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Irish Whale and Dolphin Group

IWDG Policy Document

CETACEAN
WELFARE POLICY

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Common Dolphins bow-riding *Celtic Mist*: Deirdre Slevin/IWDG

IWDG Policy Document

Introduction

The Irish Whale and Dolphin Group (IWDG) is dedicated to the conservation and better understanding of cetaceans (whales, dolphins and porpoises) in Irish waters through research and education. Since its foundation in 1990 the IWDG has increased awareness of Irish cetaceans and their habitats through a broad range of research, conservation and education initiatives. However, as our understanding of the challenges facing cetaceans in Irish waters continues to improve, so must the work of the organisation evolve and adapt to address these challenges and promote healthy, sustainable cetacean populations into the future.

Much of the work of the IWDG today involves the application of modern science. One of the most rapidly emerging biological sciences of our time is animal welfare. Where previously attention focused on the conservation of populations and species of animals, continued advances in animal welfare science has enlightened us to the importance of considering the individual animal, particularly its sentience, needs and natures. As a direct consequence, modern policy initiatives now recognise the importance of protecting the individual animal, as well as populations and species of animals.

The IWDG acknowledges the importance of cetacean welfare and the protection of good welfare standards for all cetaceans. To this end, the IWDG has prepared a welfare policy document based on modern cetacean welfare science which attempts to address the main welfare impacts affecting cetaceans in Irish waters. The overall goal of this policy document is to improve the welfare of cetaceans as experienced by the animals themselves. This goal will be achieved through the provision of guidelines to improve current human-cetacean interactions, and recommendations to achieve better welfare standards in the future.

However, due to the extensive, complex and continually evolving nature of animal welfare science and the challenges in applying this science to cetaceans, this document is not intended to be a comprehensive final analysis but rather a modest starting point that will provide foundation for future policy initiatives aimed at protecting cetacean welfare.

Réamhrá

Tá Lucht Faire na Míolta Móra agus na nDeilfeanna (IWDG) tiomanta do chaomhnú na gcéiticeach (míolta móra, deilfeanna agus muca mara) in uiscí na hÉireann agus do thuiscint níos fearr orthu trí thaighde agus trí oideachas. Ó bunaíodh é in 1990 tá an IWDG tar éis feasacht ar chéiticigh na hÉireann agus ar a ngnáthóga a mhúscailt, trí réimse leathan tionscnamh taighde, caomhnuithe agus oideachais. Ach, de réir mar atá feabhas ag teacht ar ár dtuiscint ar na dúshláin atá roimh chéiticigh in uiscí na hÉireann, ní mór d'obair na heagraíochta athrú agus dul in oiriúint chun aghaidh a thabhairt ar na dúshláin sin agus chun pobal céiticeach a bheidh folláin agus inbhuanaithe a chur chun cinn sa todhchaí.

Baineann cuid mhaith d'obair an IWDG inniu le cur i bhfeidhm na heolaíochta nua-aimseartha. Tá leas ainmhithe ar cheann de na bitheolaíochtaí is tapa atá ag teacht chun cinn lenár linn. San am atá caite díríodh aird ar chaomhnú pobal agus speiceas ainmhithe, ach de thoradh ar dhul chun cinn leanúnach in eolaíocht leasa ainmhithe tá tuiscint níos fearr againn ar an tábhacht a bhaineann leis an ainmhí aonair, go háirithe a mhothaitheacht, a riachtanais agus a nádúir, a chur san áireamh. Mar thoradh díreach air sin, aithníonn tionscnaimh bheartais nua-aoiseacha anois an tábhacht a bhaineann leis an ainmhí aonair a chosaint, chomh maith le pobail agus le speicis ainmhithe.

Admhaíonn an IWDG an tábhacht a bhaineann le leas na gcéiticeach agus le caighdeáin mhaithe leasa i gcomhair na gcéiticeach uile a chosaint. Chuige sin, tá doiciméad beartais maidir le leas ullmhaithe ag an IWDG atá bunaithe ar eolaíocht leasa nua-aoiseach i dtaca le céiticigh, a dhéanann iarracht tabhairt faoi na príomhghnéithe a bhfuil tionchar acu ar chéiticigh in uiscí na hÉireann. Is é príomhchuspóir an doiciméid sin leas na gcéiticeach, mar a mhothaíonn na hainmhithe féin é, a fheabhsú. Bainfear amach an cuspóir sin trí threoirlínte a chur ar fáil chun idirghníomhaíochtaí reatha idir dhaoine agus céiticigh a fheabhsú, agus moltaí a chur chun cinn chun caighdeáin leasa níos fearr a bhaint amach sa todhchaí.

Mar sin féin, de bharr eolaíocht leasa ainmhithe a bheith chomh leathan agus chomh casta sin agus é ag athrú go leanúnach, agus an dúshlán a bhaineann leis an eolaíocht sin a chur i bhfeidhm i dtaca le céiticigh, níl sé i gceist gur anailís chríochnúil chuimsitheach atá sa doiciméad seo ach túsphointe measartha a chuirfidh bunchloch ar fáil i gcomhair tionscnamh beartais amach anseo a bheidh dírithe ar leas na gcéiticeach a chosaint.

Cetacean welfare

Introduction

Awareness and concern for the health and well-being of animals is not a new phenomenon, existing in human culture and religion for many thousands of years. However, the extension of this concern to the investigation and assessment of animal welfare using rigorous scientific methods is a relatively recent development, beginning first in the 1960s. Since then, animal welfare science has evolved rapidly and has greatly improved our understanding of the abilities, capacities and welfare needs of individual animals.

Animal welfare refers to 'the state of an animal as it attempts to cope with its environment' [1]. As this definition implies, animal welfare is more than just the absence of cruelty or suffering. It is a complex and dynamic state that is measured on a scale ranging from good to poor. Animal welfare is measured using different criteria which have been grouped under three broad categories; basic health and functioning, affective states and natural living [2]. Basic health and functioning represents the physical state of animal welfare including good health, normal growth and development, and normal functioning of the body. Affective states represent the mental state of animal welfare and refers to emotions and other feelings experienced as either pleasant or unpleasant such as happiness, suffering, pain, stress, hunger and thirst. Natural living refers to the ability of the animal to fulfil its natural needs and desires including the expression of natural behaviours. Good welfare is attained when all of these criteria are positively fulfilled. If any or all of these criteria are compromised then the welfare of the animal is compromised. The greater the compromise, the poorer the animal's welfare will be.

The application of animal welfare science in the conservation and protection of wild animals has increased markedly in line with growing public awareness and concern. This has been particularly evident in efforts to prevent the loss of certain species of cetaceans. It is important to recognise, however, that humans cannot protect all animals from all negative welfare impacts, and this is particularly the case with wild animals. However, it is widely accepted that we have an ethical obligation to prevent negative welfare impacts within our control and to mitigate those that cannot be avoided.

Cetaceans are fascinating animals which have long captivated the imagination of humans. They are highly evolved, sentient creatures living extraordinarily complex lives which we are only beginning to understand. Cetaceans are thought to be among the most intelligent animals on planet earth, capable of sophisticated adaptive behaviours including social learning and communication. Many species exist in highly organised, culturally diverse societies, and all are conscious beings capable of experiencing sensations and emotions including pleasure, happiness, pain, fear and distress. It is because of these evolutionary capabilities that we regard their welfare with such importance.

Throughout the course of history, however, human influence on cetaceans and cetacean populations has not been kind. It is only in recent years, aided by advances in modern science, that we are beginning to understand the devastating impact our actions can have on the conservation of populations and the welfare of individual animals. Assisted by developments in animal welfare science we are now taking positive steps towards protecting the welfare of cetaceans. Many human activities are being reviewed using modern scientific methods to determine whether they have a negative effect on the welfare of cetaceans. Particular focus on human-cetacean interactions has identified significant potential for improving the welfare of cetaceans which come into contact with humans or human activity.

Human influence on cetaceans is gradually changing from one of exploitation to one of preservation and conservation. Improved understanding of the complexities of cetacean lives has resulted in increased concern and compassion for these animals. Science continues to play an important role in identifying impacts affecting the welfare of cetaceans and providing viable, economically sustainable solutions. However, as always, change is dependent upon the commitment of individuals. If willing, humans have the potential to greatly improve the welfare of cetaceans in all of the world's oceans. And each one of us can contribute to this improvement.

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The welfare of cetaceans

Welfare science is a comprehensive biological science which draws from an extensive range of specialities. To define the welfare of a particular cetacean can be challenging. The following characteristics however are important factors in cetacean welfare, and as such can be used in the evaluation of the welfare state of an individual cetacean.

Sentience

Sentience refers to the ability of an animal to experience sensations and emotions, to feel pain and suffering, and to experience a state of well-being. The recognition of sentience in animals and the associated ethical obligation to avoid unnecessary pain, suffering and distress forms the basis of the animal welfare ethic. But while the welfare of a sentient animal depends greatly on its ability to avoid negative welfare impacts, there is a growing recognition of the importance of the positive aspects of sentience, such as rewards and pleasures.

Such rewards have significance in the quality of an animal's life. Natural selection favours behaviours that enhance survival and procreation. In the conscious, sentient animal, the drive to secure food, shelter, social contact and mates are motivated by desire (appetitive behaviour) and reinforced by pleasure (consummative behaviour). Evolutionary principles predict that animals are motivated to seek rewards, and not merely to avoid pain and suffering. Therefore, the welfare of any cetacean must be assessed on its ability to avoid negative welfare impacts resulting in pain, suffering and distress as well as accessing positive welfare impacts such as social contact and the expression of natural behaviours.

Cognition and intelligence

Animal cognition is the study of the mental capacities of animals. Research in the comparative cognitive abilities of certain animals is one of the primary methods of investigation into animal intelligence. Cognitive studies on cetaceans are quite limited; however, cognitive abilities investigated in the dolphin include concept formation, sensory skills, and the use of mental representation of dolphins. Self-awareness, though not well-defined scientifically, is believed to be a sign of highly-developed, abstract thinking and the precursor to more advanced processes like meta-cognitive reasoning (thinking about thinking). One of the most compelling pieces of evidence for cetacean intelligence is that of self-recognition. Self-recognition testing has only ever been conducted on a small number of cetacean species. The most extensively studied species is the bottlenose dolphin. The results of these tests have demonstrated self-awareness in this species of cetacean. Evidence from such experiments has been used to argue the potential for cetacean intelligence [3, 4].

Societies

Ethology is the scientific and objective study of animal behaviour. To date, much of the work carried out has been comparative ethology – examining animals as individuals. However, 'social ethology' – the behaviour of social groups of animals and the social structure within them – is a relatively new discipline focusing on the relations between social behaviour, ecology and population dynamics. Studies carried out on groups of cetaceans have demonstrated complex societal development and organisation.

The social organisation of cetacean societies varies greatly between species and appears to be dependent upon the ecological conditions in which a species lives.

Long-finned pilot whales, Castlegregory, Co. Kerry (Simon Berrow/IWDG)

Risso's dolphins in Dingle Bay, Co. Kerry (Nick Massett)

Our understanding of cetacean societies is still quite fundamental; however, it is believed that the social organisation of a species is determined by factors such as physical size, group size, predator avoidance, feeding and mating strategies. Some species are quite solitary, existing alone or in small groups, while other species appear to be dependent on large, socially cohesive, hierarchical groups for survival.

Baleen whale associations are shorter in duration, with the longest known bond occurring between a mother and calf. However, it has been suggested that baleen whale societies are much more subtle and complex than we currently understand. Toothed whale societies are characterised by longer lasting social bonds. Many species form matrilineal societies in which females, and to a lesser extent males, spend their entire lives with their natal group. It is believed that the cultural transmission of learning behaviours to family members is conserved in matrilineal groups. These societies assist in the learning of complex skills essential for survival thus ensuring these skills are passed on to future generations without being lost or forgotten. As well as aiding the transmission of information these societal structures also have the effect of changing mating patterns and hence the evolution of the populations and/or species [5].

Culture

Culture can be defined as behavioural variations between sets of animals that are maintained and transmitted by social learning. This typically involves components of teaching and imitation by the animals concerned [6]. Culture has been observed in several species of cetacean and research has identified a number of different ways in which culture is transmitted in cetaceans. The first is a spread of novel and complex behaviours between members of the same generation (i.e. a 'horizontal' transmission of culture), which has been shown to occur in humpback and bowhead whales when learning songs from other males. The second type of cultural transmission is between mother and young (i.e. a 'vertical' transmission of culture), for example; female killer whales teaching off-spring to strand themselves in order to catch prey. The final type of cultural transmission occurs as a stable group transmission of culture that can be horizontal, vertical or 'oblique' (transfer from a non-parent from a previous generation), for example; vocal dialects in many species of cetacean.

Behaviour

Animal behaviour is one of the most fundamentally important properties of animal life. Behaviour is the means whereby the animal mediates dynamically with its environment, both animate and inanimate. As the animal tries to control or change its environment, its behaviour provides information about its welfare needs, preferences and internal states. Therefore, behaviour is a critically important indicator of animal welfare. Assurance of good cetacean welfare requires consideration of all of the animal's needs, including the need for certain behaviours.

There is still a great deal we do not understand about cetacean ecology and behaviour. Research into the behaviour of cetaceans at sea provides several challenges. Many cetaceans may range over long distances on a daily basis, and have seasonal

Common dolphins, Roaringwater Bay, Co. Cork (Pádraig Whooley/IWDG)

migrations of thousands of kilometres, not to mention the long time spent under water at depth. Notwithstanding these challenges cetaceans have been shown to demonstrate a great number of amazing physical behaviours. Our understanding of the meanings behind many of these behaviours, however, remains unclear and it is believed that the interpretation of these behaviours may largely depend upon the context in which the behaviour is observed.

There are many documented examples of cetacean behaviour. Despite the importance of behaviour to cetacean welfare it is not possible to list them all here. Below is a brief description of a single behaviour under each category.

Individual behaviour

Many species of cetaceans have been shown to demonstrate a number of individual behaviours. One of the most challenging of these individual behaviours is the annual migration.

Migration

Many larger species of cetaceans undertake seasonal migrations between summer feeding grounds and winter breeding grounds. During the spring the rapid increase in temperature, sunlight and day-length, and the relatively stable climatic conditions, allow a bloom in phytoplankton density, and hence an increase in zooplankton, fish and squid. Therefore, during part of the year, often more than six months in the North Atlantic, many baleen whales and some toothed whales migrate thousands of miles from lower latitude breeding and calving grounds to high latitudes to feed. In contrast to the annual migrations of the larger cetaceans, smaller cetacean species may be found at most latitudes and while they range over large areas they do not tend to make strong north-south migrations.

The humpback whale makes one of the longest migrations of any mammal, migrating as far as 8,700 kilometres one-way between summer feeding areas and winter breeding and calving grounds. These extensive migrations mean the humpback whale can be found throughout the world's oceans.

Social behaviour

A number of whale species have been shown to perform a wide range of social behaviours. There also appears to be significant differences between species in the way such behaviours are carried out.

Breaching

Perhaps the most dramatic social behaviour performed by cetaceans is the breach. Breaches are often carried out in series with some species known to breach repeatedly over an extended period of time. In many instances, two or more associated individuals have been documented breaching simultaneously. Some species of cetacean are capable of propelling themselves completely out of the water during a breach.

Whales such as sperm whales perform a breach by travelling upwards from depth. Other species such as the humpback, right, blue, minke, fin and sei travel close to the surface, parallel to the waterline and snap upwards at full speed to perform a breach. The right, humpback and sperm whales are best known for performing breaches. However, although the right whale, humpback whale and sperm whale are best known for performing breaches, oceanic dolphins, bottlenose dolphins and killer whales are also very common breachers.

Breaching humpback whale, Dunmore East, Co. Waterford (Pádraig Whooley/IWDG)

Why whales breach is unknown, however, it is likely that breaching serves many different functions depending on the context in which it occurs. Whales are more likely to breach when they are in groups, suggesting breaching is used as a means of communication for social reasons such as assertion of dominance, courting or signalling danger. Breaching often signals a change in behaviour or direction of travel. It has also been suggested that the large 'smack' upon re-entering the water is used to stun or scare prey. Others suggest that a breach allows the whale to breath in air that is not close to the surface, which may aid breathing in rough seas. Yet another suggestion for breaching is to dislodge parasites from the skin. However, this behaviour may also just be a form of play.

Collaborative behaviours

A number of whale species perform complex collaborative behaviours. It has been demonstrated that individuals within a group may have differing, but complementary roles in carrying out such collaborative behaviours. The presence of collaborative behaviours has been used to demonstrate intelligence as well as the benefit of group structure to individuals within the group. These behaviours are complex actions, requiring considerable awareness of the locations and actions of other animals in the group, as well as requiring learning to perfect the technique involved. Furthermore, the use of non-living objects, such as bubbles, as an aid to capture prey could be considered tool-use, a further indicator of intelligence. Locating and capturing food are suggested as significant selection pressures for the evolution of various cognitive abilities. Therefore, aspects of food procuring behaviour, such as co-operative feeding, should be strongly indicative of cognitive ability.

Co-operative foraging

Cetaceans frequently form co-operative groups, for example, when foraging. Co-operative foraging allows cetaceans to catch larger quantities of prey more efficiently. Certain species of cetaceans have devised highly evolved techniques to catch their prey. Among the most impressive are the co-operative foraging techniques of the humpback whale.

Humpback whales have been recorded using a technique called 'bubble-netting' to trap and feed on large shoals of schooling fish. The hunting whales dive in strict, predetermined sequence depending on each individual's role or task. While they are searching for

Humpback whales co-operative foraging (Pádraig Whooley/IWDG)

Herring bait ball (Deirdre Slevin/IWDG)

their prey the whales communicate with each other using a series of calls. Once a shoal of fish is located the whales position themselves directly below the shoal in preparation for feeding. The action is usually led by one whale and is preceded by a vocal signal when the co-ordinated behaviour begins, with another call issued just prior to surfacing [7]. One whale will swim upwards in a spiral blowing bubbles which rise to the surface forming the 'bubble-net' around the shoal. Other whales vocalise to scare or confuse the fish thus tightening their shoal, while others herd the fish into tighter schools close to the surface. The whales then rise up through the centre of the bubble-net with their mouths wide open allowing them to consume large quantities of prey. The individual whales maintain specific locations and orientations with respect to the prey and one another. The behaviour culminates in the whales breaking the surface in a spectacular communal lunge. On average co-operative feeding groups range from five to eight animals, however, groups as large as 25 whales working together have been recorded.

Communication

One of the most important capabilities of cetaceans is that of communication. Communication between individuals has been studied in both large and small species of cetacean. Research has demonstrated the evolution of sophisticated communication mechanisms in many species. Some of the most notable types of cetacean communications include the ability to communicate an individual's identity, effectively communicating their individual 'name' [8]. Scientists have also recorded the production of 'greeting calls' and 'alarm calls', which are often considered to be a highly sophisticated social behaviour of altruistic nature.

The most remarkable of all cetacean communications, however, is the song of the humpback whale. The humpback whale song is one of the most complex acoustic displays in the animal kingdom. Each song consists of several sounds in a low register, varying in amplitude and frequency, and typically lasting from 10 to 20 minutes. Humpbacks may sing continuously for more than 24 hours. The song of the humpback whale is believed to have a role in competition between males, or in determining mate selection. However, singing has also been recorded during migration and in late summer and autumn months at feeding grounds. Each humpback whale population has its own specific song. At the beginning of the breeding season each humpback whale in the population sings approximately the same song. As the breeding season progresses the songs of each population change in structure. It has been shown that the males alter the song while singing by adding slight variations such as different sounds and arrangements of sounds to create new phrases or themes in the song. These changes are slowly incorporated into the song while older patterns are lost completely over time. Each male listens for variations in competitors' songs and if a particular male is successful in mating with a female the variations of that male are incorporated into the songs of his competitors in an effort to improve their chances of mating. In a similar way, if variations added

Common Dolphins (Deirdre Slevin/IWDG)

Minke whale, West Cork (Pádraig Whooley/IWDG)

to songs do not result in successful mating they can be dropped in favour of successful variations. At the end of the breeding season males typically stop singing until the following mating season. When they resume singing, their song has the same structure as at the end of the previous breeding season, meaning each whale is capable of memorising the song over the intervening period [9]. In this way, the song of the humpback whale gradually changes and evolves over several years so that the song becomes virtually unrecognisable from its original version.

Physiology

Physiological measures are an important adjunct to behavioural measurements in the assessment of animal welfare because they aid the interpretation of behavioural observations and the analysis of links between environmental factors, behavioural and physiological reactions. It has been suggested that the ability of an animal to control its environment through its behaviour is one of the most important parameters affecting the physiological changes that occur in response to stress. Stress can have a significant and direct effect on an animal's welfare. Due to the obvious difficulties in measuring this parameter the physiology of cetaceans remains relatively undiscovered. However, as techniques to measure physiology continue to evolve and improve the physiology of cetaceans holds great promise for improving our understanding of the welfare of these animals. Useful physiological measures of welfare in cetaceans may include heart rate, respiratory rate, blood pressure, catecholamines (adrenaline and noradrenaline), enzymes and metabolites.

Health

Health is the foundation of all good welfare. It is self-evident that any impact which reduces health will also reduce welfare. Health is a very useful indicator of welfare in cetaceans as it can be determined by visual observations, as well as clinical examination pre- and post-mortem. Establishing the causes of poor health and addressing these concerns can greatly improve the welfare of an individual. The incidence of infectious, parasitic and metabolic diseases as well as the incidence and frequency of physical injury should all be considered while assessing the welfare of a cetacean. Health indicators of welfare have particular importance in incidences of entanglement and ship-strike in cetaceans.

Reproduction

Reproduction is fundamental to the continuation of all species. The capacity for reproduction and the drive to do so whenever physiological and environmental conditions allow are universal among all living organisms. Reproductive behaviour, defined as any activity directed at the perpetuation of a species, includes all the events and actions that are directly involved in the process by which an organism generates at least one replacement of itself. However, in an evolutionary sense, the goal of the individual in reproduction is not to perpetuate the population or the species; rather, relative to the other members of its population, it is to maximize the representation of its own genetic characteristics in the next generation. Therefore, fitness to reproduce and reproductive behaviour is an important characteristic of all individuals in a population and therefore good reproductive health and performance is an indication of good welfare. When the reproductive performance of an individual is compromised this may indicate poor welfare. Reproductive health is particularly important in cetaceans as they are among the longest living and slowest breeding of all animals; hence they are poorly adapted to replenishing their populations.

In summary

The welfare of any individual cetacean is a complex combination of many factors. Our understanding of the welfare of cetaceans is still at a very early stage and much has yet to be learned. However, the first step in addressing the welfare of cetaceans is eliminating poor welfare impacts resulting in pain, suffering and distress. As our understanding of the welfare of cetaceans improves, humans can strive to ensure the provision of positive welfare standards.

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Welfare and conservation

There are few species of animal, habitats or ecosystems that remain unaffected by humans. And it is an unfortunate truth that, in the main, human influence has not been kind. Decades of ignorance and exploitation have led to a great loss in the earth's biodiversity, and what has been lost is lost forever. Continued indifference to the importance of sustaining the earth's biodiversity will threaten the very existence of many more species of flora and fauna, and consequently, many important habitats and ecosystems. Therefore, it is important to act to address this decline.

Efforts to halt the rapid loss of established biological systems around the world have resulted in the emergence of conservation science. Wildlife conservation science is one aspect of this scientific discipline which has become an increasingly important practice due to the negative effects of human activity on wildlife. The conservation of cetacean populations is important for many ecological, economic and ethical reasons. Cetaceans play a vital role in sustaining many of the oceans marine ecosystems. Reducing or removing cetacean populations will have a profoundly negative effect on many of these habitats. The potential economic value of healthy cetacean populations through sustainable eco-tourism initiatives such as whale watching is supporting the growth and development of many local communities worldwide. And, the protection of an individual animal, cetacean or otherwise, from pain, distress and suffering is naturally right. As our understanding of animal welfare continues to develop, there is a growing awareness of the importance of integrating animal welfare in wild animal conservation policies.

Welfare science is closely related to wildlife conservation science. However, welfare is distinct from conservation in that welfare science addresses impacts which affect the individual animal, whereas conservation science addresses impacts which affect the population or species. Commonly, both sciences are complementary, that which benefits the welfare of an individual benefits the conservation of the population as it contributes to the survival and persistence of that individual within the population and therefore the overall success of the population. However, in certain circumstances welfare and conservation objectives can be at odds. For example, while cetacean survival is of paramount importance to the conservation of the population or species, in some instances, such as entanglements, ship strike and live-stranding, welfare concerns should be prioritised over conservation if it is determined that it is the more humane option.

Fin whales (Deirdre Slevin/IWDG)

Cetacean welfare: Impacts in Irish waters

The relationship between man and animal has evolved greatly throughout the course of history. Historically, the greatest challenge to large whale populations resulted from commercial whaling. That threat has been significantly diminished. However, new threats have emerged as a result of diversified commercial growth and development. Individually and cumulatively, these threats represent a significant challenge to cetacean welfare standards.

The following are the main welfare impacts affecting cetaceans in Irish waters.

Live-stranding

Live-strandings can occur naturally or as a result of human interference. Live-strandings occur in two forms; single and multiple or mass-strandings. Single live-strandings are often the result of old age, illness, injury or disorientation. Mass-strandings can have a number of causal factors. The question of why exactly cetaceans live-strand remains unresolved. However, a number of theories have been put forward:

Navigation errors

It has been proposed that cetaceans are capable of sensing the geometric force fields of the earth, and some species may use these force fields to navigate at sea, especially in the deep oceans [10]. Magnetic anomalies occurring in the force fields may lead to disorientation resulting in an increased frequency of live-strandings. Live-strandings may occur more frequently on shores where lines of equal magnetic force intersect the coastline perpendicularly. Research has also attributed strandings to radical changes in the Earth's magnetic field associated with natural phenomena such as earthquakes. Disruption in magnetic fields may interfere with cetaceans' ability to navigate, which may explain some multiple-strandings.

Environmental factors

Live strandings may be attributed to natural and environmental factors such as rough weather and coastal and seabed topography. The latter appears to have a significant impact on the frequency and type of

Live stranding of common dolphin mother and calf, Crookhaven, Co. Cork (Pádraig Whooley/IWDG)

stranding. Many species of cetacean commonly stranding on Irish shores are pelagic (deep sea) species which would be less experienced in using the coastal topography for navigation. Some types of shore and coast lines are more prone to strandings than others. Strandings are particularly common on shallow, sloping shores made of soft sediment which it is believed can confound the echolocation system used by these species of cetacean for navigation.

Group cohesion and family bonds

Multiple live-strandings, or mass-strandings, in one place are rare and appear to be associated with the strong social cohesion of toothed whales. Mass-strandings differ from single strandings in that the majority of animals involved in a mass-stranding are likely to be healthy. It has been suggested that family members, reluctant to leave a sick or injured group member, may follow into shallow water resulting in the stranding of several healthy animals. Most mass-strandings on the Irish coast involve pelagic species more commonly found in the open ocean such as common dolphins, striped dolphins, Atlantic white-sided dolphins and long-finned pilot whales.

Age and health

Age and health implications such as weakness due to old age, disease or infection, physical injury or difficulty giving birth may contribute to an increased incidence of live-strandings. Natural mortality, including death from old age, death of an adult female or calf during birth or the death of a dependent calf separated from its mother contribute to the incidence of live-strandings. Disease, caused by parasites, viruses or a suppressed immune system (pollution, stress and starvation can make an animal's immune system weaker and more vulnerable to diseases) also increases the incidence of live-strandings as do physical injuries due to ship strike and entanglements in fishing gear.

Foraging

Some scientists have suggested that cetaceans hunting prey close to shore or in shallow estuarine waters may become isolated in lagoons created by receding tide, and become stranded. However, this has been countered as a general explanation for live-strandings by the number of cetaceans stranding in areas devoid of their natural prey or with empty stomachs. Some research has suggested that some strandings can be attributed to animals attempting to avoid predators such as killer whales [11].

Anthropogenic causes

Cetaceans may strand due to a wide range of human influences including disturbance, entanglement in fishing gear, ship strike and acoustic trauma. The latter has been strongly linked to naval exercise where low and mid-frequency active sonar is used. The Irish navy does not use low or mid-frequency active sonar. However, this type of sonar is used by the British navy. Noise pollution from drilling, dredging, shipping and other offshore developments and seismic surveys can cause disorientation and distress leading to live-strandings. If species other than whales and dolphins are involved, for example fish or marine invertebrates, or if many species come ashore together, an acute event such as a chemical spill or explosion may be responsible.

Stranded animals, both dead and alive, can give important insight into the state of the population offshore. These insights include a complete pathology to investigate disease and parasite levels, normal biology including reproductive biology, physiology parameters and pollution levels. It is important that live animals are responded to appropriately. In many cases, it may not be possible to save the stranded animal if it is old, severely injured or sick. In such cases the animal should be left alone and allowed to die naturally. In extreme cases of animal suffering and distress euthanasia may be the most humane option for the stranded animal. It is important that dead animals, where possible, are subject to a full post-mortem to establish cause of death and any associated factors. The IWDG has published guidelines for the welfare of live-stranded cetaceans called 'Face to face with a Beached Whale' which outlines the appropriate course of action in the event of a live-stranding. The IWDG also runs a number of live-stranding courses throughout Ireland to train first and subsequent responders in the appropriate care and rescue of stranded cetaceans.

Eco-tourism (whale watching and swim-with-cetacean tourism)

Eco-tourism is not a new phenomenon, yet it continues to expand and grow year on year. Two of the most common and rapidly growing sectors of cetacean eco-tourism are whale watching and swim-with-cetacean tourism. The majority of cetacean-watching tourism is boat-based and does not involve swimmers entering the water [12]. However, swimming with cetaceans is increasing, as tour operators attempt to provide tourists with more 'intimate' interactions with the animals [13]. Continued rapid expansion, however, has increased concerns about the impact of such tourism on the welfare of focal cetacean populations. Studies have demonstrated that increased boat activity and human presence in the water can change the behaviour of cetaceans and increase stress levels [14, 15]. Dolphins were shown to change their behaviour during swim-with interactions including increased avoidance of swimmers [16], increased vocalisation and echolocation [17], as well as increased risk of injury or death due to food provisioning [13]. Southern right whales were shown to cease resting and socialising behaviour and begin travelling when interacting with boats and swimmers [18]. Southern right whales exposed to swim-with-cetacean tourism were shown to alter their distribution along the shoreline and abandon preferred nursery areas in response to interactions [18]. The behaviour of mother/calf pairs is also significantly affected by interactions with swimmers [19]. Not only is there a clear risk of harassment for the animals, there may also be a risk of injury for the human participant due to protective behaviour of the mother [19].

When managed properly and responsibly, eco-tourism represents an important and sustainable opportunity to support local coastal communities. Responsible eco-tourism includes the protection of whale, dolphin and porpoise populations as one of its main objectives. In addition to being non-disruptive to the cetacean population, responsible eco-tourism has many potential educational, environmental, scientific and socioeconomic benefits for local communities. Tourism of this kind can have a positive effect on nature by promoting a general interest in and awareness about cetaceans and their habitats.

Eco-tourism, such as whale watching, can play an important role in rural sustainability (Nick Massett)

Sustainable economic growth for local economies generated through such tourism can also lead to improved motivation to preserve marine wildlife and their habitats. It has been shown that the development of a responsible, sustainable eco-tourism industry can be more beneficial to local coastal communities than commercial whaling. Studies have shown the development of a responsible whale watching industry can lead to a more economically viable and sustainable coastal community than if the animals were killed by a whaling industry [20, 21].

The development of responsible, ecologically sustainable cetacean eco-tourism aims to effectively prevent negative welfare impacts, ensuring the welfare of focal populations and the sustainability of the industry. This can be successfully achieved through education of tour operators and engaging with local and national authorities to effectively regulate the activity from its inception. A key aspect of such regulation is the establishment of a code of practice for all eco-tourism (commercial, scientific and recreational). In Ireland Marine Notice 15 of 2005 provides guidelines for whale watching in coastal waters. However, irresponsible and/or unregulated eco-tourism has a significant potential to adversely impact both whale welfare and conservation. Poorly regulated cetacean eco-tourism can significantly increase the risk to the survival or ecological functioning of focal cetacean populations and their environments. Impacts can include boat collisions with whales, noise pollution, chemical pollution, or changes in natural behaviour patterns resulting from disturbance by boats, aircraft, associated noise, and swimmers. Short term impacts of poor cetacean eco-tourism can result in significant adverse changes in population dynamics such as birth or mortality rate, or impede normal patterns of habitat use or activity, including feeding, resting and reproduction. The long-term impacts of poor regulation on the welfare of focal populations are harder to quantify. In order to guide the development of responsible eco-tourism the International Whaling Commission (IWC) produced the following list of guidelines [22]:

1. Responsible whale watching should aim to eliminate the potential negative physiological and psychological effects of the activity at the individual, social group and population level
2. All personnel involved in whale watching operations should be appropriately trained and, where possible certified by responsible bodies
3. Regular and ongoing monitoring should be designed to identify any apparent short-term negative animal welfare impacts. These should be addressed promptly in order to improve individual animal welfare and to help secure a good conservation status for the relevant populations in the longer term
4. Whale watching operations should be encouraged to help monitor and record practical and informative welfare indicators (e.g. presence of injury, changes in health status, changes in behaviour) of the individuals and populations they are observing
5. The relevant national or regional conservation authorities should require monitoring of whale watching operations to ensure their sustainability; monitoring should involve the enforcement of appropriate regulations for the region, along with measures such as licensing systems where appropriate.
6. Co-operation, information and expertise sharing with regard to responsible whale watching should be encouraged and facilitated between Contracting Parties

Where it can be managed properly and responsibly, cetacean eco-tourism presents an important opportunity to improve the sustainability of cetacean populations and their habitats while simultaneously contributing to the viability of local coastal communities. The IWDG supports the development of responsible whale watching in Irish waters. The IWDG has identified at least six cetacean species in Ireland with good to excellent potential for developing a whale watching industry. The six species of cetacean are the harbour porpoise, common dolphin, bottlenose dolphin, minke whale, humpback whale and fin whale. All species of cetacean in Ireland are protected, however, some species are declining or rare and the subject of conservation measures. Other populations are still severely depleted after decades of over exploitation. The IWDG delivers a number of land and ocean based whale watching courses at peak times of the year providing an opportunity to view some of the 24 species of cetaceans that can be seen in Irish waters. The IWDG has also published a whale watching policy document to inform and support the development of responsible whale watching in Irish waters.

The IWDG does not promote the development of swim-with-cetacean tourism as it can significantly impact the welfare of the individual cetacean and the sustainability of the focal population. Furthermore, swim-with-cetacean tourism presents a significant risk to the health and safety of participants. Cetaceans are large, powerful, wild animals in an uncontrolled environment. Each individual cetacean is capable of experiencing emotions such as fear, distress and panic which makes their reaction to such tourism unpredictable. Therefore, it is not considered possible to guarantee the safety of all tourists under such conditions.

Entanglement/by-catch

Cetacean by-catch is the incidental capture of non-target cetacean species by fisheries resulting in mortality or serious injury. Accidental capture and entanglement in fishing gear represents a significant threat to cetacean welfare and species conservation worldwide. Cetacean by-catch is a global problem that every year results in the death of hundreds of thousands of whales, dolphins, porpoises and other marine wildlife. Entanglement is now considered one of the primary causes of anthropogenic mortality affecting all species of cetacean.

By-catch and entanglement of cetaceans occurs in a variety of fishing gear, both active and lost/abandoned, including gillnets, set nets, trammel nets, mobile trawls, fixed pot and trap fisheries, longlines and surface float systems. By-caught cetaceans can be found anchored in gear, swimming entangled in gear or dead and floating at sea or washed up on shore. Where a cetacean has insufficient power to break out of a system, it will either remain alive, if it can surface to breathe or it will drown. Drowning resulting from acutely lethal entanglement presumably includes struggling, panic and gradual subsidence. Where a cetacean has sufficient power to break out of a system the animal may carry the gear for extended periods of time over thousands of miles. The resulting chronic entanglement has a much greater impact on the individual's welfare, including laceration, constriction, immobilisation and increased drag, all of which may cause reduced feeding capabilities. This can lead to a

Fishing gear caught around the tail-stock of a humpback whale, Greencastle, Co. Donegal (Andrew Speers)

prolonged time-to-death of many weeks or months resulting from injury, infection or starvation. The frequency of scar formation indicating an entanglement event in certain cetacean populations suggests that a significant number of cetaceans suffer entanglement, but that at least some cetaceans shed the entangled gear on their own, without human intervention. As yet, the degree to which chronic lethal and non-lethal entanglement impacts the welfare of cetaceans is poorly understood.

Efforts to enhance the welfare of entangled or by-caught cetaceans include measures to prevent captures such as the use of new technologies, temporary closure of fisheries and placement of observers on fishing vessels, as well as disentanglement efforts. However, certain species of cetacean are sustaining levels of injuries and deaths caused by entanglement and by-catch that exceed what is sustainable to their populations. Further research in mitigating entanglement and by-catch is required to fully understand the causal factors. Solutions to entanglement and by-catch can then be proposed in cooperation with the fishing industry. The transfer of knowledge gained where entanglement and by-catch mitigation efforts have been successful or promising,

Bottlenose dolphin entangled in fishing net, Ventry, Co. Kerry (Ted Creedon)

and even where they have failed, is an important process in the reduction of global cetacean entanglement and by-catch.

The IWC has promoted the following in order to reduce entanglement and by-catch related adverse welfare impacts on whales [22]:

1. Fishing gear modifications and/or practices that can be shown to significantly reduce entanglement risk to whales should be adopted
2. Regulation should be introduced controlling the deployment of fixed fishing gear, especially in major large whale habitats in relevant seasons
3. Reporting and documentation of whale entanglements should be encouraged
4. Gear marking should be mandatory and gear retrieved from live and dead entangled animals should be analysed to inform 1 and 2 above
5. While recognising that disentanglement is not a sustainable, nor always practical, solution, training should be provided to responders to disentangle animals, taking allowance of human safety and practicality

Ship-strike

Ship-strikes of cetaceans are an issue of growing concern internationally. Collisions with ships are a recognised source of injury and mortality in cetaceans. With the increase in commercial shipping and the introduction of high-speed ferries worldwide the number, size and speed of ships has increased significantly. As a consequence, the threat of cetacean ship-strike has also increased. Ship-strike has the potential to greatly impact the welfare of cetaceans through physical injury resulting in prolonged suffering and even death. Vessel damage affects cetaceans in two ways: laceration (sharp cuts) from rotating propellers, and blunt impacts from vessel bows, struts, skegs and rudders. Cetaceans struck by ships are found alive or dead at sea or washed up on shore. The incidence of ship-strikes of cetaceans may be more common than previously suspected as most ship-strikes are believed to go unreported. In the case of endangered, endemic or geographically-isolated cetacean populations especially, ship-strikes may also constitute a significant conservation threat. Efforts to reduce ship-strike include areas to be avoided (ATBA), vessel lane shifts, seasonal speed restrictions and mariner education.

The occurrence and severity of ship-strike incidence is affected by a number of factors including the number of ships on the water and their geographic overlap with each cetacean species; ship factors (speed, type, size and noise), cetacean factors (age, health, activity, species, swim speed, time at the surface, habituation to ship activity and noise or unawareness of potential dangers); visibility and geographic factors such as areas of high collision incidence. Ship speed and size appear to be important factors in predicting cetacean-ship collisions and their outcomes. Larger ships travelling at higher speeds are more likely to cause severe injury and death. An analysis of worldwide collision records with large whales found that most lethal and severe injuries involve ships travelling 14kn or faster and ships 80 metres or longer [23]. A wide range of cetaceans have been involved in ship strikes, but studies have shown that the large whale species are the most susceptible. There is no difference between the collision risk for male versus female cetaceans, but there appears to be a higher risk of collisions among calves and juveniles when compared to adult cetaceans [23, 24, 25, 26].

Certain cetacean behaviours can contribute to the increased incidence of cetacean ship-strike. Some cetaceans migrate to specific feeding preference areas which increases population density and consequently the risk of collision from ships transiting these areas. Social aggregations for purposes other than feeding also occur which increases the probability of being struck as the density of animals is increased significantly and activity levels are elevated so that the presence or noise of an approaching ship may not be detected. Certain species of cetaceans often rest at the surface, increasing the risk of collision. Furthermore, responses of cetaceans to ship noise vary considerably not only by cetacean behavioural activity (resting, feeding, migration), but also by species. The level of underwater noise is a potential factor influencing the collision rate. High levels of ambient noise may make it difficult for cetaceans to detect approaching vessels and

Fin whale struck by a ship (Terry Mealy)

Killer whale killed by propeller strike on a Spanish stern trawler, off southwest Irish coast (Diarmuid O'Donovan)

to judge their relative location and movement. Cetacean responses to approaching vessels may also be affected by habituation to vessel noise. In addition, exposure to very loud sounds may cause damage to the auditory system and reduce the ability to detect oncoming vessels. Sources of anthropogenic noise include the noise generated by ships, seismic surveys and sonar systems. Some researchers have proposed that the ability to localise and avoid ships due to noise they produce appears to vary with ship size and level of radiated sound. Smaller ships produce a level of noise which allows the cetacean to localise the source of the sound, thereby allowing them to avoid being struck. Larger ships generating higher noise levels restrict the ability of the cetacean to localise the source of the sound, reducing the potential for avoiding collision. If these behaviours are compounded by environmental conditions such as darkness, weather conditions and sea state the chance of cetaceans detecting on-coming ship traffic or being detected by mariners before collision is greatly reduced.

The IWC has proposed the following conditions in order to reduce ship-strike related adverse welfare impacts on cetaceans [22]:

1. The co-occurrence of vessels and whales should be systematically analysed, to enable areas of high risk to be established as Areas to be Avoided (ATBAs) or areas of speed restrictions and strategic adjustment of shipping lanes in order to minimise vessel strikes while sustaining viable shipping routes
2. Where speed restrictions are implemented a maximum limit of 10 knots should be encouraged
3. Whenever a large whale mortality is encountered, where practical, it should be examined for cause of death to inform relevant programmes to enhance welfare and conservation, such as the above

Scientific research

Scientific research on wildlife is carried out for a variety of reasons including the study of species behaviour and ecology, population management, and to address welfare and conservation concerns. Scientific studies on wildlife vary in degree of invasiveness. However, all scientific studies on wild animals, for whatever purpose and at whatever level of invasiveness, should seek to minimise any negative impact on the welfare of the animals involved.

Many countries have enacted specific legislation relating to the protection of animals used in scientific research, often as part of an overarching act on the protection and humane treatment of animals. The laws on animal testing and research now present in many countries show wide variation in controls and practice but some consensus on principles about the use and welfare protection of research animals and the ethics of animal research exist. It is increasingly common for animal research legislation to require an ethical review and scientific justification for the proposed work. It is also commonly stipulated that the review is independent and includes an assessment of whether the likely outcome merits inflicting the expected adverse effects on the animals. Monitoring, independent scrutiny and effective enforcement of controls should be key components in good regulation of sound scientific research involving animals.

The principle of the 'Three Rs (3Rs) – Replacement, Reduction and Refinement is now widely accepted as the basis for humane animal use in research and testing. Replacement involves using non-sentient material that replaces the use of animals in experiments or tests, Reduction requires using the minimum number of animals for the scientific objectives, and Refinement involves avoiding, alleviating or minimising potential pain, distress and other adverse effects.

IWDG biopsy sampling fin whale off the Irish South coast (Michael Linehan)

Many field studies involve manipulating the study animal through procedures such as capture, marking, radio-tagging and collecting physical data (e.g. blood or tissue samples). These procedures can cause pain, suffering, distress and lasting harm to the target animal, as well as additional concerns such as reduced probability of survival and reproduction. It is therefore vitally important to carry out such procedures according to 'best practice' and to monitor the animals for potential adverse effects following procedures. In Ireland a licence is required from the National Parks and Wildlife Service to sample or place any devices on a cetacean. To ensure best practice is adhered to during scientific biopsy sampling the IWDG has developed a policy on biopsy sampling of cetaceans. Additional considerations such as the social structure and behaviour of the species under investigation are also paramount to the welfare of the individual animal and the target group. For species with a complex social organisation, temporary or permanent removal of a critical member of the social group can impair the well-being of the remaining group members.

The scientific study of cetaceans is an important means of collecting scientific data to identify welfare problems and associated risk factors. However, the scientific study of cetaceans should be subject to independent ethical review including detriment-benefit analysis. The ethical review should ensure that, at all stages in the scientific research there is an ethical justification for using animals. On-going critical evaluation of the research should be conducted, involving consideration of [22]:

1. The possibility that the objectives might be achieved by alternative means, not involving the use/lethal-use of animals
2. The balance of the predicted benefits of the work over the harms caused to the animals involved
3. Whether there is reasonable expectation that the objectives of the work will be achieved in practice and likely benefits will be maximised
4. The extent to which animal suffering is minimised and animal welfare enhanced, by implementation of the 'Three Rs'
5. Effective training, supervision and management of all personnel involved

In summary

There are many impacts affecting the welfare of cetaceans in their natural environment. The most significant potential for humans to improve the welfare of cetaceans in Irish waters is to review and improve human-cetacean interactions. All human interactions have the potential to impact negatively on cetacean welfare, however, the severity of many of these threats are poorly understood and difficult to quantify, especially given the potential for synergistic effects. Therefore, all human-cetacean interactions should be subject to independent scrutiny and ethical review for the purposes of improving and preserving the highest welfare standards for all cetaceans with which we interact.

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Cetacean welfare: Guidelines and recommendations

Many human activities have been shown to have significant adverse impacts on the welfare of cetaceans. However, it is not always practical to avoid human-cetacean interactions, and it is not always possible for humans to prevent all negative welfare impacts resulting from such interactions. Negative impacts resulting from human interactions can be direct or indirect, intentional or unintentional and they can impact individuals singularly or cumulatively. In circumstances where poor welfare outcomes may result from human interactions with cetaceans (i.e. interactions which cause pain or injury, fear or distress, or those which prevent expression of normal patterns of behaviour), we have a moral obligation to prevent as far as possible the negative welfare impacts, and to mitigate those that cannot be prevented.

The following guidelines and recommendations have been drafted following a comprehensive review of cetacean welfare science and established international codes of best practice. Each section has been compiled with specific reference to Ireland. The main objectives of these guidelines and recommendations are to reduce human-caused mortality and improve the welfare of cetaceans interacting with humans in Irish waters. The mitigation of human impacts on cetacean welfare will be greatest where the following guidelines and recommendations are adapted to the specific welfare threat and implemented effectively through the involvement, cooperation and compliance of all stakeholders.

Live-stranding

Cetacean strandings, both live and mass-stranding, are not uncommon along the Irish coastline. In Ireland, 16 species of cetacean have been recorded live-stranded, with three species, common and striped dolphin and long-finned pilot whale, accounting for around 50 per cent of all live-stranding events. Mass-strandings have also been recorded. Four species including the common, striped and Atlantic white-sided dolphin and the long-finned pilot whale account for 80 per cent of mass-stranding events. The causes of live-strandings are the subject of much debate, and the role of human activity in the marine environment on the incidence of live-strandings is of particular concern.

Guidelines:

• Ensure the health and safety of responders involved in the rescue attempt as a priority. Only trained personnel should attempt to rescue a stranded cetacean. On-lookers should not enter the water with a stranded cetacean under any circumstances. In order to ensure the safety of response personnel, attempts at euthanasia should not be conducted when a cetacean is in surf and should be conducted only when the cetacean has been stabilised, is above the tide line, or out of the surf. Please refer to euthanasia protocol below for further details.

• Determine if the animal is alive or dead. Breathing is the easiest and safest way of determining if the animal is still alive. However, in the case of large cetaceans it may be necessary to test for a palpebral reflex by checking whether there is any response to putting light pressure on the eyelid (NOT the eye) or soliciting a reflex from the blowhole or corneal movement.

• In the event of a live stranding, decisions should be made in the interest of the animal's welfare. If the animal is sick, injured or dying it should not be refloated as it will simply re-strand. Attempting to refloat an animal dying of injury, illness or old age is severely distressing to the animal and hugely detrimental to its welfare. In such circumstances, allowing the animal to die naturally may be the most humane option. Most large whales that beach will not survive. Under most circumstances, it is inhumane to attempt to refloat the stranded whale. In reality, in the majority of large whale strandings it is not possible to attempt to refloat the whale due to the physical size and weight of the animal and the difficulty in accessing the animals with suitable equipment. If attempts are made to refloat the animal or the animal has had at least one tidal cycle to refloat itself, and neither of these produce a successful outcome, the animal should be left alone and allowed to die naturally. In cases of extreme suffering and distress, and where it is possible to do so, euthanasia should be considered as the most humane option.

• The circumstances of the stranding will influence what action should be taken. Factors to take into account include: the type of stranding (single or mass);

the species (coastal or pelagic); the size of the animal(s); the nature of the coastline (steep or gently sloping); tide times and lengths; local currents and swells; weather conditions; the state and health of the stranded animal(s), availability of trained or experienced personnel and equipment, and the judgement of the veterinary surgeon or beach master.

• It is important to remain calm. Cetaceans are quite capable of surviving out of water for some time with a little assistance. Rushed attempts to refloat a stranded cetacean can cause severe injury and contribute to the stress the animal is experiencing. DO NOT attempt to push or drag the animal back into the water without first seeking professional advice. Never attempt to drag an animal back into the water by its tail, you will most likely kill or maim it.

• Stabilise the Animal. The main aim is to ensure that the animal can breathe and will not overheat or become over stressed. Support the animal in an upright position if possible, digging trenches under the pectoral fins for comfort. Keep the animal moist by covering it with wet blankets or towels, and apply water regularly. Do not cover or obstruct the blowhole and make sure to keep sand and water away from the blowhole. In sunny weather, where possible, provide shade. In very cold or windy weather erect a windbreak around the animal.

• All noise, contact and disturbance around the animal MUST be kept to a minimum. Erect a rope barrier to cordon off the area (apart from essential personnel caring for the animal) and ask the Gardaí/PSNI/coastguard/RNLI to assist with crowd control at the scene if necessary.

• A beach master should be appointed to direct and co-ordinate proceedings. He/she should liaise with Gardaí/PSNI and media, control onlookers, and ensure that the veterinary and rescue teams can attend the animal without unnecessary interference. It is important that the beach master keeps the public, and if necessary the media, informed at regular intervals.

• Any further steps towards rescuing the beached animal must be taken only after seeking the advice and support of an experienced veterinary surgeon or IWDG personnel. Assessment by a veterinary surgeon or experienced IWDG personnel may indicate what caused the stranding and whether the animal is a suitable candidate for a refloat attempt. For the welfare of the stranded animal, it is important that only viable individuals are refloated. Individuals which will not survive should not be refloated. In these cases the animal should be left alone to die naturally. In situations of extreme suffering and distress, and where it is possible, euthanasia should be considered as the most humane option. Currently, chemical euthanasia is being used to euthanise small to medium sized cetaceans which are stranded and cannot be refloated or will not survive a refloat attempt. Euthanasia is not an option for larger whale species, which should be left alone and allowed to die naturally. Shooting is not a preferred option as it can be difficult to execute (factors such as skull thickness, brain size and location make ensuring instantaneous insensibility and death difficult), and distressing for the animal and onlookers. For further details on euthanasia please refer to the section below.

Northern bottlenose whale live-stranded, Bantry, Co. Cork (Pádraig Whooley/IWDG)

• In mass stranding events, those animals unlikely to survive should be allowed to die naturally. Animals suitable for refloating should be refloated together.

• Refloating should be attempted on rising tides, once the cetaceans equilibrium has been restored, which may take several hours of stabilising in the water.

• Prior to release, the animal's behaviour should be monitored to ensure re-stranding does not occur.

• Transport of an animal to a different release site should only be carried out if it is essential and if it can be done in less than 2 hours.

• All stranded cetaceans, alive or dead, should be reported immediately to the IWDG Strandings Scheme and/or National Parks and Wildlife Service (NPWS).

• The IWDG has published a comprehensive set of guidelines for the welfare of live-stranded cetaceans called *Face to Face with a Beached Whale*. This document includes a list of contacts and resources available to aid an efficient and informed response to live stranding incidents.

Recommendations

• Education and awareness: Education and awareness among the public are important aspects of improving live-stranding reporting and assisting rescue attempts. The continuation of the IWDG training in live-stranding response is of vital importance. Training of all live-stranding responders is important to ensure the best welfare standards for the stranded animal.

• Research: The collection and scientific analysis of relevant data during live-stranding incidents will help to develop our understanding of the factors contributing to live-strandings along Irish coastlines. This information can be used to inform mitigation measures.

Eco-tourism (whale watching and swim-with-cetacean tourism)

Whale-watching is a significant and expanding industry in Ireland. As yet, little is known about the impact of eco-tourism on cetacean populations in Ireland. While it is widely accepted that the growth in popularity of eco-tourism has contributed significantly to the conservation and protection of these species through increased awareness and education, there is increasing concern that this growth could in fact be negatively impacting on the welfare of individuals. In the majority of cases, cetacean-focused tourism involves the targeting of specific cetacean populations, often for prolonged periods. There is now strong evidence to suggest that cetacean eco-tourism can significantly affect the biology and ecology of these focal communities including short term behavioural reactions such as reduced resting and socialising behaviour, as well as long-term impacts on reproductive success, survivability and critical habitat use [27, 28, 29, 30, 31, 32, and 33].

The negative short term effects of poorly-managed eco-tourism are not restricted to behavioural changes in targeted cetaceans. Many cases of serious and often fatal injury caused by ship-strike during eco-tourism have also been documented. It is also thought that the noise associated with tourist boats may reduce the ability of the animals to communicate, navigate or detect prey.

Long-term strategic planning will help mitigate the impact of tourism on the welfare of targeted animals and ensure a responsible and sustainable approach in appreciating cetaceans and their environment. There are no structures or programs currently in place in Ireland to monitor and evaluate the long-term effects of eco-tourism on either migratory or resident cetacean populations. The following guidelines will help direct the growth and expansion of eco-tourism in an ecologically sustainable manner, including best practice for all tour operators and tourists encountering or interacting with cetaceans. These guidelines will also help to ensure the welfare of the individual cetacean and the sustainability of the focal population.

Whale watching tourism

The IWDG supports and promotes the development of responsible whale watching in Irish waters. The following guidelines are recommended to ensure that all interactions are responsible and sustainable and do not negatively impact the welfare of cetaceans.

Guidelines:

- Maintain a 'Caution Zone' of 300 metres for whales and 150 metres for dolphins and porpoises. If observing groups containing whales and dolphins and/or porpoises apply a 300 metre caution zone.

- When approaching within the Caution Zone, post additional dedicated observers to aid in detecting cetaceans and avoiding disturbance or collisions.

- When within the Caution Zone maintain a constant direction at 'no wake' speed (4-7 Knots). Avoiding sudden or repeated changes in direction and speed will decrease the risk of collision.

- Never approach closer than 100 metres from any whale and 50 metres from any dolphin or porpoise, including allowing a vessel to drift due to wind, current or forward momentum.

- Slowly approach cetaceans from the side and slightly behind, never from directly in front or from directly behind a cetacean or group of cetaceans.

- Never cross the path of travel or split a group of cetaceans.

- Never pursue a cetacean or group of cetaceans.

- Leave the boat engine on and in idle when watching cetaceans to signal your presence.

- If whales approach within 100 metres or dolphins and/or porpoises within 50 metres of the boat, put engines in neutral and do not re-engage until the cetaceans are observed clear of the boat.

- Be aware of other boats in the area. Boats should position themselves adjacent to each other and should never encircle a cetacean or group of cetaceans.

- The control of noise is particularly important when interacting with cetaceans. The production of noise should be minimised to ensure important cetacean sounds are not masked and cetacean hearing is not damaged.

- It is recommended that the duration of observation should not be longer than 20 minutes.

- At no time should cetaceans be disturbed from their normal movement or behaviour.

- Never feed cetaceans. Feeding is a very social behaviour for many cetaceans and providing food may interfere with hunting and other natural socialising behaviour. There are many concerns associated with feeding of cetaceans including habituating them to humans and the practice of feeding.

- Be aware of possible signs of distress (e.g. blowing air underwater, lobtailing and unusually prolonged dives with substantial horizontal movement). Observations should not persist if these behaviours are displayed.

- When leaving, move off at a slow 'no wake' speed to the outer limit of the Caution Zone of the closest animal before gradually increasing speed.

Swim-with-cetacean tourism

The IWDG does not support swim-with-cetacean interactions. There is a growing body of evidence relating to the negative impacts of swim-with-cetacean interactions on the welfare of cetaceans. Furthermore, swimming with cetaceans is an extremely dangerous activity. Therefore, the IWDG recommends that members of the public do not attempt to swim with wild cetaceans.

Humpback whale performs lobtailing behaviour, off the Hook Peninsula, Co. Wexford (Neil Kutay)

Recommendations

• Regulation and legislation: Irish legislation needs to be reviewed to identify its potential for managing eco-tourism operations outside of designated marine protected areas. The government must develop a national licensing or permitting scheme to regulate the number and size of boats, standards of operation and site specific requirements, as this is the most effective means of regulating eco-tourism.

• Research: There is a lack of basic information on the potential impact of eco-tourism on cetacean populations and critical habitats. Further work is needed on species-specific biology and behaviour, seasonal requirements and habitat requirements. This information is important in assessing potential impacts and informing management strategies that will assist in minimising adverse effects on cetaceans and their populations. Such policy initiatives may include maximum number of operators, maximum interaction time, 'no approach times', closed seasons and reserve areas. As part of continued monitoring and assessment of approved management strategies and guidelines tour boat operators should be encouraged to provide a platform for research on the species involved in eco-tourism. This research should support welfare and conservation management and be available for education and awareness initiatives of operators and their customers. Future establishment of new commercial operations or expansion of existing operations should be preceded by studies to obtain baseline data on cetacean population numbers, distribution, behaviours and habitat use in order to identify potential impacts at the population level and inform mitigation measures.

• Education and awareness: partnership agreements between stakeholders (operators, conservationists and state agencies) are the most effective system for managing eco-tourism in Irish waters and should be established if more than one eco-tourism operator operates at a site. Eco-tourism operators should be required to participate in on-going training and certification programs to ensure they adopt best practices and can provide good wildlife interpretation.

Entanglement/by-catch

Entanglement and by-catch have been identified as the most serious threat facing many marine animals in today's oceans. Net entanglement and by-catch can affect all species of cetacean throughout their geographical range including those present in Irish waters. Many of the entanglement and by-catch incidents occurring off Irish coastlines go undetected and/or unreported, making understanding the scale, scope and cause of the problem more difficult.

Disentanglement may mitigate some of the negative welfare effects, however, only very few entangled animals are detected and successfully disentangled. Unfortunately, in some instances where survival of the entangled animal is considered unlikely, the most humane option is euthanasia. However, disentanglement or euthanasia alone will not solve the problem of entanglement and by-catch. The following guidelines have focused on mitigating the impact of entanglement and by-catch on cetaceans in Irish waters.

Guidelines:

• Human safety is paramount. Responses to entangled cetaceans, especially large whales, are inherently risky due to the variable nature of

entanglements, the size and behaviour of cetaceans and environmental conditions. Therefore, disentanglement should only be attempted by appropriately trained and experienced personnel.

• All sightings of entangled or by-caught cetaceans should be reported immediately to the National Parks and Wildlife Service (NPWS) or to the IWDG. If possible, remain with the entangled animal and observe from a safe distance (at least 100 metres) until trained personnel arrive.

• Avoid abandoning or leaving fishing gear unattended. Abandoned fishing gear should always be removed.

• If an animal cannot be disentangled and is not likely to shed the gear over time, the decision to euthanise should be made on a summed appraisal of the following parameters:

1. If the cetacean cannot swim and is not improving over time
2. If the entanglement has resulted in an injury sufficiently serious, persistent and deteriorating such that the animal is judged to have a very low likelihood of medium to long-term survival.

Euthanasia should be carried out by appropriately trained and authorised individuals using the euthanasia protocol identified below.

Recommendations

• Develop an entanglement and by-catch monitoring and recording programme: The extent of cetacean entanglement and by-catch in fishing gear and marine debris in Irish waters is poorly understood. Therefore, ensuring the documentation of cetacean entanglement and by-catch incidents is a high priority. All sightings and incidents of entangled and/or by-caught cetaceans should be reported to a centrally based entanglement and by-catch recording centre. The collection of data is important in understanding the issues specific to Irish waters and to developing entanglement prevention, mitigation and response programs. Existing cetacean stranding networks and Photo ID resources may be useful in identifying and relaying evidence of entanglement or by-catch incidents such as scars, lesions or through necropsy results.

• Responder safety: Due to the dangers involved in disentanglement, responder safety must remain a primary objective. Entanglement events should only be attended by certified and authorised personnel. Responders should be appropriately trained and experienced in disentanglement techniques including sedation, and where necessary, euthanasia techniques. Disentanglement may only proceed if appropriate training and experienced personnel, with the appropriate authorisation and specialised equipment are available. It is the responsibility of the competent authority to ensure the provision of training, experience and equipment to all responding personnel.

• Data collection and recording: Information gathered during disentanglement intervention remains one of the best means for better understanding and ultimately mitigating the problem of entanglement and by-catch. A significant amount of important scientific information can be safely gathered during the disentanglement process such as species, age, sex, individual (photo-ID and/or genetic sampling), extent and location of wounds, general health (e.g. visual and behavioural assessment, as well as biological assays), gear type and origin, and entanglement configuration. It may also be beneficial to document animals following response efforts to assess post-entanglement survival. Responders should record a personal narrative of the event and their impression of the animal and its prognosis.

• Promote the use of new technologies: The loss and damage to fishing gear from entanglements and by-catch can be very expensive and the impact of such entanglements and by-catch on populations can be devastating. Much work has been done on developing new technologies to reduce the incidental take of cetaceans and the loss and damage to fishing gear. These new technologies, including acoustic deterrents, sinking and/or neutrally buoyant ground lines, weak links of various breaking strengths and buoy trigger release and line cutter devices, should be promoted to reduce the incidents of cetacean entanglement and by-catch.

• Research: Investigation into the biology and behaviour of cetaceans to fully understand where and when most cetaceans encounter fishing gear, as well as identifying the characteristics of fishing gear that cause severe and fatal entanglement is of paramount importance. This information will aid the evaluation of existing fishing methods, and inform proposed and future potential fishing methods on mitigating cetacean entanglements and by-catch risk and the associated welfare impacts. It is therefore important to commence collection of information from both entangled and by-caught cetaceans. All disentanglements, both successful and unsuccessful, should be documented in full. It is recommended that fishing gear and marine debris removed from entangled cetaceans be analysed and archived where possible, and that the information obtained be used to prevent future entanglements. Research may also be conducted through scar based studies, interviews with fishermen, whale watching operators and examining existing stranding and photo ID databases. Any animal that has been entangled should ideally receive a complete necropsy upon death where feasible, particularly for those animals that are euthanised.

• Education and awareness: information dissemination to both the disentanglement responders and the general public is an important element in addressing entanglement and by-catch response and in increasing public awareness and reporting of entangled and by-caught animals. Once the causal factors are understood, working with the fishing industry to reduce this threat is paramount. It is important to inform the fishing community of the welfare implications of entanglements and by-catch to promote an increase in reporting and to address any perceived disincentives to reporting. This is of particular importance as fishers are often the first to spot an entangled or by-caught cetacean.

Fin whale and commercial trawler, Old Head of Kinsale, Co. Cork (Pádraig Whooley/IWDG)

Ship-strike

Collisions with ships cause serious injury and mortality in many cetacean species and evidence is emerging that such collisions may be occurring much more frequently than previously suspected. It is almost certain that many incidences of ship-strike around the Irish coast go undetected and/or unreported, and this makes quantifying the problem for Irish cetacean populations a significant challenge. Collisions may be fatal or non-fatal. Non-fatal collisions are of significant welfare concern as they are likely to negatively affect the viability of the individual cetacean.

Avoiding cetacean-ship collisions is mutually beneficial. However, in many cases the options available to effectively mitigate the impact of ship-strike on cetacean welfare are relatively few. The factors influencing the incidence of ship-strike are extremely diverse and complex. These include event-specific factors such as ship type, underwater noise, weather conditions and time of navigation, as well as external factors such as economics, convenience, knowledge and tolerance of risk, operator experience and cetacean biology and behaviour. Preferred mitigation measures would minimise the co-occurrence of cetaceans and ships. However, in many instances, this is impractical or impossible for both economic and biological reasons. It is not practical to eliminate ship traffic from certain commercial shipping lanes and ports. In addition, management options regarding changes in routing may be limited due to navigational hazards, maritime safety issues and oceanographic conditions. It is equally impractical to move cetaceans away from critical habitats.

Ireland is still at a very early stage in understanding the scope and impact of ship-strike on cetaceans in Irish waters. Therefore, our initial focus must be on research and information collection to try to quantify the extent of the problem and identify and understand the causal factors. However, documenting collisions is challenging due to remoteness and resource limitations. It is important to recognise that in the preparation of these guidelines the term 'ship' represents a significant range of vessels making it impossible to produce one set of guidelines workable for all ships. The following guidelines and recommendations aim to increase our understanding of ship-strike in Irish waters and reduce the risk of harmful cetacean-ship interactions through: 1) Reducing the probability of cetacean-ship interactions; and 2) Reducing the potential impact of ship-strike on cetacean welfare.

Minke whale surfacing, Galley Head, Co. Cork (Pádraig Whooley/IWDG)

Guidelines:

• Where possible, areas identified as being of highest relative risk should be subject to specific management measures. Imposition of these measures could be seasonal, or year-round and limited to a specific high-risk area based on historical occurrence. These measures may include re-routing ships around high-risk areas, routing ships through high-risk areas to minimise travel distances and restricting ship speed through high-risk areas to reduce the potential for serious injury or death from collisions. In areas of high risk, particularly critical habitat areas, re-routing of ships in order that they travel outside of the sensitive habitat is the preferred option. Changes to routing and provision of alternative routes to reduce the impact on cetaceans and avoid biologically important areas require extensive information on cetacean movements to be effective. The reduction of speed can significantly mitigate the impact of ship-strike on cetaceans. Reducing speed through high risk areas increases the possibility of cetaceans detecting and avoiding a ship, provides ship operators the opportunity to sight cetaceans in time to avoid them and reduces the force of blunt impact if a collision does occur.

• Observers should be trained in cetacean observation techniques and placed on ships to aid in the spotting of cetaceans and avoiding possible collisions. This is particularly important in areas of high collision risk.

• In areas where collision rates are high, it may be possible to avoid travelling at night or in bad weather, when sightings are likely to be much reduced.

• In the event of a potential collision with a large cetacean it is recommended where possible to determine the direction and speed of travel of the cetacean. If a collision can be avoided by slowing down and maintaining the same course this should be done. If, however, a collision is otherwise unavoidable it is recommended to turn away from the cetacean, in the opposite direction to the direction that the cetacean is travelling.

• When conducting whale watching ensure compliance with the guidelines outlined above to avoid collisions between observation boats and cetaceans.

Recommendations

• Ensure the safety of personnel: All mitigation strategies must consider human safety the primary concern.

• Implement a reporting infrastructure: A reporting network, including a central ship-strike database and reporting procedure, allowing the quick and convenient reporting of ship strike incidents must be developed to facilitate the recording of information relevant to the further study and understanding of ship-strike events in Irish waters. This will help to identify potential high risk areas and improve understanding of how different factors such as species at risk; distribution; what physical and behavioural characteristics make these species susceptible to ship-strike; when and where ship-strikes occur and what ship characteristics contribute to the risk, e.g. types, speed, size and noise, affect collision risk in lethal and non-lethal strike incidence.

• Data collection and research: The lack of credible scientific information about collisions has made the development of effective mitigation strategies more difficult. Improved data collection and validation of collision reports will enhance our understanding of collisions and contribute to the mitigation of cetacean-ship collisions in Irish waters. Sources of data include commercial ships, whale watching boats, fishing boats, dedicated vessel surveys, cetacean observation days, photo ID and stranding recording systems. The potential for ship crew and observers to contribute to the collection of data through recording of relevant information such as location, species and number of cetaceans observed during transit is significant. Long-term monitoring of cetacean populations is a vital part of understanding the distribution both spatially and temporally, life history, biology and behaviour of cetaceans present in Irish waters. Important areas for research include identifying factors affecting rates of ship-strike, best practice in the event of a potential and actual collision, developing methods for quantifying ship-strike mortality, and the assessment of the effects of such mortality at the population level.

• Stakeholder Collaboration: Collaboration and cooperation between scientists, industry, policy makers and other countries must be achieved in order to provide comprehensive, viable, acceptable and implementable solutions. The potential of any mitigation measure is dependent on its application. Any ship-strike reduction strategy should be agreed between all interested parties and communicated broadly through all appropriate channels to the appropriate industries. It is also important to provide a mechanism for comments, reports, and observations on the measures adopted and, if necessary, adjust the measures accordingly.

• Education and awareness: education and awareness is an important element in any ship-strike reduction strategy. Through the development of training material such as leaflets, notices, educational talks/presentations and meetings, stakeholders can be informed of vital information to reduce the risk of ship-strike. Such information will include critical habitat areas, species of particular risk, basic species-specific behaviours which increase risk, what to do when strike is imminent and how to report ship-strike incidents. It is also advised that follow up courses or discussion groups be availed of to find out the effectiveness and level of implementation of mitigation measures as well as potential improvements.

Scientific research

The first step in developing an effective welfare mitigation strategy is to understand cetacean welfare and to identify the threats impacting the welfare of cetaceans in Irish waters. Comprehensive and cooperative monitoring through data collection and scientific analysis is the most effective way of improving this understanding. In the case of many of the welfare impacts identified in this document, too little is known about the true scale and scope of the problem to attempt to address effectively through regulation or legislation. Therefore, our focus must be on continuing and expanding the current research programme to include the implications of individual and cumulative threats to the welfare of cetaceans present in Irish waters.

Detailed studies of cetacean population distribution and abundance will help to identify population trends, general movements and areas of biological significance. Welfare specific studies will identify the true extent and severity of individual and cumulative threats to different populations and species of cetaceans. As more information on the ecological and physiological needs of Irish cetacean populations is gathered through scientific research, more targeted and effective mitigation measures can be developed and implemented.

Celtic Mist (Irish Air Corps)

Guidelines:

• The principal of the Three Rs (3Rs) must always be adhered to:

Replacement refers to the preferred use of non-animal methods over animal methods whenever it is possible to achieve the same scientific aims.

Reduction refers to methods that enable researchers to obtain comparable levels of information from fewer animals, or to obtain more information from the same number of animals.

Refinement refers to methods that alleviate or minimize potential pain, suffering or distress, and enhance animal welfare for the animals used.

• Non-invasive forms of experimental studies are the most acceptable.

• The use of invasive procedures on cetaceans should be considered only where the scientific purpose is of sufficient potential significance to justify such use and when the scientific purpose cannot be achieved by other methods. There should be a reasonable expectation that the research will achieve this purpose. Where invasive procedures are necessary researchers should ensure the invasiveness is maintained at the minimal levels compatible with the aims of the research.

• Consideration for the humane treatment and well-being of the research animal(s) should be incorporated into the design and conduct of all procedures involved in the scientific research.

• All research should be directed and supervised by personnel appropriately trained and licensed in the use of the procedures. Researchers should be responsible for ensuring all personnel assisting with cetaceans are appropriately trained in experimental methods and in the care, maintenance and handling of the species being studied.

• In as far as practicable, research should not cause unnecessary disturbance to focal populations. Every effort should be made to minimise potential harmful effects of the study on the population.

• Field research that carries a risk of impacting the welfare of cetaceans should be subject to review and approval prior to commencement. Any pain, suffering, distress or lasting harm to the animal that may result from any procedure must be justified by the benefit likely to accrue from such procedures. All proposed actions should be reviewed periodically to determine their effectiveness and whether they can or should be adjusted to further reduce and minimise welfare impacts.

Fin whale and common dolphin (Conor Ryan)

Recommendations

- Research: Continued research to improve our understanding of Irish cetacean populations is fundamental to an effective welfare science programme. The core functions of the IWDG, the sightings and strandings schemes, are a vital source of relevant data on Irish cetacean populations. Maintaining and supporting these core functions is of paramount importance. In time, it may be possible to expand these schemes to include the collection of data relevant to welfare science, such as expanding photo ID or stranding report schemes to include signs of physical damage resulting from entanglement or ship-strike. Improving our understanding of the welfare threats impacting cetaceans in Irish waters will assist the development of an effective mitigation strategy. An effective welfare science programme must address both short and long-term welfare concerns. Short-term welfare studies must address immediate impacts. Long-term studies are important to identify and understand the implications of individual and cumulative welfare threats over an extended time period. Important areas for future research include developing methods for quantifying mortality resulting from welfare threats and assessing the effects of such mortality at the population level.

- Education and awareness: Co-operative research and free exchange of scientific data on species of common concern is paramount and will help to accelerate advances in modern solutions to welfare threats.

Euthanasia

A successful rescue is the ideal outcome to all live-strandings. However, in reality, for many live-stranded cetaceans, and particularly large cetaceans, rescue is difficult, if not impossible. Where the health and safety of responding personnel cannot be guaranteed or where a stranded animal has been determined by a qualified expert to be in a terminal condition a rescue attempt should not be attempted. Rescue attempts, however well-intended, may subject a terminal animal to significant additional stress and pain. In such circumstances the animal should be left alone and allowed to die naturally (with palliative care where possible).

In certain circumstances, however, it is possible for pain and suffering to reach a point at which euthanasia is a justifiable course of action. Euthanasia is defined as 'the use of humane techniques to induce the most rapid and painless and distress-free death possible' [34]. The humane dispatch of a cetacean should only be considered in cases where the death of the individual is considered inevitable. The motivation for euthanasia of compromised cetaceans is always to alleviate poor welfare in the form of pain, suffering and distress.

Euthanasia of cetaceans, especially large whales, faces many challenges. Among these challenges are ensuring responder safety, the practical difficulties of administering euthanasia, the possible impacts of location and environment, tide and weather conditions and also the difficulties in determining the point of death. Any decision to perform euthanasia in the field must account for the safety of the responding

Minke whale surface lunging (Pádraig Whooley/IWDG)

Fin whale and common dolphin (Deirdre Slevin/IWDG)

personnel and the ethical obligation of the responsible individual(s) to reduce pain and distress to the greatest extent possible as a priority. If responder safety and the welfare benefits of euthanasia cannot be achieved then it will be safer for the responder and more humane to the animal to allow it to die naturally.

Welfare is a consideration of living animals only, and is not relevant in dead animals. While death itself is not a welfare issue, the manner of an animal's death is a relevant welfare concern. Therefore, the method of euthanasia is of particular importance to the welfare of a compromised cetacean. Euthanasia should be conducted using best practice to ensure it is as humane as possible by minimising time to death and associated pain and suffering.

Animals which are seriously ill or injured, with no prospects for survival in the wild, including animals which have re-stranded following a rescue attempt, should be allowed to die naturally. Where the animal is experiencing prolonged suffering, pain or distress then euthanasia can be considered as the most humane option. However, any decision to euthanise should be based on careful scientific and practical evaluation of an individual situation, and never in response to external pressures. It is important to ensure that once a decision to euthanise has been made by a qualified expert the public and media are informed of the decision and the process.

The euthanasia of cetaceans should only be considered in situations where all of the following parameters apply:

1. Rescue of the compromised cetacean is not possible (refloating, disentanglement, etc.)
2. The injury or illness is sufficiently serious to compromise the likelihood of the animal's survival
3. The chosen euthanasia method does not compromise the safety of personnel administering the method or the environment in which the procedure is carried out
4. That the application of the euthanasia method ensures that the death of the cetacean is as rapid and humane as possible.

In situations where all of the above parameters apply and euthanasia has been determined to be in principle the most appropriate option the IWDG recommend the following guidelines are followed to ensure the best welfare outcome for the compromised cetacean:

Personnel:

- In all cases euthanasia should only be undertaken by appropriately trained and licensed personnel. Euthanasia should never be attempted by untrained individuals.

- The process of euthanasia should involve the minimum number of personnel to ensure the avoidance of unnecessary distress to the animal as well as the safety of those involved.

- Where the euthanasia of a compromised cetacean is not possible due to factors such as the circumstances of the stranding, or it is determined that the most humane option is not to attempt euthanasia, the animal should be left alone to die naturally. This should include the provision of palliative care where possible and protection from extreme weather conditions.

- The management of members of the public who attend a stranding event can have a significant impact on the welfare of the stranded animal. Members of the public should not be allowed access to the animal during euthanasia. A barrier should be erected to ensure all members of the public are kept at a safe distance from the stranded animal.

Weaponry and equipment:

- Weaponry and equipment should be manufactured and maintained to a high standard to avoid malfunctions.

Procedure:

- Euthanasia should only proceed following consultation with an appropriately qualified veterinarian and after approval by the relevant government official(s).

Minke whale, Blasket Islands, Co. Kery (Nick Massett/IWDG)

• Terminally injured/ill stranded cetaceans for whom rescue has been determined by a qualified expert as inappropriate should be humanely euthanised as soon as practicable.

• Euthanasia methods should reliably minimise fear, distress and pain and should reliably result in instantaneous insensibility and death. Therefore, the brain is the preferred target as instantaneous unconsciousness is only achieved when the brain itself is traumatically injured in the thalamic region.

• In instances where an appropriate method for euthanasia is immediately unavailable short term welfare benefits may be conferred by administering deep sedation.

• In instances where preferred methods of euthanasia are not available use of pre-euthanasia sedation, where possible, can enhance the suitability of any secondary euthanasia method available.

• In the event of a pregnant female being euthanised, the humane dispatch of exteriorised foetuses in accordance with good animal welfare practice standards for the slaughter of other mammalian species should be ensured.

• Where external factors such as environmental conditions are liable to significantly compromise the welfare efficacy of the euthanasia process, euthanasia should not be attempted.

• Appropriate methods of euthanasia differ depending on the size and species of compromised cetacean. Therefore, it is imperative that the correct method of euthanasia is determined and used.

• It is essential that death is confirmed after euthanasia. Whenever the carer is not certain that death has occurred, additional techniques must be used to ensure death.

• Regular objective monitoring and evaluation of the euthanasia procedure should be undertaken to ensure it minimises pain, distress and suffering and to identify potential improvements in procedures.

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An tÚdar

Is ball den IWDG le fada an lá é Paul Kiernan agus duine a thacaíonn le leas ainmhithe. Bhain Paul amach céim onóracha i gColáiste na hOllscoile, Baile Átha Claith in Eolaíocht Ainmhithe i nDámh na Talmhaíochta, mar a bhí, agus céim Mháistreachta i Leas Ainmhithe i nDámh na Tréidliachta. Tá Paul ag obair leis an Roinn Talmhaíochta, Bia agus Mara, áit ar chuir sé suim ar dtús sna haigéin agus é ag obair agus ina chónaí ar chósta thiar-thuaidh na hÉireann. Idir an dá linn tá sé cáilithe mar thumadóir scúba agus mar shaorthumadóir, agus bhain sé amach a theastais AIDA 4 Réalta agus Leibhéal 3 SSI sa saorthumadóireacht le gairid. Tá an-tóir ag Paul ar an taisteal agus is ar cheann dá chuairteanna ar an Astráil a chonaic sé míol mór dronnach den chéad uair. Ó shin i leith tá suim ar leith aige i leas céiticeach. Tá dúil a anama sna haigéin agus i leas céiticeach á cur chun cinn aige ina chuid oibre mar Oifigeach Leasa leis an IWDG.

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Humpback whale off the Blasket Islands, Co. Kerry (Lucy Hunt/IWDG)

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The **Irish Whale and Dolphin Group** (IWDG) was established in December 1990 as an all-Ireland group dedicated to the conservation and better understanding of cetaceans (whales, dolphins and porpoises) in Irish waters through study, education and interpretation. This document recognises the growing importance of cetacean welfare science to the understanding of cetaceans in Irish waters and the protection and conservation of healthy, sustainable cetacean populations into the future.

The IWDG relies on members and partnerships to achieve its goals. Please visit www.iwdg.ie and join the IWDG to support our work.

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