dispersal of Common Guillemots *Uria aalge* guarding chicks in the North Sea: the effect of predator presence and prey availability at sea. Ardea 90(1): 103-119.
Camphuysen C.J., C.M. Berrevoets, H.J.W.M. Cremers, A. Dekinga, R. Dekker, B.J. Ens, T.M. van der Have, R.K.H. Kats, T. Kuiken, M.F. Leopold, J. van der Meer & T. Piersma 2002. Mass mortality of common eiders (Somateria mollissima) in the Dutch Wadden Sea, winter 1999/2000: starvation in a commercially exploited wetland of international importance. Biological Conservation 106(3): 303-317.
Camphuysen C.J., Heubeck M., Cox S., Bao R., Humple D., Abraham C. & Sandoval A. 2002. The Prestige oil spill in Spain. Atlantic Seabirds 4(3): 131-140.
Desholm M., Christensen T.K., Scheiffarth G., Hario M., Andersson Å., Ens B., **Camphuysen** C.J., Nilsson L., Waltho C.M., Lorentsen S-H., Kuresoo A., Kats R.K.H., Fleet D.M. & Fox A.D. 2002. Status of the Baltic/Wadden Sea population of the Common Eider *Somateria m. mollissima*. Wildfowl 53: 167-203.
Underhill L.G., Crawford R.J.M. & **Camphuysen** C.J. 2002. Leach's storm petrels *Oceanodroma leucorhoa* off southern Africa: breeding and migratory status, and measurements and mass of the breeding population. Trans. Roy. Soc. S. Afr. 57: 43-46.
Camphuysen C.J. 2001. The distribution of Spectacled Petrels *Procellaria conspicillata* in the south-eastern Atlantic. Atlantic Seabirds 3(3): 113-124.
Camphuysen C.J. 2001. Northern Gannets *Morus bassanus* found dead in The Netherlands, 1970-2000. Atlantic Seabirds 3(1): 15-30.
Camphuysen C.J. & Heubeck M. 2001. Marine oil pollution and beached bird surveys: the development of a sensitive monitoring instrument. Environmental Pollution 112: 443-461.
Camphuysen C.J. & Van der Meer J. 2001. Pelagic distribution, moult and (sub-) specific status of Cory's Shearwaters *Calonectris [d.] diomedea/borealis* wintering off southern Africa. Marine Ornithology 29: 85-93.
Leopold M.F., Leeuwen P.W. van, Horn H. & **Camphuysen** C.J. 2001. Grote IJsduiker *Gavia immer* eet kleine visjes: een verdronken vogel geeft geheimen prijs. Limosa 73: 135-143.
Camphuysen C.J. 2000. Mass mortality of Common Eiders *Somateria mollissima* in the Wadden Sea, winter 1999/2000: food related parasite outbreak? Atlantic Seabirds 2(1): 47-48.
Camphuysen C.J. 2000. Seabirds drowned in fishing nets off Jan Mayen (Greenland Sea). Atlantic Seabirds 2(2): 87-91.
Camphuysen C.J. 2000. Zomerwaarnemingen van Noordse Pijlstormvogels *Puffinus puffinus* in Nederland. Limosa 73: 7-16.
Camphuysen C.J. & J. van der Meer 2000. Notes on the distribution of the Spectacled Petrel *Procellaria conspicillata* in the South Atlantic. Atlantic Seabirds 2(1): 13-18.
Tasker M.L., **Camphuysen** C.J., Cooper J., Garthe S., Montevecchi W.A. & Blaber S.J.M. 2000. The impacts of fishing on marine birds. ICES J. Mar. Sc. 57: 531-547.

Camphuysen C.J. 1999. Diurnal activity patterns and nocturnal group formation of wintering Common Murres in the central North Sea. Colonial Waterbirds 21(3): 406-413.
Camphuysen C.J. 1999. New feeding technique of Great Cormorants *Phalacrocorax carbo sinensis* at beam trawlers. Atlantic Seabirds 1(2): 85-90.
Camphuysen C.J. & A. Webb 1999. Multi-species feeding associations in North Sea seabirds: jointly exploiting a patchy environment. Ardea 87(2): 177-198.
Camphuysen C.J., Barreveld H., Dahlmann G. & Franeker J.A. van 1999. Seabirds in the North Sea demobilised and killed by polyisobutylene $(C_4H_8)_n$. Marine Pollution Bulletin 38(12): 1171-1176.
Camphuysen C.J. & Reid J.B. 1999. Trends in seabird systematics: recent sometimes conflicting decisions of BOURC and CSNA. Atlantic Seabirds 1(2): 92-94.
Phillips R.A., M.K. Petersen, K. Lilliendahl, J. Solmundsson, K.C. Hamer, C.J. **Camphuysen** & B. Zonfrillo 1999. The diet of the Northern Fulmar *Fulmarus glacialis*: reliance on commercial fisheries? Marine Biology 135: 159-170.
Camphuysen C.J. 1998. Beached bird surveys indicate decline in chronic oil pollution in the North Sea. Mar. Poll. Bull. 36(7): 519-526.
Camphuysen C.J. 1998. Het voorkomen van de Alk *Alca torda* in Nederlandse wateren. Limosa 71: 69-77.
Franeker J.A. van, **Camphuysen** C.J. & Mehlum F. 1998. The birds of Jan Mayen. Circumpolar Journal 13(2): 28-43.
Camphuysen C.J. & Garthe S. 1997. An evaluation of the distribution and scavenging habits of Northern Fulmars (*Fulmarus glacialis*) in the North Sea. ICES J. Mar. Sc. 54: 654-683.
Furness R.W. & **Camphuysen** C.J. 1997. Seabirds as monitors of the marine environment. ICES J. Mar. Sc. 54: 726-737.
Northridge S., Tasker M.L., Webb A., **Camphuysen** C.J. & Leopold M.F. 1997. White-beaked *Lagenorhynchus albirostris* and Atlantic white-sided *L. acutus* distributions in north-west European and U.S. North Atlantic waters. SC/48/SM44, Rep. Int. whal. Commn. 47: 797-805.
Camphuysen C.J., Ens B.J., Heg D., Hulscher J., Meer J. van der & Smit C.J. 1996. Oystercatcher winter mortality in The Netherlands: the effect of severe weather and food supply. Ardea 84a: 469-492.
Camphuysen C.J. & Winter C.J.N. 1996. Arctic Terns *Sterna paradisaea* in the central northern North Sea in July: offshore staging area for failed breeders? Seabird 18: 20-25.
Garthe S., **Camphuysen** C.J. & Furness R.W. 1996. Amounts of discards in commercial fisheries and their significance as food for seabirds in the North Sea. Mar. Ecol Progr. Ser. 136: 1-11.
Meer J. van der & **Camphuysen** C.J. 1996. Effect of observer differences on abundance estimates of seabirds from ship-based strip transect surveys. Ibis 138: 433-437.
Reijnders P.J.H., Leopold M.F., **Camphuysen** C.J., Heessen H.J.L. & Kastelein R.A. 1996. The status of harbour porpoises in Dutch waters and state of related research in The Netherlands: an overview. SC/47/SM41, Rep. Int. Whal. Commn. 46: 607-611.
Camphuysen C.J. 1995. Grauwe Pijlstormvogel *Puffinus griseus* en Noordse Pijlstormvogel *P. puffinus* in de zuidelijke Noordzee: een offshore perspectief. Limosa 68: 1-9.
Camphuysen C.J. 1995. Herring Gull *Larus argentatus* and Lesser Black-backed Gulls *Larus fuscus* feeding at fishing vessels in the breeding season: competitive scavenging versus efficient flying. Ardea 83(2): 365-380.
Camphuysen C.J., Heessen H.J.L. & Winter C.J.N. 1995. Distant feeding and associations with cetaceans of Gannets *Morus bassanus* from Bass Rock, May 1994. Seabird 17: 36-43.
Camphuysen C.J. & Winter C.J.N. 1995. Feeding Fin Whales *Balaenoptera physalus* in the North Sea. Lutra 38: 81-84.
Camphuysen C.J. 1994. Flatfish selection by Herring Gulls *Larus argentatus* and Lesser Black-backed Gulls *Larus fuscus* scavenging at commercial beamtrawlers in the southern North Sea. Neth. J. Sea Res. 32(1): 91-98.
Camphuysen C.J. 1994. The Harbour Porpoise *Phocoena phocoena* in the southern North Sea, II: a come-back in Dutch coastal waters? Lutra 37(1): 54-61.
Dahlmann G., Timm D., Averbeck C., **Camphuysen** C.J. & Skov H. 1994. Oiled seabirds - Comparative investigations on oiled seabirds and oiled beaches in the Netherlands, Denmark and Germany (1990-1993). Mar. Poll. Bull. 28: 305-310.
Camphuysen C.J. & Leopold M.F. 1993. The Harbour Porpoise *Phocoena phocoena* in the southern North Sea, particularly the Dutch sector. Lutra 36(1): 1-24.
Camphuysen C.J. 1992. Zeevogelstrandingen op de Nederlandse kust: 26 jaar een vinger aan de pols (1965-1991). Limosa 66(1): 1-16.
Camphuysen C.J. 1990. Biometrics of auks at Jan Mayen. Seabird 12: 7-10.

Camphuysen C.J. 1989. Diurnal rhythm of the Fulmar *Fulmarus glacialis* in the arctic summer. Dansk Orn. Foren. Tidsskr. 83: 85-86.
Camphuysen C.J. 1989. Vondst van een noordelijke Zeekoet *Uria aalge hyperborea* in Nederland. Limosa 62(1): 47-48.
Camphuysen C.J. & Derks P.J.T. 1989. Voorkomen en sterfte van de Fuut *Podiceps cristatus* voor de Nederlandse kust, 1974-86. Limosa 62: 57-62.
Camphuysen C.J. & IJzendoorn E.J. van 1988. Influx of Pomarine Skua in northwestern Europe in autumn 1985. Dutch Birding 10(2): 66-70.
Camphuysen C.J. & IJzendoorn E.J. van 1988. Invasie van Middelste Jagers in Nederland in november 1985. Dutch Birding 10(2): 54-65.
Camphuysen C.J. 1986. Vondsten van Kleine Alken *Alle alle* en Papegaaiduikers *Fratercula arctica* langs de Nederlandse kust. Limosa 59(3): 138-141.
Franeker J.A. van, **Camphuysen** C.J. & Mehlum F. 1986. Status over Jan Mayens fugler. Vår Fuglefauna 9(3): 145-158.
Camphuysen C.J. 1982. Vondst van een Kuhls Pijlstormvogel *Calonectris diomedea*. Limosa 55(3): 99-100.
Camphuysen C.J. & Maas F.J. 1982. Zeevogels in Nederland in 1978. Limosa 55: 17-22.

JOHN KENNETH BAKER FORD

B.Sc. Hons., Ph.D. (UBC)

Current Positions Program Head, Cetacean Research, Conservation Biology Section, Pacific Biological Station, Fisheries and Oceans Canada
Adjunct Professor, Department of Zoology, Faculty of Science, and Fisheries Centre, Faculty of Graduate Studies, University of BC
Address Pacfic Biological Station
Fisheries and Oceans Canada
3190 Hammond Bay Road,
Nanaimo, BC Canada V9T 6N7
E-mail: John.K.Ford@dfo-mpo.gc.ca

PERSONAL DATA
Date and Place of Birth: 28 January 1955 Victoria, B.C., Canada
Citizenship Canadian
Education B.Sc. (Honours) Zoology (1972-76), University of British Columbia
Ph.D. Zoology (1977-85), University of British Columbia

EMPLOYMENT HISTORY
1973-76 Marine Mammal Husbandry and Training, Vancouver Aquarium
1985-86 NSERC Postdoctoral Fellow, Pacific Biological Station, Fisheries & Oceans Canada, Nanaimo, BC
1987-88 NSERC Postdoctoral Fellow, ESL Environmental Sciences Ltd.,Vancouver BC
1988-2001 Vancouver Aquarium Marine Science Centre:
1988-92 Curator of Marine Mammals
1992-96 Marine Mammal Scientist
1996-98 Director of Conservation and Research
1999-2001 Senior Marine Mammal Scientist
2001-present Research Scientist and Head, Cetacean Research Program, Pacific Biological Station, Fisheries & Oceans Canada, Nanaimo, B.C.

RESEARCH AND CONSERVATION ACTIVITIES
• Life history, social ecology, and acoustic behaviour of killer whales in British Columbia
- Field studies on foraging ecology of killer whale ecotypes in British Columbia, including potential prey limitation of the salmon-feeding resident population (1990-present).
- Annual field census using individual photo-identification of whales in coastal BC and adjacent waters, in collaboration with G. Ellis (DFO), and K. Balcomb (Center for Whale Research). 1977-present

- Ongoing acoustical monitoring of killer whale populations in the Northeast Pacific Ocean by means of analysis and interpretation of group-specific vocal dialects. 1977-present
J.K.B. Ford – March 2010 Page 2 of 17 - Population genetic studies of killer whales in collaboration with G. Ellis and L. Barrett-Lennard (University of British Columbia). 1994-2001

• Population status, ecology, and behaviour of humpback whales: British Columbia, Hawaii, and Japan
- Lead for Canada, multi-national SPLASH project (Structure of Populations, Levels of Abundance and Status of Humpbacks), a North Pacific-wide project to determine abundance and population structure of humpback whales. 2004-2007.
- Studies on population abundance and identity, site fidelity, and feeding habits of humpback whales in the Queen Charlotte Islands and north BC mainland coast. 1991-present
- Co-principal investigator in a study of the population status of humpback whales in the Bonin Islands, Japan, and its relationship to other North Pacific populations for World Wildlife Fund Canada and Japan. 1988
- Field assistant in study of population dynamics of humpback whales in Hawaii. Responsible for collecting identification photographs of individual whales, making acoustic recordings,and monitoring behavioural activities. New York Zoological Society. 1980-81

• Status, distribution and abundance of cetaceans in British Columbia
- Chief scientist on annual DFO ship surveys for cetaceans in British Columbia waters, 2002-2009
- Three-year field census program undertaken for Gwaii Haanas/South Moresby National Marine Park Reserve, Parks Canada; first such study in area. 1991-93; follow-up survey,
2004-2006.

• Management of human impacts on cetaceans
- Member, and Chair of Scientific Subcommittee, of the joint federal/provincial Johnstone Strait Killer Whale Committee, tasked with developing recommendations to government regarding disturbance effects of whale watching, logging, and fishing on killer whales off northern Vancouver Island. 1990-97
- Member, Board of Directors, Johnstone Strait Killer Whale Interpretive Centre Society. 1994-present
- Invited participant, First International Workshop on the Scientific Aspects of Whale Watching Management, Montecastello di Vibio, Italy. Apr 1995
- Invited Expert, Workshop on the Identity, Structure, and Vital Rates of Killer Whales Populations, International Whaling Commission Scientific Committee, Cambridge, England Jun 1981.

• Impacts of underwater noise on marine mammals
- Technical Specialist on impacts on marine mammals from acoustic deterrent devices, Salmon Aquaculture Review, B.C. Environmental Assessment Office. 1996-97.
- Invited Specialist, Acoustic Deterrents Workshop, U.S. Marine Mammal Commission, Seattle. Mar 1996.
- Co-investigator, effects of acoustic deterrent devices at salmon farms on harbour porpoise. 1994-95.
- Technical Assistant, Beaufort Sea Environmental Impact Statement, regarding biological effects and potential impacts of underwater noise on marine mammals. ESL Environmental Sciences Ltd. 1981-84
- Invited participant in 'The Question of Sound from Icebreaker Operations', a workshop on the effects of proposed Arctic LNG carriers on marine mammals. Petro Canada, Toronto. Feb 1981
- Designed and conducted field study of the potential effects of underwater industrial noise on J.K.B. Ford – March 2010 Page 3 of 17 belugas in the Beaufort Sea. F.F. Slaney & Co., environmental consultants. 1976-77.

• Oil spill preparedness, response and recovery: marine mammals
- Member, Advisory Committee, Robson Bight Salvage Recovery Team, 2008
- Technical Advisor, Queen of the North Sinking Response Team, 2006
- Technical reviewer and advisor for research and recovery programs involving killer whales and humpback whales in aftermath of *Exxon Valdez* oil spill, Alaska. U.S. Dept. of Justice, 1989-92; Exxon Valdez Oil Spill Trustee Council, 1993-2001
- Assisted in rescue and rehabilitation of sea otters during *Exxon Valdez* oil spill. Apr-May 1989
- Assisted in coordination and completion of field surveys to assess impacts of *Nestucca* oil spill on sea otters along west coast of Vancouver Island. Jan-Mar 1989
- Technical Specialist advising on marine mammal issues on the coast of B.C. and potential impacts from renewed hydrocarbon exploration. West Coast Offshore Exploration

Environmental Review Panel. 1984-85

• **Underwater acoustic behaviour and stock identity of narwhals in the Canadian Arctic**
- Field investigation of potential role of underwater vocalization in population studies of narwhals, "Whales Beneath the Ice" program, World Wildlife Fund Canada. 1984-85.
- First comprehensive recording and analysis of vocal signals of narwhals. 1975-76

• **Abundance and distribution of cetaceans in the Canadian Arctic**
- Principal investigator in field study of distribution, abundance and age segregation of bowhead whales and other marine mammals, Beaufort Sea. 1986.
- Co-investigator, aerial surveys of the distribution of white whales as related to physical and chemical oceanographic factors, southern Beaufort Sea. 1977.
- Conducted systematic aerial surveys of marine mammals in Baffin Bay and Davis Strait. Aug-Oct 1976.

ACADEMIC RELATED ACTIVITIES
- Department of Zoology, Faculty of Science, University of B.C.: Research Associate, 1989-92; Adjunct Professor 1993-present
- Marine Mammal Research Unit, Fisheries Centre, Faculty of Graduate Studies, University of B.C.: Adjunct Professor, 1993-present
- Honourary Reader, Department of Zoology, University of St. Andrews, Scotland, 2000-2003
- Guest Investigator, Woods Hole Oceanographic Institution, 1997-99
- Co-instructor, undergraduate level course on biology of marine mammals, Bamfield Marine Station. 1992-2002
- Co-instructor, UBC field course in earth and ocean sciences, Baja California, Jan-Mar 2000
- Supervisor of BSc Honours, MSc and PhD students at the University of B.C., including:
- Barrett-Lennard, L.G. 1992. Echolocation in wild killer whales *(Orcinus orca)*. MSc thesis.
- Deecke, V. 1994. Using an artificial neural network to investigate dialect development in killer whales (*Orcinus orca*). BSc Honours thesis.
- Heise, K. 1996. Life history parameters of the Pacific white-sided dolphins (*Lagenorhynchus obliquidens*) and its diet and occurrence in the coastal waters of British Columbia. MSc thesis.
- Harms, E. 1997. Association patterns and pod cohesion of northern resident killer whales (*Orcinus orca*). MSc thesis.
- O, Miriam. 1998. Investigation of intraspecific scars and nicks within the northern J.K.B. Ford – March 2010 Page 4 of 17 resident killer whale (*Orcinus orca*) population of the northeast Pacific. BSc Honours thesis.
- Barrett-Lennard, L.G. 2000. Population structure and mating patterns of killer whales (*Orcinus orca*) as revealed by DNA analysis. PhD thesis.
- Keple, A. 2002. Seasonal abundance and distribution of marine mammals in the Strait of Georgia, British Columbia. MSc thesis.
- Yurk, H. 2005. Stability of vocal culture in killer whales (Orcinus orca). PhD thesis.
- Dalla Rosa, L. in progress.The relationship between oceanographic parameters and distribution of humpback whales. PhD thesis.
- Rambeau, A. 2008. Determining abundance and stock structure for a widespread migratory animal: the case of humpback whales (Megaptera novaeangliae) in British Columbia, Canada. MSc thesis, University of BC.
- Advisory Committee for the following students:
- Recchia, C.A. 1994. Social behaviour of captive belugas, *Delphinapterus leucas.* Woods Hole Oceanographic Institution, Massachusetts Institute of Technology. PhD thesis.
- Strager, H. 1994. Pod specific call repertoires and compound calls of killer whales, *Orcinus orca* L. 1758, in the waters of northern Norway. MSc thesis, University of Aarhus, Denmark.
- Thomsen, F. 1995. An analysis of whistles and calls from the sound repertoire of killer whales (*Orcinus orca*) off the coast of Vancouver Island, British Columbia, Canada. Diploma thesis, University of Hamburg, Germany (co-supervisor)
- Erbe, C. 1997. The masking of beluga whale (*Delphinapterus leucas*) vocalizations by icebreaker noise. Ph.D. thesis, University of British Columbia. 215 pp.
- Similä, T. 1997. Behavioral ecology of killer whales in northern Norway. PhD thesis, University of Tromsø, Norway.

- Thomsen, F. 1999. An investigation of the acoustic signals of killer whales (*Orcinus orca*) off Vancouver Island, British Columbia. PhD thesis, University of Hamburg, Germany (co-supervisor).
- Williams, R.M. 1999. Behavioural responses of killer whales to whale-watching: opportunistic observations and experimental approaches. MSc thesis, University of British Columbia.
- Hall, A.M. 2004. Seasonal abundance, distribution and prey species of harbour porpoise (*Phocoena phocoena*) in southern Vancouver Island waters. MSc thesis, University of British Columbia.
- McCluskey, S. 2006. Space Use Patterns and Population Trends of Southern Resident Killer Whales (*Orcinus orca*) in Relation to Distribution and Abundance of Pacific Salmon (*Oncorhynchus* spp.) in the Inland Marine Waters of Washington State and British Columbia. MSc thesis, University of Washington.
-

AWARDS and FELLOWSHIPS

Dean's Honours List, University of B.C., 1976
Vancouver Natural History Society Award, 1976
Kit Malkin Memorial Scholarship, 1977-80
Maclean Fraser Memorial Scholarship, 1978-82
J.K.B. Ford – March 2010 Page 5 of 17
University of B.C. Graduate Fellowship, 1979-82
Best Student Paper Award, Society for Marine Mammalogy Biennial Conf., Boston, MA, 1983
NSERC Postdoctoral Fellowship in Canadian Government Laboratories, 1985-86
NSERC Industrial Fellowship, 1986-88
Murray A. Newman Award for Significant Achievement in Aquatic Research, Vancouver Aquarium Marine Science Centre, 2009.

COMMITTEE MEMBERSHIPS

- Cetacean Specialist Group, International Union for the Conservation of Nature (IUCN), 2009-present
- Species Specialist Group, Marine Mammals, Committee on the Status of Endangered Wildlife in Canada, 2005-present
- Marine Mammal Subcommittee, Canadian Council on Animal Care, 2003-present
- Killer Whale Recovery Team, 2004-present
- Sea Otter Recovery Team, 2002-present
- Chair, North Pacfic Right Whale Recovery Team, 2002-2005

PUBLIC EDUCATION ACTIVITIES

- Frequent public lectures on whale biology and conservation. Host organizations and facilities include Smithsonian Institution, Washington; Field Museum of Natural History, Chicago; Cleveland Natural History Museum, Ohio; National Aquarium, Baltimore; Columbus Zoo, Ohio; Canadian Geographical Society, Vancouver, Victoria, Nanaimo, Ottawa; Vancouver Island University; Royal British Columbia Museum, Victoria; Alberta Provincial Museum, Edmonton; Vancouver Institute, Vancouver.
- Numerous popular magazine articles, including: National Geographic Magazine, Natural History (New York).
- Contributions to numerous television documentaries, including productions for National Geographic, Discovery Channel (Canada and US), Canadian Broadcasting Corporation, Australian Broadcasting Corporation, British Broadcasting Corporation, NHK Tokyo, TBS Tokyo.
- Co-developed public displays and exhibits on marine mammals, Vancouver Aquarium Marine Science Centre.

REPORTS AND PUBLICATIONS
Scientific Journals:

Ford, J.K.B, G.M. Ellis, P.F. Olesiuk, and K.C. Balcomb. 2010. Linking killer whale survival and prey abundance: food limitation in the oceans' apex predator? Biology Letters, 6:139-142. Published on-line before print September 15, 2009.
Himworth, C.G., M. Haulena, D. M. Lambourn, J.K. Gaydos, J. Huggins, K. Zaremba, J. Calambokidis, J. Ford, P. Ross, and S. Raverty. In press. Pathology and epidemiology of phocid herpesvirus-1

infections in wild and rehabilitating harbor seals (*Phoca vitulina*) in the Northeastern Pacific. J. Wildlife Diseases
Calambokidis, J., Barlow, J., Ford, J.K.B., Chandler, T.E., and Douglas, A.B. 2009. Insights into the population structure of blue whales in the eastern North Pacific from recent sightings and photographic identification. Marine Mammal Science 25:816-832.
Parsons, K.M., Balcomb, K.C. III, Ford, JK.B., and Durban, J.W. 2009. The social dynamics of southern resident killer whales and conservation implications for this endangered population. Animal Behaviour 77:963-971
Ward, E.J., Parsons, K., Holmes, E.E., Balcomb, K.C. III, and Ford, J.K.B. 2009. The role of menopause and reproductive senescence in a long-lived social mammal. Frontiers in Zoology,6:4.
Riesch, R., Ford, J.K.B., and Thomsen, F. 2008. Whistle sequences in wild killer whales (*Orcinus orca*). J. Acoustical Soc. Amer. 124:1822-1829.
Ford, J.K.B., and Reeves, R.R. 2008. Fight or flight: antipredator strategies of baleen whales. Mammal Review, 38:50-86.
Steiger, G. H., Calambokidis, J., Straley, J. M., Herman, L. M., Cerchio, S., Salden, D. R., Urbán R., J.,Jacobsen, J. K., von Ziegesar, O., Balcomb, K. C., Gabriele, C. M., Dahlheim, M. E., Uchida,S., Ford, J. K. B., Ladrón de Guevara P., P., Yamaguchi, M., Barlow, J. 2008. Geographic variation in killer whale attacks on humpback whales in the North Pacific: implications for predation pressure. Endangered Species Research, 4: 247–256.
Gregr, E.J., Nichol, L.M., Watson, J.C., Ford, J.K.B., and Ellis, G.M. 2008. Estimating carrying capacity for sea otters in British Columbia. Journal of Wildlife Management, 72:382-388.
Hickie, B.E., Ross, P.S., Macdonald, R.W., and Ford, J.K.B. 2007. Killer whales (*Orcinus orca*) face protracted health risks associated with lifetime exposure to PCBs. Environmental Science and Technology 41: 6613-6619.
Krahn M.M., Hanson, M.B., Baird, R.W., Boyer, R.H., Burrows, D.G., Emmons, C.K., Ford, J.K.B.,Jones, L.L., Noren, D.P., Ross, P.S., Schorr, G.S., and Collier, T.K. 2007. Persistent organic pollutants and stable isotopes in biopsy samples (2004/2006) from Southern Resident killer whales. Marine Pollution Bulletin, 54:1903–1911.
Guinet, C., Domenici, P., de Stephanis, R., Barrett-Lennard, L., Ford, J. K. B., and Verborgh, P. 2007. Killer whale predation on bluefin tuna: exploring the hypothesis of the endurance-exhaustion technique. Marine Ecology Progress Series 347:111-119.
Pitman, R. L., Fearnbach, H., LeDuc, R., Gilpatrick, J. W. Jr., Ford, J. K. B., and Ballance, L. T. 2007. Killer whales prey on a blue whale calf on the Costa Rica Dome: genetics, morphometrics, vocalizations and composition of the group. Journal of Cetacean Research and Management 9:151-157.
Trites, A.W., Deecke, V.B., Gregr, E.J., Ford, J.K.B., and Olesiuk, P.F. 2007. Killer whales, whaling and sequential megafaunal collapse in the North Pacific: a comparative analysis of the dynamics
J.K.B. Ford – March 2010 Page 7 of 17
Of marine mammals in Alaska and British Columbia following commercial whaling. Marine Mammal Science 23:751-765.
Wade, P.R., Barrett-Lennard, L.G., Black, N.A., Burkanov, V.N., Burdin, A.M., Calambokidis, J.,Cerchio, S., Dahlheim, M.E., Ford, J.K.B., Friday, N. A., Fritz, L.W., Jacobsen, J.K. Loughlin, T.R., Matkin, C.O. Matkin, D.R., McCluskey, S.M., Mehta, A.V., Mizroch, S.A. , Muto, M.M.,Rice, D.W., Robe, P., and Clapham, P. 2007. Killer whales and marine mammal trends in the North Pacific – a re-examination of evidence for sequential megafauna collapse and the preyswitching hypothesis. Marine Mammal Science 23:766-802.
Ford, J.K.B., and Ellis, G.M. 2006. Selective foraging by fish-eating killer whales *Orcinus orca* in British Columbia. Marine Ecology Progress Series 316:185-199.
Reisch, R., Ford, J.K.B., and Thomsen, F. 2005. Stability and group-specificity of stereotyped whistles in resident killer whales, *Orcinus orca*, off British Columbia. Animal Behaviour 71:79-93.
Ford, J.K.B. 2005. First records of long-beaked common dolphins, *Delphinus capensis*, in Canadian waters. Canadian Field-Naturalist 119:110-113.
Ford, J.K.B., Ellis, G.M., Matkin, D.R., Balcomb, K.C., Briggs, D., and Morton, A.B. 2005. Killer whale attacks on minke whales: prey capture and antipredator tactics. Marine Mammal Science 21:603-618.
Deecke, V.B., Ford, J.K.B., and Slater, P.J.B. 2005. The vocal behaviour of mammal-eating killer whales: communicating with costly calls. Animal Behaviour 69:395-405.
Vagle, S., Ford, J.K.B., Erickson, N., Hall-Patch, N., and Kamitakahara, G. 2004. Acoustic recording systems for baleen whales and killer whales on the west coast of Canada. Canadian Acoustics 32:23-32.

Au, W.W.L., Ford, J.K.B., Horne, J.K, and Newman Allman, K.A. 2004. Echolocation signals of freeranging killer whales (*Orcinus orca*) and modeling of foraging for chinook salmon (*Oncorhynchus tshawytscha*). J. Acoust. Soc. Am. 115:901-909.
Deecke, V.B., Slater, P.J.B., and Ford, J.K.B. 2002. Selective habituation shapes acoustic predator recognition in harbour seals. Nature, 420:171-173.
Williams, R., Bain, D.E., Ford, J.K.B., and Trites, A.W. 2002. Behavioural responses of male killer whales to a 'leapfrogging' vessel. J. Cetacean Research and Management 4:305-310.
Thomsen, F., Franck, D. and Ford, J.K.B. 2002. On the communicative significance of whistles in wild killer whales (*Orcinus orca*). Naturwissenschaften 89 (9): 404-407.
Yurk, H., Barrett-Lennard, L., Ford, J.K.B., Matkin, C.O. 2002. Cultural transmission within maternal lineages: vocal clans in resident killer whales in southern Alaska. Animal Behaviour 63:1103-1119.
Olesiuk, P.F., Nichol, L.M., Sowden, M.J. and Ford, J.K.B. 2002. Effect of the sound generated by an acoustic deterrent device on the relative abundance and distribution of harbour porpoise (*Phocoena phocoena*) in Retreat Passage, British Columbia. Marine Mammal Science 18:843-862.
Barrett-Lennard, L.G., Deecke, V.B., Yurk, H., and Ford, J.K.B. 2001. A sound approach to the study of culture. Behavioural and Brain Sciences, 24:325-326.
Thomsen, F., Frank D., and Ford, J.K.B. 2001. Characteristics of whistles from the acoustic repertoire of resident killer whales (*Orcinus orca*) off Vancouver Island, British Columbia. Journal of the Acoustical Society of America. 109:1240-1246.
Deecke, V.B., Ford, J.K.B. and Spong, P. 2000. Dialect change in resident killer whales (*Orcinus orca*): implications for vocal learning and cultural transmission. Animal Behaviour, 60:629-638.
Gregr, E.J., Nichol, L., Ford, J.K.B., Ellis, G., and Trites, A.W. 2000. Migration and population structure of northeastern Pacific whales off coastal British Columbia: an analysis of commercial whaling records from 1908-1967. Marine Mammal Science, 16:699-727.
Deecke, V.B., Ford, J.K.B. and Spong, P. 1999. Quantifying complex patterns of bioacoustic variation: use of a neural network to compare killer whale (*Orcinus orca*) dialects. Journal of the Acoustical Society of America, 105(4): 2499-2507.
Ford, J.K.B., Ellis, G.M., Barrett-Lennard, L., Morton, A, Palm, R., and Balcomb, K.C. 1998. Dietary specialization in two sympatric populations of killer whales (*Orcinus orca*) in coastal British Columbia and adjacent waters. Canadian Journal of Zoology, 76:1456-1471.
Watson, J.C., Ellis, G.M., Smith, T.G. and Ford, J.K.B. 1997. Updated status of the sea otter, *Enhydra lutris,* in Canada. Canadian Field-Naturalist 111:277-286.
Barrett-Lennard, L.G., Ford, J.K.B., and Heise, K.A. 1996. The mixed blessing of echolocation: differences in sonar use by fish-eating and mammal-eating killer whales. Animal Behaviour, 51:553-565.
Thomsen, F., Ford, J.K.B., and Franck, D. 1996. Whistles as close range emotive signals in wild killer whales (*Orcinus orca*) off Vancouver Island, British Columbia, Canada. Bioacoustics, 6:309-310.
Kastelein, R.A., Ford, J., Berghout, E., Wiepkema, P.R., and van Boxsel, M. 1994. Food consumption, growth and reproduction of belugas (*Delphinapterus leucas*) in human care. Aquatic Mammals 20:81-97.
Ford, J.K.B. 1991. Vocal traditions among resident killer whales (*Orcinus orca*) in coastal waters of British Columbia. Canadian Journal of Zoology, 69:1454-1483.
Hoelzel, A.R., Ford, J.K.B., and Dover, G.A. 1991.
A paternity test case for the killer whale (*Orcinus orca*) by DNA fingerprinting. Marine Mammal Science, 7(1):35-43.
Bigg, M.A., Olesiuk, P.F., Ellis, G.M., Ford, J.K.B. and Balcomb, K.C. III. 1990 Social organization and genealogy of resident killer whales (*Orcinus orca*) in the coastal waters of British Columbia and Washington State. Report of the International Whaling Commission (Special Issue 12):383-405.
Ford, J.K.B. 1989. Acoustic behaviour of resident killer whales (*Orcinus orca*) in British Columbia. Canadian Journal of Zoology, 67:727-745.
Moore, S.E., Francine, J.K., Bowles, A.E. and Ford, J.K.B.. 1988. Analysis of calls of killer whales, *Orcinus orca*, from Iceland and Norway. In: J. Sigurjonsson and S. Leatherwood (eds.), North Atlantic killer whales. Journal of the Marine Research Institute (Reykjavik) 11:225-250.
Ford, J.K.B., and Fisher, H.D. 1982. Killer whale (*Orcinus orca*) dialects as an indicator of stocks in British Columbia. Report of the International Whaling Commission, 32:671-679.
Ford, J.K.B., and Fisher, H.D. 1978. Underwater acoustic signals of the narwhal (*Monodon monoceros*). Canadian Journal of Zoology, 56:552-560.

Books, Book Chapters, and Theses

Ford, J.K.B., and Ellis, G.M. in press. Ecological specializations and their influence on the social organization and behaviour of killer whales. In: Yamagiwa, J., and L. Karczmarski (eds.), Primates and Cetaceans: Field Studies and Conservation of Complex Mammalian Societies. Springer, New York, NY.
Ford, J.K.B. 2009. Killer whale *Orcinus orca*. In: Perrin, W.F., Wursig, B., and H.G.M. Thewissen (eds.), The Encyclopedia of Marine Mammals Second Edition. Elsevier, New York, NY.
Ford, J.K.B. 2009. Dialects. In: Perrin, W.F., Wursig, B., and H.G.M. Thewissen (eds.), The Encyclopedia of Marine Mammals Second Edition. Elsevier, New York, NY.
Ford, J.K.B. 2005. Killer whale. In: World Book Encyclopedia, Chicago, Il. p. 316
Ford, J.K.B. 2002. Killer Whale *Orcinus orca*. In: Perrin, W.F., Wursig, B., and H.G.M. Thewissen (eds.), The Encyclopedia of Marine Mammals. Academic Press, New York. pp. 669-676.
Ford, J.K.B. 2002. Dialects. In: Perrin, W.F., Wursig, B., and H.G.M. Thewissen (eds.), The Encyclopedia of Marine Mammals. Academic Press, New York. pp. 322-323.
Ford, J.K.B., Ellis, G.M. and Balcomb, K.C. 2000. Killer Whales: The Natural History and Genealogy of *Orcinus orca* in British Columbia and Washington. Second Edition. UBC Press, Vancouver,and U. of Washington Press, Seattle. 102 pp.
Ford, J.K.B., and Ellis, G.M. 1999. Transients: Mammal-Hunting Killer Whales of British Columbia, Washington, and Southeastern Alaska. UBC Press, Vancouver, and U. of Washington Press, Seattle. 96 pp.
Ford, J.K.B., Ellis, G.M. and Balcomb, K.C. 1994. Killer Whales: The Natural History and Genealogy of *Orcinus orca* in British Columbia and Washington State. UBC Press, Vancouver, and U. of Washington Press, Seattle. 102 pp.
Bigg, M.A., Ellis, G.M., Ford, J.K.B., and Balcomb, K.C. 1987. Killer whales: a study of their identification, genealogy and natural history in British Columbia and Washington State. Phantom Press, Nanaimo, B.C.79 p.
Ford, J.K.B. 1984. Call traditions and dialects of killer whales (*Orcinus orca*) in British Columbia. Ph.D. dissertation, University of British Columbia. 435 p.
Ford, J.K.B., and Fisher, H.D. 1983. Group-specific dialects of the killer whale (*Orcinus orca*) in British Columbia. In: R. Payne (ed.), Communication and behavior of whales. AAAS Selected Symp. 76, Westview Press, Boulder, Co. p. 129-161. Ford, J.K.B. 1976. Underwater acoustic signals of the narwhal, *Monodon monoceros*. B.Sc. Honours
thesis, University of British Columbia. 45 p.

Reports

Ford, J.K.B, Wright, B.M., Ellis, G.M., and Candy, J.R. 2010. Chinook salmon predation by resident killer whales: seasonal and regional selectivity, stock identity of prey, and consumption rates. DFO Can. Sci. Advis. Sec. Res. Doc. 2009/101. iv + 43 p.
Clark, D.S., Coopper, T., Doherty, A., Ford, J.K.B., Koops, M.A., Mandrak, N.E., Morris, T.J., and Smedbol, R.K. 2009. Terms and Concepts Used in the SARA Program. Canadian Science Advisory Secretariat, Res. Doc 2009/0xx. Fisheries and Oceans Canada, Ottawa, ON.
Ford, J.K.B., Wright, B.M., Ellis, G.M., and Candy, J.R. 2009. Chinook salmon predation by resident killer whales: seasonal and regional selectivity, stock identity of prey, and consumption rates. Canadian Science Advisory Secretariat, Res. Doc 2009/101. Fisheries and Oceans Canada, Ottawa, ON.
Ford, J.K.B., Rambeau, A.L, Abernethy, R.M., Boogaards, M.D., Nichol, L.M., and Spaven, L.D. 2009. An assessment of the potential for recovery of humpback whales off the Pacific coast of Canada. Canadian Science Advisory Secretariat, Res. Doc 2009/015. Fisheries and Oceans Canada, Ottawa, ON.
Nichol, L.M., and J.K.B. Ford. 2008. Recent scientific information regarding seismic sound and mitigation measures with respect to marine mammals. Working paper, CSAS Workshop on Scientific Information on the Impacts of Seismic Sound on Fish, Invertebrates, and Marine Mammals, Workshop II, March 26-28, 2008, Ottawa, ON.
Calambokidis, J., Falcone, E.A., Quinn, T.J., Burdin, A.M., Clapham, P.J., Ford, J.K.B., Gabriele, C.M.,LeDuc, R., Mattila, D., Rojas-Bracho, L., Straley, J.M., Taylor, B.L., Urbán R., J., Weller, D. Witteveen, B.H., Yamaguchi, M., Bendlin, A., Camacho, D., Flynn, K., Havron, A., Huggins, J.,and Maloney, N. 2008. SPLASH: Structure of populations, Levels of Abundance and Status of Humpback Whales in the North Pacific. Final report for Contract AB133F-03-RP-00078. Cascadia Research, Olympia, WA.
Heise, K., Barrett-Lennard, L.G., and Ford, J.K.B. 2008. Update COSEWIC Status Report on Killer Whales *Orcinus orca*. Prepared for the Committee on the Status of Endangered Wildlife in Canada.

Ford, J.K.B., Ellis, G.M., and Durban, J.W. 2007. An assessment of the potential for recovery of West Coast transient killer whales using coastal waters of British Columbia. Research Document 2007/088. Canadian Science Advisory Secretariat, Fisheries & Oceans Canada, Ottawa, ON.
Raverty, S., Hanson, B., Lamborn, D., Gaydos, J., Haulena, M., Ford, J.K.B., Calambokidis, J., and Ross, P.S. 2007. An overview of emerging infectious and noninfectious diseases in the Northeastern Pacific Ocean. Working paper, Scientific Committee of the International Whaling Commission, SC/59/DW, 59th Annual Meeting, 7-18 May, 2007, Anchorage, AK.
Straley, J., Ford, J., Ellis, G., Matkin, D., Deecke, V. and Gabriele, C. 2007. Prey preferences of mammal-eating killer whales in southeastern Alaska and British Columbia. Working paper submitted to Special Meeting on Killer Whales, Scientific Committee of the International Whaling Commission, SC/59/Rep 1, 59th Annual Meeting, 7-18 May 2007, Anchorage, AK.
Robbins, J., Barlow, J., Burdin, A.M, Calambokidis, J., Clapham, P.J., Ford, J.K.B., Gabriele, C.M.,LeDuc, R., Mattila, D., Quinn II, T.J., Rojas-Bracho, L., Straley, J.M., Úrban, J., Wade, P.,Weller, D., Witteveen, B.H., Wynne, K., and Yamaguchi, M. 2007. Minimum estimates of humpback whale entanglement frequency in the North Pacific Ocean based on scar evidence. Working paper SC/59/BC, Scientific Committee, International Whaling Commission Meeting, Anchorage, AK May 2007.
Heise, K., J. Ford, and P. Olesiuk. 2007. Marine mammals and turtles. In: Lucas, B.G., Verrin, S., and Brown, R. (eds). Ecosystem overview: Pacific North Coast Integrated Management Area (PNCIMA). Can. Tech. Rep. Fish. Aquat. Sci. 2667: xii + 104 p.
Ford, J.K.B. 2006. An assessment of critical habitats of resident killer whales in British Columbia. Research Document 2006/072. Canadian Science Advisory Secretariat, Fisheries & Oceans Canada, Ottawa, ON.
Ford, J.K.B., and Ellis, G.E. 2005. Prey selection and food sharing by fish-eating 'resident' killer whales (*Orcinus orca*) in British Columbia. Research Document 2005/041. Canadian Science Advisory Secretariat, Fisheries & Oceans Canada, Ottawa, ON.
Ford, J.K.B., Ellis, G.E., and Olesiuk, P.F. 2005. Linking prey and population dynamics: did food limitation cause recent declines of 'resident' killer whales (*Orcinus orca*) in British Columbia? Research Document 2005/042. Canadian Science Advisory Secretariat, Fisheries & Oceans Canada, Ottawa, ON.
Nichol, L.M., Watson, J.C., Ellis, G.M., and Ford, J.K.B. 2005. An assessment of abundance and growth of the sea otter population (*Enhydra lutris*) in British Columbia. Research Document 2005/094. Canadian Science Advisory Secretariat, Fisheries & Oceans Canada, Ottawa, ON.
Olesiuk, P.F., Ellis, G.M, and Ford, J.K.B. 2005. Life history and population dynamics of northern resident killer whales (*Orcinus orca*) in British Columbia. Research Document 2005/045. Canadian Science Advisory Secretariat, Fisheries & Oceans Canada, Ottawa, ON.
Ford, J.K.B. 2004 The role of acoustics in defining killer whale populations and societies. Background paper LJ/04/KW4, Killer Whale Taxonomy Workshop, La Jolla, CA 30 Apr – 2 May, 2004.
Heise, K.A., Sloan, N.A., Olesiuk, P.F., Bartier, P.M. and Ford, J.K.B. 2003. Living marine legacy of Gwaii Haanas. IV: Marine mammal baseline to 2003 and marine mammal-related management issues throughout the Haida Gwaii region. Parks Canada Technical Reports in Ecosystem Science, Rep. 038. 150 pp.
Ford, J.K.B., and Ellis, G.M. 2002. Reassessing the social organization of resident killer whales in British Columbia. In: Proceedings of the Fourth International Orca Symposium and Workshop, 23-28 Sept 2002. CEBC-CNRS, Villiers en Bois, France. pp. 72-74.
Nichol, L.M., Gregr, E.J., Flinn, R., Ford, J.K.B., Gurney, R., Michaluk, L., and Peacock, A. 2002. British Columbia commercial whaling catch data 1908 to 1967: A detailed description of the B.C. historical whaling database. Can. Tech. Rep. Fish. Aquat. Sci., 2396. 83 pp.
Trites, A.W., Bain, D.E., Williams, R.M., and Ford, J.K.B. 2002. A review of short- and long-term effects of whale watching on killer whales in British Columbia. In: Proceedings of the Fourth International Orca Symposium and Workshop, 23-28 Sept 2002. CEBC-CNRS, Villiers en Bois, France. pp. 165-167.
Yurk, H., Ford, J.K.B., Matkin, C.O, Saulitis, E.S., Barrett-Lennard, L.G. and Heise, K. 2002. Why do some killer whales talk so much? In: Proceedings of the Fourth International Orca Symposium and Workshop, 23-28 Sept 2002. CEBC-CNRS, Villiers en Bois, France. pp. 200-203.
Iwama, G.K., Nichol, L., and Ford, J. 1997. Aquatic mammals and other species: major findings and recommendations. Salmon Aquaculture Review, B.C. Environmental Assessment Office. Discussion Paper D. 64 pp.

Calambokidis, J., et al. (23 authors, incl. J. Ford). 1997. Population abundance and structure of humpback whales in the North Pacific Basin. Final Rep., Cascadia Res. Collective, for Southwest Fisheries Science Center, La Jolla, CA.
Ford, J.K.B., Heise, K., Barrett-Lennard, L.G., and Ellis, G.M. 1994. Killer whales and other cetaceans of the Queen Charlotte Islands/Haida Gwaii. Prep. for: South Moresby/Gwaii Haanas National Park Reserve, Canadian Parks Service, by the Vancouver Aquarium. 46 p
Heise, K., Barrett-Lennard, L., Ford, J.K.B., and Ellis, G. 1993. Killer whales of the Queen Charlotte Islands: results of research on the abundance, distribution and population identity of *Orcinusorca* in the waters of Haida Gwaii in 1992. Prep. for: South Moresby/Gwaii Haanas National Park Reserve, Canadian Parks Service, by the Vancouver Aquarium. 36 p.
Ford, J.K.B., Ellis, G.M., and Nichol, L.M. 1992. Killer whales of the Queen Charlotte Islands: a preliminary study of the abundance, distribution and population identity of *Orcinus orca* in the waters of Haida Gwaii. Prep. for: South Moresby/Gwaii Haanas National Park Reserve, Canadian Parks Service, by the Vancouver Aquarium. 69 p.
Ford, J.K.B. 1987. A catalogue of underwater calls produced by killer whales (*Orcinus orca*) in British Columbia. Canadian Data Report of Fisheries and Aquatic Science 633: 165 p.
Ford, J.K.B., Cubbage, J.C. and Norton, P. 1987. Distribution, abundance, and age segregation of bowhead whales in the southeast Beaufort Sea, August-September 1986. Environmental Studies Research Funds Rep. No.089. Ottawa. 93 p.
Ford, J.K.B., Nichol, L.M., and Cavanagh, D.M. 1986. Preliminary assessment of the value of underwater vocalizations in population studies of narwhals in the Canadian Arctic. Prep. for the Whales Beneath the Ice program, World Wildlife Fund Canada, by West Coast Whale Res. Fdn.,Vancouver, B.C. 44 p.
Harwood, L.A., and Ford, J.K.B. 1983. Systematic aerial surveys of bowhead whales and other marine mammals in the southeastern Beaufort Sea, August-September 1982. Prep. by ESL Environmental Sciences Ltd., Sidney, B.C., for Dome Petroleum Ltd. and Gulf Canada Resources Inc., Calgary, Alta. 70 p.
Ford, J.K.B. 1981. Underwater acoustic signals of free-ranging white whales and narwhals. In: N.M. Peterson (ed.), The question of sound from icebreaker operations: proceedings of a workshop, 23-24 February 1981, Toronto, Ont. Petro-Canada Ltd., Calgary, Alberta. p. 291-303.
Ford, J.K.B. 1980. Acoustic behaviour of killer whales off eastern and southern Vancouver Island. Prep. for Dept. of Fisheries and Oceans and Dept. of Supply and Services, Ottawa, Ont. 54 p.
Fraker, M.A., Gordon, C.D., McDonald, J.W., Ford, J.K.B., and Cambers, G. 1979. White whale (*Delphinapterus leucas*) distribution and abundance, and the relationship to physical and chemical characteristics of the Mackenzie Estuary. Fish. and Mar. Serv. Tech. Rep. No. 863. 56 p.
Ford, J.K.B. 1977. White whale-offshore exploration acoustic study. Prepared for Imperial Oil Ltd.,Calgary, Alta. 21 p.

Conference and Symposia Abstracts

Ford, John K.B., Ellis, G.M., and Wright, B.M. 2009. Kin-directed food sharing and extreme natal philopatry in a population of fish-eating killer whales. Oral presentation at 18th Biennial Conference on the Biology of Marine Mammals, Society for Marine Mammalogy, Quebec City, Canada. 12-16 October 2009.
Ross, P.S., Cullon, D., Buckman, A., Jeffries, S.J., Helbing, C.C., and Ford, J.K.B. 2009. Is climate change poised to exacerbate contaminant- related health risks in marine mammals? Oral presentation at 18th Biennial Conference on the Biology of Marine Mammals, Society for Marine Mammalogy, Quebec City, Canada. 12-16 October 2009.
Grebner, D.M., Bradley, D.L., Capone, D.E., Miksis-Olds, J.L., Parks, S.E., and Ford, J.K.B. 2009. Killer whale discrete pulsed call variation. Poster presentation at 18th Biennial Conference on the Biology of Marine Mammals, Society for Marine Mammalogy, Quebec City, Canada. 12-16 October 2009.
Barlow, J., Calambokidis, J., Falcone, E.A., Baker, C.S., Burdin, A., Clapham, P., Ford, J.K.B., Gabriele, C., LeDuc, R.G., Mattila, D., Quinn, T.J., Rojas-Bracho, L., Straley, J.M., Taylor, B.L,Urbán R., J., Wade, P., Weller, D.W., Witteveen, B.H., Yamaguchi, M. 2009. Humpback whale abundance in the North Pacific estimated by photographic capture-recapture with bias correction from simulation studies. Oral presentation at 18th Biennial Conference on the Biology of Marine Mammals, Society for Marine Mammalogy, Quebec City, Canada. 12-16 October 2009.
Dalla Rosa, L., Ford, J.K.B., and Trites, A.W. 2009. Distribution and relative abundance of humpback whales in relation to environmental variables in coastal British Columbia and adjacent waters. Poster

presentation at 18th Biennial Conference on the Biology of Marine Mammals, Society for Marine Mammalogy, Quebec City, Canada. 12-16 October 2009.
Deecke, V.B., Barrett-Lennard, L.G., Spong, P., Ford, J.K.B. 2009. Kinship and social factors affect the structure of stereotyped calls in resident killer whales (*Orcinus orca*). Poster presentation at 18th Biennial Conference on the Biology of Marine Mammals, Society for Marine Mammalogy, Quebec City, Canada. 12-16 October 2009.
Au, W.W.L., Horne, J.K., Jones, C.D., and Ford, J.K.B. 2009. Killer whale (*Orcinus orca*) biosonar discrimination of Chinook salmon from other salmon species. Oral presentation at 18th Biennial Conference on the Biology of Marine Mammals, Society for Marine Mammalogy, Quebec City, Canada. 12-16 October 2009.
Ross, P.E., G. Ylitalo, P. Krahn, S. Jeffries, J.K.B. Ford, B. Hickie and J. Calambokidis. 2009. How do we recover the endangered Southern Resident killer whales in light of persistent environmental contaminants? Puget Sound Georgia Basin Ecosystem Conference, Seattle, WA , 8-11 Feb 2009
Ford, J.K.B. 2008. The Acoustic Environment as a Dimension of Critical Habitat under SARA: A Marine Mammal Perspective. Working paper presented at National Science Workshop Terms and Concepts Used in the SARA Program, June 10-11, 2008, Ottawa, ON.
Grebner, D.M., Bradley, D.L., Capone, D.E., Parks, S.E., and Ford, J.K.B. 2007. Individual variation in pulsed call production of killer whales (*Orcinus orca*) during joining events in Johnstone Strait, BC. Poster presentation at 17th Biennial Conference on the Biology of Marine Mammals, Society for Marine Mammalogy, Cape Town, South Africa. 29 November - 3 December 2007.
Stevens, T.S., and Ford, J.K.B. 2007. A catalogue of discrete calls produced by 'offshore' killer whales (*Orcinus orca*) in the northeastern Pacific. Poster presentation at 17th Biennial Conference on the Biology of Marine Mammals, Society for Marine Mammalogy, Cape Town, South Africa. 29 November - 3 December 2007.
Calambokidis, J., Falcone, E.A., Barlow, J., Burdin, A., Clapham, P., Ford, J.K.B., Gabriele, C., Mattila, D., Straley, J.M., Urbán R., J., Weller, D., Witteveen, B.H., Yamaguchi, M. 2007. New insights on migrations and movements of North Pacific humpback whales from the SPLASH project. Spoken presentation at 17th Biennial Conference on the Biology of Marine Mammals, Society for Marine Mammalogy, Cape Town, South Africa. 29 November - 3 December 2007.
Falcone, E.A., Barlow, J., Burdin, A., Calambokidis, J., Clapham, P., Ford, J.K.B., Gabriele, C., Mattila, D., Straley, J.M., Urbán R., J., Weller, D., Witteveen, B.H., Yamaguchi, M. 2007. Detecting population-level trends in injury and health for humpback whales across the North Pacific with flank photos from the SPLASH study. Poster presentation at 17th Biennial Conference on the Biology of Marine Mammals, Society for Marine Mammalogy, Cape Town, South Africa. 29 November - 3 December 2007.
Ford, J.K.B. 2007. Long-term killer whale research in British Columbia and Washington State: Perspectives from the 4th decade of field studies. Invited Spoken Presentation at Special Session on Long-Term Field Studies, 17th Biennial Conference on the Biology of Marine Mammals, Society for Marine Mammalogy, Cape Town, South Africa. 29 November - 3 December 2007.
Ford, J.K.B., and Reeves, R.R. 2007. Fight or flight: antipredator strategies in baleen whales. Spoken presentation at 17th Biennial Conference on the Biology of Marine Mammals, Society for Marine Mammalogy, Cape Town, South Africa. 29 November - 3 December 2007.
Ford, J. 2007. Salmon predation by resident killer whales: is chinook abundance limiting whale recovery? Science Symposium 2007, DFO Pacific Region, Institute of Ocean Sciences, May 24-25, 2007. p. 7.
Ford, J.K.B. and Brownell, R. L. Jr. 2006. Global overview of killer whales: ecotypes and conservation status. Presentation at Western North Pacific Killer Whale Symposium, Tokyo, Japan, 16-19 Feb 2006.
Ford, J. K.B., and Ellis, G.M. 2006. Depredation of recreational fisheries by resident killer whales in British Columbia: extent of occurrence and factors influencing fish selection. Presentation at Symposium on Fisheries Depredation by Killer and Sperm Whales: Behavioural Insights, Behavioural Solutions. 2-5 October 2006, Pender Island, BC. Sponsored by Vancouver Aquarium.
Ford, J.K.B., Ellis, G.M. , Olesiuk, P.F., and Balcomb, K.C. 2005. Linking prey and population dynamics: did food limitation cause recent declines of 'resident' killer whales? Spoken presentation at 16th Biennial Conference on the Biology of Marine Mammals, Society for Marine Mammalogy, San Diego, CA. 12-16 December 2005 .Calambokidis, J., Barlow, J., Falcone, E., Schlender, L, Douglas, A.B., Steiger, G.H., Ford, J.K.B. 2005. Changes in abundance of humpback whales off the west coast of the U.S. Spoken presentation at 16th Biennial Conference on the Biology of Marine Mammals, Society for Marine Mammalogy, San Diego, CA. 12-16 December 2005.

Deecke, V.B., Ford, J.K.B., Slater, P.J.B. 2005. Studying killer whale predation in the field: a sound approach to detecting kills? Spoken presentation at 16th Biennial Conference on the Biology of Marine Mammals, Society for Marine Mammalogy, San Diego, CA. 12-16 December 2005.
Olesiuk, P.F., Ellis, G.M, Ford, J.K.B. 2005 Life history and population dynamics of northern resident killer whales (*Orcinus orca*) in British Columbia. Spoken presentation at 16th Biennial Conference on the Biology of Marine Mammals, Society for Marine Mammalogy, San Diego,CA. 12-16 December 2005.
Parsons, K.M., Balcomb, K.C., Durban, J.W., Ford, J.K.B. 2005. Long-term social dynamics of fisheating killer whales. Spoken presentation at 16th Biennial Conference on the Biology of Marine Mammals, Society for Marine Mammalogy, San Diego, CA. 12-16 December 2005.
Yurk, H., Ford, J.K.B. 2005 Culturally selected call structures may affect social structure and mate choice in resident killer whales. Spoken presentation at 16th Biennial Conference on the Biology of Marine Mammals, Society for Marine Mammalogy, San Diego, CA. 12-16 December 2005.
Ford, J.K.B. and Ellis, G.M. 2004. Killer whales at risk: assessing the conservation status of distinct, sympatric ecotypes of *Orcinus orca* in British Columbia. Oral presentation at Species-at-Risk Conference, Victoria, BC, 1-3 March 2004.
Ford, J.K.B., Ellis, G.M., Briggs, D., and Symonds, H. 2003. Fission in maternal lineages of resident killer whales in British Columbia. Spoken Presentation. In: Abstracts of the Fifteenth Biennial Conference on the Biology of Marine Mammals, Greensboro, North Carolina, 14-19 December 2003. p. 53.
London, J., Jeffries, S.J., Ford, J.K.B., Olesiuk, P.F., Calambokidis, J., and VanBlaricom, G.R. 2003.Ramifications of an extended foraging event by eleven transient killer whales on a population of harbor seals in Hood Canal, Washington, USA. In: Abstracts of the Fifteenth Biennial Conference on the Biology of Marine Mammals, Greensboro, North Carolina, 14-19 December2003. p. 95
Wade, P., and 21 co-authors, including J. Ford. 2003. Commercial whaling and “whale killers”: a reanalysis of evidence for sequential megafauna collapse in the North Pacific. In: Abstracts of the Fifteenth Biennial Conference on the Biology of Marine Mammals, Greensboro, North Carolina, 14-19 December 2003. p. 170
Au, W.W.L, Ford, J.K.B. and Allman, K.A. 2001. Echolocation signals of wild killer whales (*Orcinus orca).* In: Abstracts of the 14th Biennial Conference on the Biology of Marine Mammals. 28 Nov– 3 Dec, 2001. Vancouver, BC.
Barrett-Lennard, L.G., Ford, J.K.B., Ellis, G.M., and Matkin, C.O. 2001. Mating patterns and inbreeding avoidance in non-dispersing resident killer whales. In: Abstracts of the 14th Biennial Conference on the Biology of Marine Mammals. 28 Nov – 3 Dec, 2001. Vancouver, BC.
Deecke, V.B., Slater, P.J.B., and Ford, J.K.B. 2001. Costly calls – the response of harbour seals to killer whale vocalizations. In: Abstracts of the 14th Biennial Conference on the Biology of Marine Mammals. 28 Nov – 3 Dec, 2001. Vancouver, BC.
Keple, A., Ford, J.K.B., and Trites, A.W. 2001. Relative abundance and seasonal distribution of marine mammals in the southern Strait of Georgia, British Columbia. In: Abstracts of the 14th Biennial Conference on the Biology of Marine Mammals. 28 Nov – 3 Dec, 2001. Vancouver, BC.
Thomsen, F., Teichert, S., Franck, D., and Ford, J.K.B. 2001. Variable calls as graded close-range signals in wild killer whales (*Orcinus orca*). In: Abstracts of the 14th Biennial Conference on the Biology of Marine Mammals. 28 Nov – 3 Dec, 2001. Vancouver, BC.
Wilhelmi, F, Thomsen, F. Franck, D., and Ford, J.K.B. 2001. An investigation of dialects in G-clan matrilines of resident killer whales (*Orcinus orca)* off Vancouver Island, British Columbia. In: Abstracts of the 14th Biennial Conference on the Biology of Marine Mammals. 28 Nov – 3 Dec,2001. Vancouver, BC.
Yurk, H., Ford, J., Spong, P. Matkin, C., and Gabriele, C.M. 2001. Remote acoustic montiroing of killer whales: advantages and current limitations. In: Abstracts of the 14th Biennial Conference on the Biology of Marine Mammals. 28 Nov – 3 Dec, 2001. Vancouver, BC.
Yurk, H., L. Barrett-Lennard, and J.K.B. Ford. 2000. The essence of killer whale societies: culturally maintained kinship groups in a hierarchically structured community. In: Intl. Conf. on Animal Social Complexity and Intelligence. Chicago Academy of Sciences. Aug 23-26, 2000. Chicago, Il.
Gregr, E.J., L. Nichol, A.W. Trites, J.K.B. Ford, and G. Ellis. 1999. Migration and population structure of Northeastern Pacific whales off coastal British Columbia: an analysis of whaling records from 1905-1967. In: Abstracts of the Thirteen Biennial Conference on the Biology of Marine Mammals, Soc. for Marine Mammalogy, 28 Nov –3 Dec 1999. Wailea, Hawaii.
Thomsen, F., F. Dierk, S. Teichert, and J.K.B. Ford. 1999. Whistle sequences in wild killer whales (*Orcinus orca*). In: Abstracts of the Thirteen Biennial Conference on the Biology of Marine Mammals, Soc. for Marine Mammalogy, 28 Nov –3 Dec 1999. Wailea, Hawaii.

Thomsen, F. and Ford, J.K.B. 1998 Behavioural significance and structure of whistles in wild killer whales (Orcinus orca) in the waters around Vancouver Island, British Columbia. World Mar.Mammal Science Conf., Monaco.
Ford, J.K.B. 1998. Status of cetaceans in British Columbian waters. In: Environmental Contaminants and Marine Mammal Health: Research Applications. P.S. Ross and S. De Guise (eds). Can.Tech. Rep. of Fish. Aquat. Sci. 2255. p. 13.
Heise, K.A., L.G. Barrett-Lennard, and J.K.B. Ford. 1997. Changes in the abundance of Pacific whitesided dolphins along the coast of British Columbia. Symposium on Conservation of Cetaceans, Marine Conservation Biology Conference, University of Victoria, BC. June 1997.
Ford, J.K.B., G.M. Ellis, and A. Morton. 1995. Diet specialization of resident and transient killer whales in coastal British Columbia and adjacent areas. In: Abstracts of the Eleventh Biennial Conference on the Biology of Marine Mammals, Soc. for Marine Mammalogy, 14-18 Nov, 1995, Orlando, FL
Ford, J.K.B. 1995. Dialects and population identity of killer whales off the west coast of North America. European Cetacean Society Conference, 9-11 Feb, 1995, Lugano, Switzerland. (invited keynote lecture)
Ford, J.K.B., and A.B. Morton. 1991. Vocal behaviour and dialects of transient killer whales in coastal waters of British Columbia, California and southeast Alaska. In: Abstracts of the Ninth Biennial Conference on the Biology of Marine Mammals, Soc. for Marine Mammalogy, 5-9 Dec, 1991,Chicago, Il.
Bigg, M.A., G.M. Ellis, J.K.B. Ford, and K.C. Balcomb. 1990. Feeding habits of the resident and transient forms of killer whale in British Columbia and Washington State. Third Int. OrcaSymposium, 9-12 Mar, 1990, Victoria, B.C.
Ford, J.K.B. 1988. Killer whale communication: overcoming the "language" barrier. In: Selected papers of the Third Biennal Conference, Amer. Cetacean Soc., 11-13 Nov, 1988, Monterey, CA, p. 77-86.
Ford, J.K.B., P. Norton and L.A. Harwood. 1987. Relative distribution and abundance of bowhead whales in the southeastern Beaufort Sea, 1986. Fourth Conference on the Biology of the Bowhead Whale, *Balaena mysticetus*, 4-6 Mar, 1987, Anchorage, AK.
Ford, J.K.B. 1986. Underwater acoustics as a tool in field studies of cetaceans. Second Biennal Conference, Amer. Cetacean Soc., 21-23 Nov, 1986, Monterey, CA..
Ford, J.K.B. 1985. Independent call traditions among "resident" killer whales off British Columbia. In: Abstracts of the Sixth Biennial Conference on the Biology of Marine Mammals, Soc. for Marine Mammalogy, 22-26 Nov, 1985, Vancouver, B.C.
Bigg, M.A., J.K.B. Ford, and G.M. Ellis. 1985. Two sympatric forms of killer whales off British Columbia and Washington. In: Abstracts of the Sixth Biennial Conference on the Biology of Marine Mammals, Soc. for Marine Mammalogy., 22-26 Nov, 1985, Vancouver, B.C.
Ford, J.K.B. 1983. Group-specific dialects of killer whales (*Orcinus orca*) in British Columbia. In: Abstracts of the Fifth Biennial Conference on the Biology of Marine Mammals, Soc. for Marine Mammalogy, 27 Nov-1 Dec, 1983, Boston, MA. p. 30.
Ford, J.K.B. 1980. Group-specific vocalizations of the killer whale (*Orcinus orca*). In: Abstracts of the papers presented at the 146th National Meeting of the AAAS, 3-8 Jan, 1980, San Francisco, CA. p. 40.
Fraker, M.A., and J.K.B. Ford. 1979. The distribution and abundance of white whales (*Delphinapterus leucas*) in the Mackenzie Estuary, Canada, in relation to oceanographic factors. In: Abstracts of the Third Biennial Conference on the Biology of Marine Mammals, 7-11 Oct, 1979, Seattle, WA. p. 21.

Popular Articles:
Ford, J.K.B. 1992. The Orca Channel. In: Tracks in the Sand, Shadows on the Sea: Marine Mammals of Argentina and Antarctica. Ed. By A. Lichter. Ediciones Terra Nova, Buenos Aires, Argentina. p 199-205.
Ford, J.K.B. 1991. Family fugues. Natural History (New York), March 1991.
Ford, J. 1989. Narwhals: ice-edge unicorns. Sea Kayaker 6(1):20-23.
Ford, J. 1987. Sound under the ice. Waters, J. Vancouver Aquarium 10:20-24.
Ford, J. 1987. Narwhals. Newton Graphic Science Mag., Tokyo. 7(12):98-105.
Ford, J., and D. Ford. 1986. Narwhal: unicorn of the arctic seas. National Geographic Magazine (Wash. D.C.), 169:355-363.
Ford, J.K.B. 1985. Acoustic traditions of killer whales. Whalewatcher, J. Amer. Cetacean Soc. 19(3):3-6.
Ford, J. 1985. Sounds from the deep: eavesdropping on dolphins and whales. Sea Kayaker 2(1):22-24.
Ford, J., and D. Ford. 1981. The killer whales of B.C. Waters, J. Vancouver Aquarium 5: 32 p.

Ford, J.K.B. 1977. Sounds and cetaceans. Waters, J. Vancouver Aquarium 2(1):20-28

Christophe Guinet

Researcher of de CNRS (Centre National de Recherche Scientifique)

Research topics : Effects of the variability of the oceanographic and climatic conditions on the acquisition and allocation strategy of resources of the superior marine predators.

Marine resources are distributed in space in relation to oceanographic conditions (fronts, upwellings, oceanic ice edges, river run offs) and their dynamics in time and space. The major challenge for marine predators is to obtain in an optimal manner food which is unevenly distributed and varies strongly between seasons and between years.
My research program is centred on:

1. Effects of oceanographic conditions observed or simulated on the hunting strategies

2. Effects of allocation of food on reproduction and demographic performance of superior marine predators

3. Gathering of oceanographic data by bioacquisition using marine mammals

Research themes and projects :

Distribution of marine predators in relation to oceanographic parameters : effects of shelves

Ecology, fishing efficacy and maternel investment of subantarctic and Antarctic pinnipeds

Conservation of marine ecosystems, influence of human activities, notably of fisheries, maritime traffic on cetacean populations.

Bioacquisition of temperature and salinity profiles

Christophe Guinet has authored over a hundred peer reviewed publications. Selected publications:

Bailleul F et al. 2010 Looking at the unseen: combining animal bio-logging and stable isotopes to reveal a shift in the ecological niche of a deep diving predator Ecography 33 (4) pp 709-719

Viviant M et al. 2010 Prey capture attempts can be detected in Steller sea lions and other marine predators using accelometers. Polar Biology 33 (5) 713-719

Cost et al. 2009 The importance of oceanographicfronts to marine birds and mammals of the southern oceans (proceedings paper) Journal of Marine Systems 78(3) pp 363-376

Guinet C et al 2007 Killer whale predation on bluefin tuna: exploring the hypothesis of the endurance-exhaustion technique Marine Ecology Progress Series 347 pp 111-119

Roche C et al. 2007 Marine Mammals and demersal longline fishery interactions in Crozet and Kergulen Exclusive Economic Zones: An assessment of depredation levels CCAMLR Science 14 pp: 67-82

Luque SP et al. 2007 A maximum likelihood approach for identifying dive bouts improves accuracy, precision and objectivity. Behaviour 144 Part 11 pp: 1315-1332

Biuw M et al. 2007 Variations in behaviour and condition of a Southern Ocean top predator in relation to in situ oceanographic conditions. Proceedings of the National Academy of Sciences of the United States of America. 104 (34) pp: 13705-13710

Cotte C and Guinet C 2007 Historical whaling records reveal major regional retreat of Antarctic sea ice. Deep Sea Research Part 1 Oceanographic Research Papers 54 (2) pp: 243-252

Guinet C et al 2000 Co-ordinated attack behaviour and prey sharing by killer whales at Crozet Archipelago: Strategies for feeding on negatively-buoyant prey. Marine Mammal Science 16 (4) pp: 829-834

Guinet C and Bouvier J 1995 Development of intentional stranding hunting techniques in killer whale (*Orcinus orca*) calves at Crozet Archipelago. Canadian Journal of Zoology 73(1) pp: 27-33

Ferrey M et al. 1993 Status and social behaviour of the botlenosed dolphin *Tursiops truncatus* (Mont 1821) in the basin Darcachon, SW France. Revue d'ecologie-la terre et la vie. 48(3) pp: 257-278

Guinet C 1992 Predation behaviour of killer whales (*Orcinus orca*) around Crozet Islands. Canadian Journal of Zoology 70(9) pp: 1656-1667

Guinet C 1991 Intentional stranding apprenticeship and social play in Killer Whales (*Orcinus orca*) Canadian Journal of Zoology 69(11) pp: 2712-2716

Guinet C 1991 The Killer Whales (*Orcinus orca*) of the Crozet Archipleago- some comparisons with other populations. Revu d'ecologie-la terre et la vie. 46(4) pp: 321-337

Guietn C 1990 Sympatry of the Transient and Resident Pods of Killer Whales in the Johnstone strait, British Columbia. Revu d'ecologie-la terre et la vie.45(1) pp: 25-34

Mardik Leopold

Institute of Marine Research IMARES - Texel *
Postbus 167
1790 AD Den Burg

Section: marine mammals

Expertise: sea birds, ecology, population ecology

Research: The main accent of his research is on distribution and food ecology of sea birds in the coastal area and the North Sea. Besides he participates in surveys of harbour porpoises and dolphins in the North Sea

Publications of drs. MF Leopold

2010

Bemmelen, R.S.A. van; Leopold, M.F.; Verdaat, J.P. (2010)
Vogeltellingen Bruine Bank januari 2010: aanvullende beschermde gebieden op de Noordzee
Texel : IMARES, (Rapport C005/10)
Harmsel, J. ter; Leopold, M.F. (2010)
"Morgan "kan voorlopig nog niet terug naar zee
Nederlands Dagblad (2010-06-24).
Jong, M.L. de; Smit, C.J.; Leopold, M.F. (2010)
Aantallen en verspreiding van Eiders, Toppereenden en zee-eenden in de winter van 2008 - 2009 in de Waddenzee en de Noordzeekustzone
Texel : IMARES, (Rapport C148/09)
Kleis, R.; Leopold, M.F. (2010)
Dichter bij Darwin (interview met M.F. Leopold)
Resource : weekblad voor Wageningen UR 2010 . - p. 10 - 12.

Leopold, M.F.; Verdaat, J.P.; Spierenburg, P.; Dijk, J. van (2010)
Zee-eendenvoedsel op een recente zandsuppletie bij Noordwijk
Texel : IMARES, (Rapport C021/10)
Leopold, M.F.; Bemmelen, R.S.A. van (2010)
Masterplan wind - seabirds Cruise Report May 2010
Texel : IMARES, (Report C065/10)
Leopold, M.F.; Witte, R.H. (2010)
Masterplan Wind - Seabirds Cruise Report September 2010
Texel : IMARES, (Report C116/10)
Tulp, I.Y.M.; Craeymeersch, J.A.M.; Leopold, M.F.; Damme, C.J.G. van; Fey, F. (2010)
The role of the invasive bivalve Ensis directus as food source for fish and birds in the Dutch coastal zone.
Estuarine Coastal and Shelf Science 90 (3). - p. 116 - 128.
Wal, J.T. van der; Quirijns, F.J.; Leopold, M.F.; Slijkerman, D.M.E.; Jongbloed, R.H. (2010)
Calculation rules for the DSS (WINDSPEED)
Den Helder : IMARES, (Report C058/10)

2009

Baptist, M.J.; Leopold, M.F. (2009)
The effects of shoreface nourishments on Spisula and scoters in The Netherlands
Marine Environmental Research 68 (1). - p. 1 - 11.
Bemmelen, R.S.A. van; Geelhoed, S.C.V.; Leopold, M.F. (2009)
Vogeltellingen Bruine Bank september 2009: aanvullende beschermde gebieden op de Noordzee
Den Helder/Texel : IMARES, (Rapport C108/09)
Bos, O.G.; Leopold, M.F.; Bolle, L.J. (2009)
Passende Beoordeling windparken: Effecten van heien op vislarven, vogels en zeezoogdieren
Texel : IMARES, (Rapport C079/09)
Kleis, R.; Leopold, M.F. (2009)
Met al dat canvas voor je ogen zie je geen moer (interview met Mardik Leopold)
Resource : weekblad voor Wageningen UR 4 (5). - p. 13 - 13.
Leopold, M.F. (2009)
16th ASCOBANS Advisory Committee Meeting
Bonn : ASCOBANS,
Leopold, M.F. (2009)
Voorbereiding in de hoogste versnelling augustus 2009
Leopold, M.F. (2009)
Op reis met de Beagle (II) : verslag juli 2009
Leopold, M.F. (2009)
NWO op de Beagle
VPRO, TV documentaireserie van de reis vanaf 13 september 35 weken rond 21.10 uur op Nederland 2
Leopold, M.F. (2009)
Gestrand! Waarom spoelen zo veel dode bruinvissen aan?
Quest : geeft antwoord 9 . - p. 95 - 98.
Leopold, M.F. (2009)
Achtergrond Hoe doe je Darwin na?
Bionieuws 20 (28-11-2009). - p. 4.

Leopold, M.F.; Bos, O.G. (2009)
Duurzaamheid van de mechanische wadpierenvisserij in de Waddenzee
Texel : IMARES, (Rapport C013/09)
Leopold, M.F.; Camphuysen, C.J. (2009)
Did the pile driving during the construction of the Offshore Wind Farm Egmond aan Zee, the Netherlands, impact porpoises?
Texel : IMARES, (Report C091/09)
Leopold, M.F.; Brenninkmeijer, A. (2009)
Notitie Q4 - WP - Kleine mantelmeeuw
Texel : IMARES, (Rapport C096/09)
Lindeboom, H.J.; Heessen, H.J.L.; Lavaleye, M.S.S.; Leopold, M.F. (2009)
Gebiedsbescherming en biodiversiteit in de Noordzee
De Levende Natuur 110 (6). - p. 246 - 252.
Soldaat, E.; Leopold, M.F.; Meesters, H.W.G.; Robertson, C.J.R. (2009)
Albatross mandible at archeological site in Amsterdam, the Netherlands, and WP records of Diomeda albatrosses
Dutch Birding 31 . - p. 1 - 16.
Wal, J.T. van der; Quirijns, F.J.; Leopold, M.F.; Slijkerman, D.M.E.; Jongbloed, R.H. (2009)
Inventory of current and future presence of non-wind sea use functions
Den Helder : IMARES, (Report C131/09)
Wal, J.T. van der; Quirijns, F.J.; Leopold, M.F.; Slijkerman, D.M.E.; Jongbloed, R.H. (2009)
Identification and analysis of interactions between sea use functions
Den Helder : IMARES, (Report C132/09)

2008

Brinkman, A.G.; Ens, B.J.; Jansen, J.M.; Leopold, M.F. (2008)
Handkokkelactiviteiten in de Waddenzee : antwoord op een aantal vragen van de Provincie Fryslân
Den Burg : Wageningen IMARES, vestiging Texel, (Rapport / IMARES C047/08)
Leopold, M.F.; Stralen, M.R. van; Vlas, J. de (2008)
Zee-eenden en schelpdiervisserij in de Voordelta
Texel : IMARES, (Rapport C008/08)
Slijkerman, D.M.E.; Leopold, M.F.; Brasseur, S.M.J.M.; Brinkman, A.G.; Dankers, N.M.J.A.; Duin, W.E. van (2008)
Doelen in omvang, ruimte en tijd Noordzeekustzone. Deel A: Uitwerking instandhoudingsdoelen (versie 1.0)
Den Helder : IMARES, (Rapport C029/08)

2007

Baptist, M.J.; Leopold, M.F. (2007)
De relatie tussen zichtdiepte en vangstsucces van de Grote Sterns van De Petten, Texel
Texel : IMARES, (Rapport / IMARES C097/07)
Barrett, R.; Camphuysen, C.J.; Anker-Nilssen, T.; Chardine, J.W.; Furness, R.W.; Garthe, S.; Hueppop, O.; Leopold, M.F. (2007)
Diet studies of seabirds: a review and recomendations
ICES Journal of Marine Science 64 (9). - p. 1675 - 1691.
Brinkman, A.G.; Leeuw, J.J. de; Leopold, M.F.; Smit, C.J.; Tulp, I.Y.M. (2007)
Voedselecologie van een zestal schelpdieretende vogels
Den Hoorn : IMARES Texel, (Rapport C078/07)

Camphuysen, C.J.; Leopold, M.F. (2007)
Drieteenmeeuw vestigt zich op meerdere platforms in Nederlandse wateren
Limosa 80 (4). - p. 153 - 156.
Ens, B.J.; Dankers, N.M.J.A.; Leopold, M.F.; Lindeboom, H.J.; Smit, C.J.; Breukelen, S. van; Schans, J.W. van der (2007)
International comparison of fisheries management with respect to nature conservation
Wageningen : Wettelijke Onderzoekstaken Natuur & Milieu, (Rapport / Wettelijke Onderzoekstaken Natuur & Milieu 42)
Leopold, M.F.; Spannenburg, P.C.; Verdaat, J.P.; Kats, R.K.H. (2007)
Identification and size estimation of Spisula subtruncata and Ensis americanus from shell fragments in stomachs and faeces of Common Eiders Somateria mollissima and Common Eiders Scoters Melanitta nigra
In: Common Eiders Somateria mollisssima in the Netherlands The rise and fall of breeding and wintering populations in relation to the stocks of shellfish / Kats, R.K.H., . - Groningen : Rijksuniversiteit Groningen, (Scientific contributions 19)
Leopold, M.F.; Camphuysen, C.J. (2007)
Did the pile driving during the construction of the Offshore Wind Farm Egmond aan Zee, the Netherlands, imapct local seabirds?
Texel : IMARES Texel, (Report C062/07)
Leopold, M.F.; Baptist, M.J. (2007)
De effecten van onderwaterzandsuppleties op het habitat van de Kustzee, Spisula en enkle beschermde soorten zeevogels
Den Burg : IMARES, (Rapport C014/07)
Philippart, C.J.M.; Beukema, J.J.; Cad, G.C.; Dekker, R.; Goedhart, P.W.; Iperen, J.M. van; Leopold, M.F.; Herman, P.M.J. (2007)
Impacts of nutrient reduction on coastal communities
Ecosystems 10 (1). - p. 95 - 118.
Skov, H.; Leopold, M.F.; Tasker, M.L. (2007)
A quantitative method for evaluating the importance of marine areas for conservation of birds
Biological Conservation 136 (3). - p. 362 - 371.
Tamis, J.E.; Heusinkveld, J.H.T.; Asjes, J.; Leopold, M.F.; Karman, C.C. (2007)
Developments in North Sea policy and their impact on the offshore oil and gas industry
Den Helder : IMARES, (Report C067/07)

2006

Leopold, M.F.; Camphuysen, C.J. (2006)
Bruinvisstrandingen in Nederland in 2006: achtergronden, leeftijdsverdeling, sexratio, voedselkeuze en mogelijke oorzaken
IJmuiden : IMARES, (Rapport / IMARES C083/06)
Rijnsdorp, A.D.; Stralen, M.R. van; Baars, J.M.D.D.; Hal, R. van; Jansen, H.M.; Leopold, M.F.; Schippers, P.; Winter, H.V. (2006)
Rapport Inpassing Visserijactiviteiten Compensatiegebied MV2
IJmuiden : IMARES, (Rapport C047/06)

2005

Jong, M.L. de; Ens, B.J.; Leopold, M.F. (2005)
Het voorkomen van zee- en eidereenden in de winter van 2004-2005 in de Waddenzee en

de Noordzee-kustzone
Wagningen : Alterra, (Alterra-rapport 1208)
Roomen, M.W.J. van; Turnhout, C. van; Winden, E. van; Koks, B.; Goedhart, P.W.; Leopold, M.F.; Smit, C. (2005)
Trends van benthivore watervogels in de Nederlandse Waddenzee 1975-2002: grote verschillen tussen schelpdiereneters en wormeneters
Limosa 78 . - p. 21 - 38.

2004

Brasseur, S.M.J.M.; Reijnders, P.J.H.; Damsgaard Henriksen, O.; Carstensen, J.; Tougaard, J.; Teilmann, J.; Leopold, M.F.; Camphuysen, K.; Gordon, J. (2004)
Baseline data on the harbour porpoise, Phocoena phocoena, in relation to the intended wind farm site NSW, in the Netherlands
Alterra, (Alterra-rapport 1043)
Bult, T.P.; Ens, B.J.; Baars, J.M.D.D.; Kats, R.K.H.; Leopold, M.F. (2004)
B3: Evaluatie van de meting van het beschikbare voedselaanbod voor vogels die grote schelpdieren eten
IJmuiden : RIVO, (RIVO rapport C018/04)
Forkink, A.; Groot, R.S. de; Hoof, J.W.; Vos, C.J.; Schans, J.W. van der; Buisman, E.; Dankers, N.M.J.A.; Leopold, M.F. (2004)
Ontwikkeling van een geintegreerde kosten-baten analyse methode van multi-functioneel ruimtegebruik in de Noordzee en kustzone
Wageningen : Foundation for Sustainable Development ism ESA Group,
Leopold, M.F.; Dijkman, E.M.; Cremer, J.S.M.; Meijboom, A.; Goedhart, P.W. (2004)
De effecten van mechanische kokkelvisserij op de benthische macrofauna en hun habitat; eindverslag EVA II (evaluatie schelpdiervisserij tweede fase); deelproject C1/3
Alterra, (Alterra-rapport 955)
Leopold, M.F.; Camphuysen, C.J.; Lieshout, S.M.J.; Braak, C.J.F. ter; Dijkman, E.M. (2004)
Baseline studies North Sea wind farms: Lot 5 marine birds in and around the future site Nearshore Windfarm (NSW)
Alterra, (Alterra-rapport 1047)
Leopold, M.F.; Smit, C.J.; Goedhart, P.W.; Roomen, M.W.J. van; Winden, A.J. van; Turnhout, C. van (2004)
Langjarige trends in aantallen wadvogels, in relatie tot de kokkelvisserij en het gevoerde beleid in deze; eindverslag EVA II (evaluatie schelpdiervisserij tweede fase) deelproject C2
Alterra, (Alterra-rapport 954)
Leopold, M.F.; Camphuysen, C.J.; Braak, C.J.F. ter; Dijkman, E.M.; Kersting, K.; Lieshout, S.M.J. (2004)
Baseline studies North Sea wind farms: Lot 5 marine birds in and around the future sites Nearshore Windfarm (NSW) and Q7
Alterra, (Alterra-rapport 1048)
Tulp, I.Y.M.; Leopold, M.F. (2004)
Marine mammals and seabirds in Mauritanian waters : pilot study April 2004
RIVO Biologie en Ecologie, (Report / RIVO 04.020)

2003

Dankers, N.M.J.A.; Leopold, M.F.; Smit, C.J. (2003)
Vogel- en Habitatrichtlijn in de Noordzee
Wageningen : Alterra, (Alterra-rapport 695)

Veen, J.; Peeters, J.; Leopold, M.F.; Damme, C.J.G. van; Veen, T. (2003)
Les oiseaux piscivores comme indicateurs de la qualité de l'environnement marin: suivi des effets de la plche littorale en Afrique du Nord-Ouest
Wageningen : Alterra, (Alterra-rapport 666)

2002

Lindeboom, H.J.; Leopold, M.F.; Dankers, N.M.J.A.; Brasseur, S.M.J.M.; Bezemer, V.; Bervaes, J.C.A.M. (2002)
Een zeereservaat in de Voordelta als marienecompensatie voor Maasvlakte II
Wageningen : Alterra, (Alterra-rapport 443)

2000

Camphuysen, C.J.; Berrevoets, C.M.; Have, T.M. van der; Cremers, H.J.W.M.; Dekinga, A.; Dekker, R.; Kats, R.K.H.; Kuiken, T.; Leopold, M.F.; Meer, J.; Piersma, T. (2000)
Mass mortality of common eiders (Somateria mollissima) in the Dutch Wadden Sea, winter 1999/2000: starvation in a commercially exploited wetland of international importance
Biological Conservation 106 (3). - p. 303 - 317.

Christina Lockyer

Dr Christina Lockyer
Age Dynamics
c/o Innelvveien 201
Kaldfjord
N-9100 Kvaløysletta
Norway

The North Atlantic Marine Mammal Commission

General Secretary

Christina Lockyer (née Grzegorzewska), born 10th April 1947, is British, and was educated in England: B.Sc. (Hons), Biology -1968 at the University of East Anglia, M.Phil., Zoology - 1972 at the University of London, and Sc.D., Zoology - 1989 at the University of East Anglia. She stepped into office as General Secretary of NAMMCO on 1st March 2005. Formerly she has been employed as a principal scientist by the Natural Environment Research Council in the United Kingdom between 1968 and 1996, and since 1977 at their Sea Mammal Research Unit, originally based in Cambridge, England. From April 1996 until January 2003, she was employed as a senior scientist at the Department of Marine Ecology and Aquaculture at the Danish Institute for Fisheries Research, Charlottenlund in Denmark, after which she launched her own biological consultancy firm Age Dynamics investigating and teaching age determination methods and life history in marine mammals. Her research encompasses population biology, behaviour and ecosystem energetics of large and small whales, and she has an extensive scientific publications record. Her work has included visits to

the Far Seas Fisheries Research Laboratory, Shimizu, Japan for 3 months in 1977, and NOAA Southwest Fisheries Science Center in La Jolla and Sea World Research Institute in San Diego, USA for 3 years between 1988-1990.
She has regularly been involved in advisory committees to the International Whaling Commission (IWC) since the early 1970s, ICES and the Agreement on Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS) of which she was Secretary between 1992 and 1996. Between 1989 and 1991, she was elected President of the worldwide Society for Marine Mammalogy whose membership numbers around 2,000 scientists. She was elected Chairman of the European Cetacean Society with a membership of about 500 scientists, between 1997 and 2003.
She has been involved as international coordinator of the EU-funded EPIC (Project DGXIV 97/0006) and earlier as Danish coordinator in BYCARE (EU FAIR contract CT05-0523), investigating marine mammal - fisheries interactions and by-catch mitigation which subsequently lead to the introduction of acoustic deterrents in Danish North Sea set-net fisheries to prevent harbour porpoise incidental catches.
Currently, in addition to her full-time position as General Secretary of NAMMCO, she continues to run international practical courses on marine mammal biology in universities and research institutions, in conjunction with Age Dynamics, and acts as occasional scientific consultant to the European Commission and various international organisations.

Recent publications:

Rosel, P.E., Frantzis, A., Lockyer,C. and A. Komnenou. 2003. The Source of Aegean Sea Harbour Porpoises. *Marine Ecology Progress Series* 247:257-261.
Lockyer, C. and M. Müller. 2003. Solitary, yet sociable. Pp. 138-150. In, *Between species: celebrating the dolphin-human bond*, eds. Frohoff, T. and Peterson, B., Sierra Club books, San Francisco, 361pp.
Lockyer, C. 2003. A review of methods for defining population structure in the harbour porpoise (*Phocoena phocoena*). *NAMMCO Scientific Publications* volume 5:41-69.
Lockyer, C., Heide-Jørgensen, M.P., Jensen, J. and M.J. Walton. 2003. Life history and ecology of harbour porpoises (*Phocoena phocoena*, L.) from West Greenland. *NAMMCO Scientific Publications* volume 5:177-194.
Lockyer, C. 2003. Harbour porpoises (*Phocoena phocoena*) in the North Atlantic: Biological parameters. *NAMMCO Scientific Publications* volume 5: 71-89.
Lockyer, C. and C. Kinze. 2003. Status, ecology and life history of the harbour porpoise (*Phocoena phocoena*) in Danish waters. *NAMMCO Scientific Publications* volume 5:143-175.
Lockyer, C., Desportes, G., Anderson, K., Labberté, S. and U. Siebert. 2003. Monitoring growth and energy utilisation of the harbour porpoise (*Phocoena phocoena*) in human care. *NAMMCO Scientific Publications* volume 5:107-120.
Lockyer, C. and H. Andreasen. 2004. Diet of harbour porpoise (*Phocoena phocoena*) in Danish waters. *European Research on Cetaceans* 15:260-268.
Borrell, A., Aguilar, A., Cantos, G., Lockyer, C., Heide-Jørgensen, M.P. and J. Jensen. 2004. Organochlorine residues in harbour porpoises from Southwest Greenland. *Environmental Pollution* 128 (2004):381-391.
Strand, J., Larsen, M.M. and C. Lockyer. 2005. Accumulation of organotin compounds and mercury in harbour porpoises (*Phocoena phocoena*) from the Danish waters and West Greenland. *Science of the Total Environment* 350 (2005):59-71.
Lockyer, C. 2006. Cetacean feeding, growth, and energetics in relation to the marine ecosystem - implications for management? In, *Whaling and History II: New Perspectives*, ed. J.E.Ringstad, pp. 101-111. Publication no 31, Kommander Chr. Christensens Hvalfangstmuseum, Sandefjord, 192 pp.
Tornero, V., Borrell, Aguilar, A., Forcada, J. and Lockyer, C. 2006. Organochlorine contaminant and retinoid levels in blubber of common dolphins (*Delphinus delphis*) off northwestern Spain.

Environmental Pollution 140(2):312-321.
Lockyer, C. 2007. All creatures great and smaller: a study in cetacean life history energetics. *Journal of the Marine Biological Association, U.K.* 87:1035-1045.
Lockyer, C., Hohn, A.A., Doidge, D.W., Heide-Jørgensen, M.P. and Suydam, R. 2007. Age Determination in Belugas (*Delphinapterus leucas*) – a Quest for Validation of Dentinal Layering. *Aquatic Mammals* 33(3), 293-304.

James McBain

James McBain, who has more than 42 years of experience in veterinary medicine and 38 years with marine mammals, retired as vice president of corporate veterinary services for Busch Entertainment Corporation in December of 2008. Bush Entertainment Corporation was the parent company for the five SeaWorld and Busch Gardens Parks. Jim started his Busch Entertainment career in September 1987 as a staff veterinarian at SeaWorld San Diego. He is currently retained by SeaWorld Parks and Entertainment Corporation (Same as Busch Entertainment Corporation) as a contract veterinary consultant.

Selected publications:

Sweeney JC, Stone R, Campbell M, McBain J, St Leger J, Xitco M, Jensen E, Ridgway S 2010 Comparative Survivability of Tursiops Neonates from Three U.S. Institutions for the Decades 1990-1999 and 2000-2009 AQUATIC MAMMALS 36(3) pp 248-261

Sitt T, Bowen L, Blanchard MT, Gershwin LJ, Byrne BA, Dold C, McBain J, Stott JL 2010 Cellular immune responses in cetaceans immunized with a porcine erysipelas vaccine VETERINARY IMMUNOLOGY AND IMMUNOPATHOLOGY 137(3-4) pp: 181-189

Finneran JJ, Carder DA, Dear R, Belting T, McBain J, Dalton L, Ridgway SH. 2005 Pure tone audiograms and possible aminoglycoside-induced hearing loss in belugas (Delphinapterus leucas) JOURNAL OF THE ACOUSTICAL SOCIETY OF AMERICA 117 (6) pp: 3936-3943

Reidarson TH, McBain J, Dalton LM 1999 Lactate dehydrogenase isoenzyme patterns in cetaceans Journal Of Zoo And Wildlife Medicine (30) 2 pp: 228-234

Reidarson TH, Harrell JH, Rinaldi MG, McBain J 1998 Bronchoscopic and serologic diagnosis of Aspergillus fumigatus pulmonary infection in a bottlenose dolphin (Tursiops truncatus) Journal Of Zoo And Wildlife Medicine 29 (4) pp 451-455

Reidarson TH, McBain J, House C, et al 1998 Morbillivirus infection in stranded common dolphins from the Pacific Ocean Journal Of Wildlife Diseases 34(4) pp: 771-776

Reidarson TH, Griner LA, Pappagianis D, McBain J 1998 Coccidioidomycosis in a bottlenose dolphin Journal Of Wildlife Diseases 34(3) pp: 629-631

Fernando Ugarte

***Organization**: Fernando Ugarte*
Head of Department of Birds and Mammals.
Greenland Institute of Natural Resources
Box 570, 3900 Nuuk, Greenland
E-mail: feug@natur.gl - http://www.natur.gl

Fernando Ugarte is the Head of Department for Mammals and Birds at the Greenland Institute of Natural Resources. He leads a team that gives advice to the government of Greenland for the management of caribou, muskoxen, seabirds and marine mammals, including whales, seals, walrus and polar bear. Fernando is member of the Scientific Committee of NAMMCO (North Atlantic Marine Mammal Commissions) and has been observer at the meetings of the IWC (International Whaling Commission), JCNB (Canada-Greenland Joint Commission for the conservation of Narwhal and Beluga) and the IUCN Polar Bear Specialist Group. Born in Mexico City, Fernando graduated as a biologist at the University of Tromsø in Norway. He worked as a scientist for the Sea Watch Foundation out of the United Kingdom and has traveled the world from Iceland to Antarctica in his research missions. Fernando was responsible for monitoring the killer whale Keiko (featured the movie "Free Willy") during its reintroduction to the ocean in 2002.

Starting out with killer whales (Orcinus orca) Fernando's research has focused on whales and the management of marine mammals from walrus, to seals, polar bears and even porpoise before he came to Greenland. In his work Fernando's is especially interested in survey methods and populations dynamics. He work include collaborating and involving many different parties with interest in the resources of the ocean -- from International organizations, law makers to local hunters in communities throughout the Arctic.

Selected Publications:

Simon, M., Hanson, B., Tougaard, J., Murry, L. and Ugarte, F. 2009. From captivity to the wild and back: an attempt to release Keiko the killer whale. Marine Mammal Science.

Boertman, D., Johansen, K., Rasmussen, L.M., Schiedek, D., Ugarte, F., Mosbech, A., Frederiksen, M. and Bjerrum, M. (draft 2008). Preliminary strategic environmental impact assessment of hydrocarbon activities in the KANUMAS East assesment area. National Environmental Research institute and Greenland Institute of Natural Resources.

Boertmann, D., Rasmussen, L.M., Ugarte, F., Mosbech, A., Johansen, K., Schiedek, D., Frederiksen, M. and Bjerrum, M. (draft 2008). Preliminary strategic environmental impact assessment of hydrocarbon activities in the KANUMAS West assesment area. National Environmental Research institute and Greenland Institute of Natural Resources.

Egevang, C., Stenhouse, I. J., Rasmussen, L.M, Willemoes, M. & Ugarte, F. 2008. Field report from Sand Island, Northeast Greenland, 2008. Grønlands Naturinstitut, 13 pp.

Simon, M., McGregor, P. K. and Ugarte, F. 2007. The acoustic behaviour of herring-eating killer whales (Orcinus orca). Acta Ethologica. DOI 10.1007/s10211-007-0029-7.

Simon, M., Wahlberg, M., Ugarte, F. and Miller, L. 2006. Icelandic killer whales use a call suitable for herding herring. Bioacoustics. 16:57–74.

Ugarte, F. and Evans, P. 2006. Monitoring of marine mammals in the Cardigan Bay SAC: surveys from May 2003 to April 2005, and recommendations for future work. CCW Marine Monitoring Report No. 23 (Species Challenge Report No: 05/01/04). 38pp

Simon, M., Wahlberg, M., Ugarte, F. and Miller, L., 2005. Acoustic characteristics of underwater tailslaps used by killer whales (Orcinus orca) in Norway and Iceland to debilitate herring (Clupea harengus). Journal of Experimental Biology. 208:2459-2466.

Ugarte, F., Lastra, P., Evans, P.G.H., Hartley, S. & Laing, S. 2004. Studies of marine mammals in the Cardigan Bay cSAC carried out by the Cardigan Bay Marine Wildlife Centre during May 2003 – April 2004. Progress report for the Countryside Council for Wales

Simon, M. and Ugarte, F. 2004. Analysis of SLTDR data of locations and diving behaviour of Keiko during July-September 2002. Report to Ocean Futures Society and The Human Society of the US

Ensor, P., Matsuoka, K., Hirose, K., Ljunblad, D., Minami, K. Olson, P., Rankin, S., Stevik, p., Tsunekawa, M. and Ugarte, F. 2003. 2002-2003 International Whaling Commission-Southern Ocean Whale and Ecosystem Research (IWC-SOWER) Circumpolar Cruise, Area V. Report to the scientific committee of the IWC.

Ugarte, F. and Simon, M. 2002. Research on wild killer whales carried out during summer 2002 around Westman Islands, Iceland. Report to Ocean Futures Society, The Human Society of US and the Icelandic Marine Research Institute

Wahlberg, M., Ramos-Fernandez, G., Ugarte, F., Møhl, B., and. Rasch, M. 2002. Recording spider monkeys with a microphone array. In: M. Wahlberg's PhD thesis. University of Southern Denmark, Odense.

Similä, T. and Ugarte, F.1997. Abundance and social organisation of killer whales in northern Norway. In: T. Similä's PhD thesis. University of Tromsø.

Ugarte, F. 1996. Penguins and marine mammals of the Argentinean Patagonia. Report to Wim De RoutierTravels, Germany

Similä, T. and Ugarte, F. 1993. Surface and underwater observations of cooperatively feeding killer whales in northern Norway. Can. J. Zool. 71(8): 1494-1499

Niels van Elk

Cornelis Erik van Elk
Born: 1963 Utrecht the Netherlands
Dolfinarium Harderwijk
Strandboulevard Oost 1
3841AB Harderwijk
Tel +31341467467
E-mail: n.v.elk@dolfinarium.nl

Niels van Elk was educated in Wales B.Sc. (1984) joint honours marine biology and physical oceanography at the University of Bangor. He received his veterinary degree in 1994 at Utrecht University. He is senior veterinarian and supervising marine mammal curator of Compagnie des Alpes who have three marine mammal parks and is the onsite veterinarian of Dolfinarium Harderwijk since 1998. He is a consulting veterinarian at Fjord and Baelt Centre in Denmark, Munster Delphinarium Germany, and Nurnberg Zoo Germany and has consulted multiple times at other dolphin holding facilities in Europe. Besides taking care of the collection of marine mammals at Harderwijk he is also the veterinarian in charge of the rehabilitation centre SOS Dolfijn..
He does part time research at the Erasmus University Medical Centre Rotterdam wildlife research group under supervision of professor Osterhaus and professor Kuiken. He has been a board member of the European Association of Aquatic Mammals from 2004 to 2010. During this time he organised two conferences (Harderwijk 2004 and Oltremare 2005) and co-organised the EAAM workshop on bottlenose reproduction in Paris (Oct 3-5 2005) and organised the EAAM workshop on rehabilitation of cetaceans in Harderwijk (March 21st 2005).

Peer reviewed pubications

van Elk CE, van de Bildt MWG, de Jong AAW, Osterhaus AD, Kuiken T 2009 Genital Herpesvirus In Bottlenose Dolphins (Tursiops Truncatus): Cultivation, Epidemiology, And Associated Pathology . Journal Of Wildlife Diseases 45(4) pp: 895-906

van Elk CE, van Dep Bildt MW, Martina BE, Osterhaus AD, Kuiken T. 2007 Escherichia coli septicemia associated with lack of maternally acquired immunity in a bottlenose dolphin calf. Veterinary Pathology 44(1) pp 88-92

Van Elk CE, Epping N, Gans SJ 2001 Pulmonary function measurements in dolphins using capnography. Veterinary Record 149(10) pp:308-309

Liesbeth Weijs, Cornelis van Elk , Krishna Das , Ronny Blust , Adrian Covaci 2010 Persistent organic pollutants and methoxylated PBD Es in harbour porpoises from the North Sea from 1990 until 2008: Young wildlife at risk? Science of the Total Environment 409 228–237

Weijs L, Das K, Siebert U, van Elk N, Jauniaux T, Neels H, Blust R, Covaci A. 2009 Concentrations of chlorinated and brominated contaminants and their metabolites in serum of harbour seals and harbour porpoises. Environment International 35 (6) pp: 842-850

Thomsen F, van Elk N, Brock V, Piper W. 2005 On the performance of automated porpoise-click-detectors in experiments with captive harbor porpoises (Phocoena phocoena). J Acoust Soc Am. 2005 Jul;118(1):37-40

Beineke A, Siebert U, van Elk N, Baumgärtner W 2004Development of a lymphocyte-transformation-assay for peripheral blood lymphocytes of the harbor porpoise and detection of cytokines using the reverse-transcription polymerase chain reaction Vet Immunol Immunopathol.9 8(1-2) pp:59-68

Conference proceedings and presentations

Surgical intervention in a bottlenose dolphin with chronic arthritis of the right shoulder joint
CE van Elk et al
IAAAM 41st Annual conference proceedings, May 2010, Vancouver Canada.

A *candida glabrata* bronchopneumonia treated with voriconazole in a *tursiops truncatus*
Niels van elk et al
IAAAM 37th Annual Conference Proceedings, May 2006, Nassau, Bahamas

Lung function measurements in dolphins; a preliminary report.
S.J.M.Gans*, , C.E.van Elk, N.Epping, F.H.C.de Jongh, H.C.Hoogsteden.
IAAAM 37th Annual Conference Proceedings, May 2006, Nassau, Bahamas

The use of spiral ct-scan in respiratory tract infections in small cetaceans
S. J. M. Gans, C. E. van Elk, N. Epping, H. J. Ph.Vogel, and H. C. Hoogsteden
IAAAM 37th Annual Conference Proceedings, May 2006, Nassau, Bahamas

Luteinizing hormone urine concentration monitoring and ultrasonography of ovaries compared as techniques to predict ovulations in *Tursiops truncatus*
Niels van elk et al
2005 Seward Alaska 36th IAAAM Annual Conference Proceedings

Capnography in bottlenose dolphins (*Tursiops truncatus*)
C.E. van Elk* N. Epping, S.J.M. Gans
2002 Algarve Portugal 33rd IAAAM Annual Conference Proceedings

Skin pathology, possibly caused by pox virus, leading to severe healthproblems in harbor porpoises from european waters
Niels van Elk, Ursula Siebert, Genèvieve Desportes, and Kirsten Anderson
IAAAM 29th Annual Conference Proceedings October 2000 New Orleans Louisiana USA

Invited presentations:

On the rehabilitation of cetaceans. CE van Elk 2007 Italian National Conference On Cetaceans And Sea Turtles Rome 5-6 December 2007