

Table S1. Themes of welfare characterisation based on reflexive thematic analysis of expert opinion from questionnaire 1, transcribed as intelligent verbatim

Final theme	Original terms
Physical comfort/discomfort	It means the animal is overall comfortable; Freedom from discomfort; Physical comfort and health; Minimal or absence of discomfort; Animal well-being is the status of discomfort in an animal's perception; Comfortable as possible; Physical problems (thermal and physical discomfort); Widespread negative welfare impacts in all domains when a cetacean is stranded
Physical state and wellbeing, health, injury and disease status	The summary state of an animals physical well-being; Animal welfare is the sum effect of an animal's experiences on its physical well-being; It means the animal is overall healthy; The prevention of harm, the need to be protected from injury and disease; Animal need to be in health; Not subjecting an animal to physical harm, and to eliminating or minimising such harm if it has occurred naturally; Freedom from injury and disease; A good/healthy physical state of an individual; Without injury ; An animals welfare encompasses its physical well-being; These terms refer to the physical health of the animal; Well-being refers to physical state of the animal; Whether the individual is sick or injured; The identifying of an animals normal, healthy state; The physical health and welfare of an animal; An animals welfare refers to its well-being, health and condition physically; It refers to the health of animal (physical); The ability of an animal to meet its physical needs; Physical point of view; Putting the animals' health as a priority; Health status; The welfare of an animal relates to its physical health; Health and natural functions of the animal; Health; Animal welfare is concerned with the physical health of an animal; The state of the animal, based on its health but also physical state, reflected by its overall quality of life; Welfare includes physical wellbeing; Positive welfare is a state of physical wellbeing i.e. The absence of injury; Physical state; Wild animal biology and health; A condition of perfect body; Minimise any further injury or deterioration in condition; The state of being (physical) of an individual or group/population of animals as it relates to quality of life; Physical elements for cetaceans; Proxy measures of health; Some level of compromised health; Chronic and debilitating diseases; Should consider their physical status; Physical state health problems e.g. Low oxygen; The state of the animal, physically; Widespread negative welfare impacts in all domains when a cetacean is stranded
Animal's experience/perception of situation, mental or psychological state or well-being, affective states or feelings	Status of discomfort in an animal's perception; Sum effect of an animal's experiences of its physical well-being; Animal welfare is the sum effect of an animal's experiences on its mental well-being; Animal's perception of the world and self; Not subjecting an animal to psychological harm, and to eliminating or minimising such harm if it has occurred naturally; No perceive route of escape or release; A good/healthy mental state of an individual; Safety (no fear/distress); Animal welfare is the experience an animal has of its own life; Ensuring that animals do not suffer; An animals welfare encompasses its mental/psychological well-being; These terms refer to the mental health of the animal; Well-being refers to the mental state; What he/she is experiencing psychologically/emotionally; The mental health and welfare of an animal; An animals welfare refers to its well-being mentally; It refers to the health of animal (mental); The ability of an animal to meet its mental needs; Animal welfare means how an animal feels including its mental state regarding its situation; Well-being - the status, when no health related aspects or impacts from past experiences pose stress on an animal; The welfare of an animal relates to its mental well-being; Assessing the affective aspects; Animal welfare is the quality of an animal's subjective experience which include a balance of pleasant and unpleasant mental

	states; Animal welfare is about the feelings an animal experiences; Animal welfare is concerned with the mental feelings of an animal; Welfare includes mental wellbeing; Mental state; A condition of perfect mind, psychological health; Ability of an individual animal to feel suffering or distress; Psychological elements for cetaceans; Animal experiences positively or negatively valenced states and emotions; The balance of positive and negative affective states experienced by an animal; The experience an animal has of its own life; Psychological status; Mental state; Welfare state of any stranded cetacean can be considered as compromised since they are experiencing a life-threatening situation; Difficult to understand or know when an animal is in pain or how much, effects of drugs on cetaceans are limited, on the dangers, and how useful they are; It is difficult to determine if they are stressed or in pain, or aware, unless there are obvious signs, but I suspect that there are not always obvious signs; Minimise stress; The state of the animal mentally; The state of animal according to the animal; The animals mental experiences (i.e. How they are 'feeling', which may be positive or negative); Mental impacts of conspecifics and impacts on conspecifics - i.e. For social species, this is a significant impact to consider, for solo animals the presence of humans might have more of an impact for example; Widespread negative welfare impacts in all domains when a cetacean is stranded
Normal, natural or wild behaviour	The summary state of an animals behavioural well-being; Behaviours; Express natural behaviour; Normal behaviour patterns; Ability to express natural behaviours; Normal behaviour; Proxy measures of behaviour, often directly measure valence (aversion or attraction to events or stimuli); Able to live according to the needs of your species; Ability of an animal to successfully breed; Ability to carry out its "normal" repertoire of behaviours; Ability to behave naturally; Widespread negative welfare impacts in all domains when a cetacean is stranded; Able to live the life that they are most adapted to; The right to live their life according to nature's rules, conditions and challenges; Ability to carry out typical species specific or species appropriate functions
Overall wellbeing or Quality of life	Overall quality of life; State of being (physical) of an individual or group/population of animals as it relates to quality of life; Summary state of an animal's physical well-being; Sum effect of an animal's experiences on its physical well-being; The state of being (emotional) of an individual or group/population of animals as it relates to quality of life; Quality of life and mechanism of death are often overlooked
Normal physiology and homeostasis	The summary state of an animals physiological well-being; Normal biological and physiological processes; Animal welfare/well-being refers to the capacity of an animal to maintain their homeostasis; High breathing rate means the animal is stressed; Proxy measures of physiology; Welfare in ecology needs to be context dependent, and although stranded cetaceans might have poor welfare, how do non-stranded cetaceans die and how does that compare to strandings; Prevent drying damaging skin, eyes, overheating, dehydration; Special physiology designed to cope with life in various parts of the sea; Widespread negative welfare impacts in all domains when a cetacean is stranded
Pain and suffering, distress, stress or fear	Not in any form of distress; The need to be protected from pain, suffering; The terms deal with pain and suffering that an animal may perceive; Pain, suffering; Free from pain or intense stress; Freedom from fear and distress; Minimal or absence of pain, anxiety and stress; Ensuring that animals do not suffer; Animal well-being is the status of fear, distress, pain, in an animal's perception; Condition that reflects the animals degree of pain and suffering; Without pain, or suffering including stress; Animal welfare is mostly a state of no suffering and minimum stress from psychological point of view; Additional or unusual suffering;

	<p>Minimising or avoiding pain and mental stress; Freedom from undue pain; Stress levels; Being able to live without pain, fear, having a positive state of mind; Free from pain, fear and distress; Minimize pain and suffering; Animal living with no pain, no stress; Relates to if the animal is suffering; Relieve stress pain or inflect stress pain; Reducing/eliminating undue stress (physical/environmental) on animals; Positive welfare is a state of psychological wellbeing i.e. The absence of unnecessary suffering, pain; Ability of an individual animal to feel suffering or distress; Minimise suffering and stress; Low stress condition; The state of being (emotional) of an individual or group/population of animals as it relates to quality of life, pain and suffering; Ensuring that an animal is not distressed or otherwise suffering; As with all species, the important thing is to reduce suffering as much as possible; It mainly means to do what we can to not cause or prolong suffering in an animal; Minimize suffering; High welfare is often described in terms of constraints the animal has to be free from, re the various domains models; Brief experiences of fear or pain may not affect welfare overall - these states have survival value; Assistance must be provided to alleviate their suffering, to prevent and care for sun burns, to avoid stress due to the presence of large numbers of people, to avoid thoughtless actions and avoid unnecessary suffering</p>
Ability to live in normal/natural social and environmental conditions or habitat	<p>Able to get back in the water; Out of habitat, unfamiliarity with the environment; Separation of calf from dam; Able to live the life that they are most adapted to; Animals welfare encompasses its social well-being; Environmental conditions (shelter, feed, etc); The right to live their life according to nature's rules, conditions and challenges; Ensuring key 'needs' are provided (environment, appropriate social contact etc); Ability to carry out typical species specific or species appropriate functions, or ability to return to that state if temporarily compromised; Being able to live without shelter; Natural habitat; A condition of perfect social health; Freedom of living in their habitat free of boat disturbance and fishing net, quiet and safe environment, etc; "stress free" life with environmental enrichment; "out of habitat"; Achieve the most natural and comfortable situation for the animal to approximate conditions; Returning to the free-ranging social group; Lack of ability to move back into its normal environment; That means to me that a stranded animal is alive; Basically animal welfare means ensuring an animal has all its needs met to survive; Critical for the individual's prospects for rehabilitation and return to the ocean; Ability to make adaptations when these are compromised; Survival rate; The animal is in such a condition that it is able to be saved; In respect of cetaceans, this is how long has it been stranded, how long since salvage began, condition of animal etc;; The ability of an animal to cope with its environment; Welfare - positive expectation on the future well-being of an animal; Ability to cope with the environment in which it finds itself; How it lives and dies; Assessed with respect to their prognosis for post-rescue survival; Considering the long term state of the animal; The time it strands to the end of its life (whether it is refloated and goes back to live its life in the wild or if it is rehabilitated); Either it is returned to the sea with a reasonable chance of survival or that the animal is euthanized in a way that causes it minimal distress; In locations where rehabilitation facilities exist, it should be clear that an animal taken to such a place will be returned to the sea or euthanized; Swift return to the water and release with the minimum intervention, for suitable candidates; Stranding of large cetaceans is unfortunately mostly killing for the animal; It also depends on the species; But in general I think for smaller cetacean the more aspects of well-being are relevant; Tolerance of different species is critical here - in</p>

	terms of ability to survive stranding and have positive outcomes; Determining whether returning the animal to its natural habitat can/should be attempted
Sufficient food and water	Freedom from hunger and thirst; Good nutrition; Ability of an animal to successfully forage; Sufficient food and water supply; Ensuring key 'needs' are provided (food, water); Being able to live without lack of food, water; Freedom of living with plenty of food
Appropriate decision-making about re-floating or euthanasia, and targeted rescue/re-floatation efforts to prioritize animal welfare	<p>Determining whether returning the animal to its natural habitat can/should be attempted; Extends, where necessary, to euthanasia; The desire to help often exceeds the ability to do so appropriately, leading to wrong welfare decisions being made; The correct decision-making process whether to try and refloat or to euthanize; I do wonder if sometimes we are doing more harm than good by activating such intense rescue efforts for live strandings; Refloating animals who strand again and again until they die, for example, seems unnecessarily cruel; I realize SOME cetaceans will be rescued successfully, but perhaps more effort should be made to determine when, where, and under what circumstances success is more likely and only respond to THOSE strandings with an intensive rescue effort; Other strandings, where the cetacean(s) is/are likely to die should perhaps be left alone; Ensuring that welfare/well-being of the animal is clinically put first, above personal feelings and motives, to make sure the right thing is done for that animal whether it is refloated or euthanised; While I am convinced that humans can help animals in stressful situations, this needs to be targeted, it must be seen with extreme caution for the future of the population due to genetic deterioration and possible long-term effects; Respect the animal's decision to run aground, Returning it to the sea many times goes against animal welfare; Doing what is right for the animal and not buckling under pressure to "just do something urgently"; Make sure what we are doing is in the best interest of animal welfare and not for the sake of appeasing the public or stakeholders; It means using the evaluation parameters we have at our disposal to make good judgement calls about the suffering of an animal and the likelihood that refloating will be associated with a good welfare outcome; This depends not only on the immediate welfare of the animal but also on the circumstances of the stranding, such as environmental conditions, resourcing, location of stranding and species involved; The welfare of the animal should be objectively assessed; Many NGO's or personalities who claim to be experts on marine mammal strandings give advice to first responders, not on objective information or with the welfare of the animal in mind but based on animal rights belief; Consideration of the well-being of the individual above all else and making decisions about release or euthanasia with this in mind; Lack of medical and management knowledge in many areas; Professional attention with medical and biological decisions; Sometimes release an animal is not the better way of attention; Especially with large whales, euthanasia is a difficult task, however especially important due to the often-hopeless situation; Hence, more research and developments should focus on humane euthanasia options for different (large) whale species in different situations; Every individual should not have to endure unnecessary suffering and that euthanasia is chosen over refloating where the individual's viability is deemed low; Euthanasia needs to be in consideration for every situation; Emphasis is put on the physical and some individuals are euthanised as it is deemed 'better' for them when in truth a decision has been taken without all the facts; I hate that some people feel that euthanasia is not an action that takes an animal's welfare into account; In my opinion, a stranded animal is best served and most humanely treated when it is euthanized; If appropriate and possible euthanasia to</p>

	<p>minimise suffering; Intensive management that these animals can get when stranded and what a significant stressor that is, on top of the stress of the stranding itself; If and how they can be mitigated to enable a successful refloatation and release -at what point are there perhaps impacts that can't be easily corrected meaning that the cetacean will continue to experience negative impacts following refloatation and release</p>
Human activities in environment	<p>Good welfare involves cetaceans being able to live without human impacts; Human activities; Investigate the relationship that human activities have on the health of different species and their ecosystems</p>
Treatment and care by humans, including during stranding response	<p>The way in which the animal is dealt with by people trying to help it (whether they are trained rescuers or not) can positively or negatively affect the animal depending on what is being done; How they are treated/cared for; To assist the animal; How we as humans should act towards animals and how we take care of them so that their quality of life is not compromised, or if compromised, is mitigated appropriately; Best possible care and holding of an animal; If there is human intervention, some appreciable change in the behaviour or demeanour of the animal, reduced levels of stress, calmness, change in respiratory rates; Assistance must be provided to alleviate their suffering, to prevent and care for sun burns, to avoid stress due to the presence of large numbers of people, to avoid thoughtless actions and avoid unnecessary suffering; I think that the amount of time the animal(s) is/are stranded is extremely important when assessing welfare impacts and how quickly they can be helped by humans; To protect from environmental conditions, sun, wind, animals; Sufficient and necessary care for the stranded animal; Consideration for how we as humans treat animals should be included when considering animal welfare/well-being; I.e., they should be treated with respect, responsibly and humanely and to also uphold their dignity; Deal accordingly to ethic needs in wildlife; Impacts of conspecifics and impacts on conspecifics - i.e. For social species, this is a significant impact to consider, for solo animals the presence of humans might have more of an impact for example; Intensive management that these animals can get when stranded and what a significant stressor that is, on top of the stress of the stranding itself; If and how they can be mitigated to enable a successful refloatation and release -at what point are there perhaps impacts that can't be easily corrected meaning that the cetacean will continue to experience negative impacts following refloatation and release</p>

Table S2. Themes of welfare knowledge gaps based on reflexive thematic analysis of expert opinion from questionnaire 1, transcribed as intelligent verbatim

Final theme	Original terms
Ability to assess what animals feel or their mental state	<p>What they are thinking when high and dry on the beach; The ability to measure the degree to which a cetacean feels fear or distress when attended by a group of humans during a stranding; Little is considered from a mental state; Assess the animals stress and reduce this; Our aim is to keep the stress levels to a minimum during a rescue and always keep this in mind when deciding the next step; No easy mechanism to quantify the welfare impact of external environmental stressors on the stranded animal- to enable, for example those strategies which are most likely to calm, or exacerbate, stress in a stranded animal; There is much more information available on assessing their physical condition than their mental condition, and the impact of the stranding on the animal</p>

	<p>psychologically; Stress levels & exhaustion; Regarding mental wellbeing: Since we cannot discern a “normal” stressor response from actual distress in most animals, it is difficult to discern “healthy/natural” stress from distress by just endocrinologic measurements; Hence, improving this branch of research, though quite difficult, appears quite important to me; I believe having a degree of empathy for these animals is extremely important, to try and understand what they are going through, and use that to drive a compassionate response which takes the animals physical AND mental/social needs into consideration; Gap in knowledge of how impacts in the different physical domains manifest themselves in cetaceans</p>
<p>Post release monitoring to understand survival, outcomes or success of re-floatation</p>	<p>A comprehensive examination of post-stranding release success by species; More knowledge of the survivability of animals re floated would be useful; More extensive use of satellite tags would help; Fate of refloated and released animals; Survival post release; Post release survival; Better understanding of the outcomes for animals that are refloated and released and the circumstances that lead to the best long-term outcomes; Lack of knowledge of survival rates and thorough assessments of operational responses that can influence the outcomes; Post-rescue survival; Tagging; Post-release monitoring; As with most wildlife rescue projects, post-release monitoring is a significant knowledge gap; Survival rate post live stranding and release; Techniques and post release monitoring for large whales; Success of animals that have been "refloated"; Better understanding of the outcome for refloated individuals under a range of scenarios; Satellite tagging and post-release monitoring to gauge success of refloated and/or rehabilitated cetaceans; There is a loud contingent of the public and the professional world that believes refloating stranded cetaceans without post-release monitoring constitutes a successful rescue; Without context (species, stranding time, condition, etc;), this is an inappropriate assumption; Survival post refloating of individuals in a mass stranding event; Satellite telemetry to monitor success of refloatation or return to the sea is limited; More survival post stranding studies (using satellite tracking etc) are required; Data on survival following re-floating; Some welfare compromise is acceptable if measures taken result in welfare improvement and post-rescue survival, but there is very little information available on whether rescued animals stay rescued, or if they simply disappear, and ground-truthing assessments made while they are stranded; I also cringe at 'successful' rescue being declared when no post-release monitoring has been conducted; It may be a successful re-floating, but it does not mean an animal survived nor is necessarily the most humane action to take; Availability of accounts of successful rescues; Survival rate post release; Post-release monitoring is also limited;; Assessing if a stranded animal survives after release; We have now purchased 8 tags to tag stranded cetaceans so we have the ability to track them after release; Physiologic consequences of stress and potential short and long implications on whale health and survivability, post release sequelae impact on welfare of the animal (locomotion, secondary consequences to release, malignant hyperthermia, myoglobinuria, metabolic acidosis); Stress during the handling, success of release and sustained success of the individual released to the wild; Chance of survival for given species/distances from suitable habitat/body conditions; Documentation at stranding and follow up data would help</p>
<p>Lack of information, education and awareness for</p>	<p>A lot of people do not know how to properly respond to marine mammal strandings; Techniques for moving large whales without causing damage and with minimal suffering; Not a lack of potential methods - more a lack of capacity and opportunity (when animal is so obviously compromised) to apply them, and sometimes observant public resistance to 'interference' - the public just usually want a positive outcome through 'rescue'; Training on animal health assessment undertaken without emotion; How far is it</p>

potential responders about if, when and how to respond	reasonable to transport a stranded animal either for refloat or to a facility for further assessment/treatment?; The information is quite unorganised and often deteriorated towards being "animal friendly" i.e. Biased towards that making the animal survive in whatever condition is superior to either a natural death, or euthanasia; "Help" in general needs to be defined in terms of animal welfare and especially "animal-welfare" organizations are quite bad about that; Info available directs responders to immediately refloat if environmental conditions are right or refloat to another site; The assessment of welfare must be done in an objective approach taking all ethical aspects into consideration; Because cetaceans are large mammals and often get a lot of public exposure there is a desire for us to 'interfere' with a natural process; Should we do this?; We know that some animals do not survive or have been left by pods to die - this needs to be highlighted - e.g. Old males, any male not in a mass stranding, subadult Sperm Whale males; We should be able to necropsy any whale dead at a stranding to continue the learning; There are limited resources, especially given that many of the species that strand are not considered to be endangered or threatened; Much education and awareness work is needed
Lack of specialist/ expert advice and consultation from those with field experience and veterinarians	There is not much-specialized staff working on this in my country; Ability of assessing the welfare of a stranded cetacean is depending on the expertise of the veterinarians and biologists involved; The quality of knowledge is crucial for the level of understanding on welfare; Better consultation with species-specific experts and those who have field experience would also help; Lack of specialists in veterinary medicine; Having access to it and working in an environment that allows for relevant information to be used in decision making; Better consultation with species-specific experts and those who have field experience; Stranding response profession has been diluted by organizations most interested in welfare, and least interested in conservation; This results in an individual animal focus rather than a population focus, dilutes available resources, and confuses public messaging regarding conservation vs welfare; Limited facilities and expertise
Ability to assess physiological indicators and recognise deviations from normal/baseline	Better harmonisation and publication of basic measurable physiological indicators, e.g., baseline heartrate, breathing; Know the normal haematological and serum biochemical parameters for most species; Physiological responses; Blood profiles; Access to quick haematology and biochemistry results to inform on welfare is often missing; Suitable thermistor probes are often not available; Breathing rates it can be difficult to access 'normal' breathing rates for different species; Taking body temperature; There is a lot of info on clinical diagnostics that may need to be taken by a vet but not more general indicators that could be used by a lay person or biologist for example; Available blood parameters is limited; Blood and stress parameters; Physiologic consequences of stress and potential short and long implications on whale health and survivability, post release sequelae impact on welfare of the animal (locomotion, secondary consequences to release, malignant hyperthermia, myoglobinuria, metabolic acidosis); Lack of baseline data for a number of species; Internationally-supported published range of parameters measurable on the shore which indicate the condition of the stranded animal
Ability to assess body condition	Assessing true body condition in a live stranded animal beyond profile shape - i.e.: measuring blubber thickness, accurate weight vs body length and girth; Knowledge gap for deep-diving species (beaked whale mainly), which tend to live strand often (at least in EU) but difficulties in the assessment of things like their nutritional status; Body condition

Ability to diagnose internal injuries ante-mortem, including capture myopathy	Assessment of the extent of muscle damage due to grounding is also not easy to assess, clear and measurable indicators would be a decision aid in such difficult situations; A global gold standard protocol for assessment with clear diagnostics particularly no way to diagnose barotrauma or depth related injuries in deep diving species such as beaked whales in situ during stranding (not retrospectively through necropsy and analysis); Hearing loss; Not visible injuries but special diagnostic techniques on the beach can help to know if euthanasia can be performed quicker or rehabilitation can be performed; Indicators of internal injury; Captive studies useful for indicators of pain, wound/disease relative to affective state; Health check on every whale before release and a significant % had hearing loss; Almost all of these whales restrand so they now euthanise all these with a massive reduction of restrandings; Data on capture myopathy is limited; Clinical and pathological lesions in live stranded cetaceans; Timely detection of capture myopathy
Understanding the health and disease status of the animal	Fast and reliable, if possible non-invasive, monitoring methods of the actual underlying physical health; Observations from visual inspections can be misleading and might not align with the animal's internal condition, hence a terminally ill individual might be refloated due to no obvious deterioration in body condition and/or external injuries; Understanding the health of the individual; Lack of baseline data for a number of species, provided you are dealing with stranded cetaceans, which - by definition - are not healthy; Internationally-supported published range of parameters measurable on the shore which indicate the condition of the stranded animal and whether a refloat is likely to be successful and perhaps extended to consideration or rehabilitation (where this is possible); Indicators of disease or infestation; Captive studies useful for indicators of pain, wound/disease relative to affective state; Ability to diagnose common findings such as diseases like morbilli, brucella and capture myopathy, and understanding at what point an animal with the above may not be able to survive; Welfare of the rest of the pod or population of the animal or species, especially in the case of releasing an animal that is possibly sick (potentially carrying a disease that can infect others)
Ability to interpret stranded cetacean behaviour in terms of welfare state	Better harmonisation and publication of basic measurable movement; More information on assessing the animal's behaviour; Current information on assessing stranded (and for that matter, any) cetacean welfare, it seems to me, relies overmuch on indicators PEOPLE can identify and identify WITH; As long as a cetacean is not cringing, whining, tucking in its tail, flattening its ears, shivering, looking mangy, matted, or emaciated and so on, a person will tend to consider the animal "okay;" Cetaceans obviously don't exhibit any of these poor welfare signs; It's hard even to tell that a cetacean is in pain when it has an obvious injury - its demeanour is often stoic even when it must be in significant pain; In general, I think the field suffers from a lack of "translation" - the ability to translate what cetaceans are "feeling" into indicators that humans can easily recognize (e.g., can easily identify in terrestrial mammals); General interpretation of behaviour reflecting stress or poor physical condition; The link between observed indicators/behaviours and welfare outcomes
Assessment and interpretation of indicators of neurological state and	Better harmonisation and publication of basic measurable pupillary responses; Apart from the difficulties with physical assessments, the mental state cannot be assessed at all; Some clinical diagnostics are difficult to access when the stranded cetacean is submerged e.g. Eye responses to blinking and pupil; Indicators of sensibility; Neurologic assessment seems to be questionable at times, with some misinformation and/or diverging opinions about what qualifies as an obtunded animal; Neurological diseases and approach even medical and biological

responsiveness/sensibility	
Understanding social support and communication among animals	Cetacean communication is currently not well understood - sometimes cetaceans that are live stranded can be very vocal and at some point in the future when we know more perhaps there may be a way to understand whether the vocalisations they are producing are positive or negative in nature, or even more specific than that; Vocalisation rate and stress; Role of social support; Role of social support from other animals on the beach and post-release
Collection and documentation of empirical data to assist triage/decision-making	Triage of a cetacean's current state; General standardised categorization of welfare status, based on empirical evidence to help those attending strandings to triage with more confidence; No measurable way to assess what to do with a live animal, especially if deciding on whether to refloat or rehabilitate; Such as a flowchart one can follow; Lack of baseline data for a number of species, provided you are dealing with stranded cetaceans, which - by definition - are not healthy; Internationally-supported published range of parameters measurable on the shore which indicate the condition of the stranded animal and whether a refloat is likely to be successful and perhaps extended to consideration or rehabilitation (where this is possible); Not visible injuries but special diagnostic techniques on the beach can help to know if euthanasia can be performed quicker or rehabilitation can be performed; Cetaceans don't give you much to go on and it is often difficult to communicate to the uninitiated the significance of signs which in other species would be less critical to welfare; Especially for large cetaceans the clinical examination of the animal is difficult to be performed; Increases the challenge of assessing the degree of suffering of a stranded animal; Not enough information on how to assess whether an individual has the capacity to be rehabbed and returned to the wild; Treatment options and effectiveness of treatments; Comprehensive documentation of stranding events and responses are required to better assess efficacy and outcomes; There are differences between US and European efforts which may benefit from working to make them more universal and compatible; Very poor documentation at stranding and follow up data; The process of death is poorly understood in cetaceans and a better understanding of indicators for progression towards death could be very useful for triage on the beach; Welfare of the rest of the pod or population of the animal or species, especially in the case of releasing an animal that is possibly sick (potentially carrying a disease that can infect others); Gap in knowledge of how impacts in the different physical domains manifest themselves in cetaceans
How to make decisions about when and how to euthanise stranded cetaceans	Efficacy of euthanasia methods and when to implement them; The right time for euthanasia (attempts) is often difficult to determine and the reasoning might not be understood/accepted by the public, which can be difficult for the team on the ground; Dosages for euthanasia of large whales? Proper/standardized needles for euthanasia injection in different species; More information about euthanasia and perhaps some international standards would be helpful; Euthanasia can be an appropriate welfare outcome; Any agency considering training in marine mammal rescue needs to remove emotion and add euthanasia to the mix; Euthanasia is not a welfare issue and should be considered as an action that should be taken to relieve any suffering caused by stranding - especially when attempts to refloat the cetacean are or are likely to be ineffective and/or would involve very welfare impactful activities/actions; Organisations that use euthanasia should have clear decision-making policies and not make snap decisions, especially for large whales (given that euthanasia is more challenging due to uncertainties regarding dosage/delivery); Better

	understanding of indicators of death and progress towards death; The process of death is poorly understood in cetaceans and a better understanding of indicators for progression towards death could be very useful for triage on the beach; What are appropriate humane indicators to use to determine when euthanasia should be used
Causes of stranding and how to prevent stranding	Causes of strandings (recognising that there are likely to be many); Better knowledge of human-related environmental conditions specific to a region (e.g., seismic exploration, shipping traffic, intensity of commercial fishing) would help to determine their potential contribution to stranding events and thus suggest means of decreasing the occurrence of these events; Better understanding of why they strand - particularly for mass strandings - might help to either prevent or mitigate strandings; Lack of understanding on reasons for stranding in the first place; Lack information about the trends in strandings in many areas
Effects of species, animal size and features of the stranding (geographical location and duration) on welfare	Species and individual animal differences; It is difficult to establish standards to evaluate the welfare for all species of stranded cetaceans due to the biological variety of different animals; Understanding the behavioural needs in rehabilitation of larger or deep diving animals; Many have the rehab of small cetaceans, dolphins and porpoises down but there is a need to understand how best to provide care for larger species at a stranding location and for rehabilitation; The particular species involved, and within each species its size/age/gender are all likely to be important variables; Also, duration of stranding and geography; It is unlikely that a "one size fits all" protocol can be established; Assessment of welfare is not necessarily related to the location in my opinion, but more to the type of stranded animal (odontocete vs mysticete); I think that geographic location is huge and that managers and the public expect that what works in one area with one set of species should work elsewhere; Species differences; Data limited, particularly, with live stranded whales and larger species; Risk assessment about which kind of strandings, in which locations, are most likely to respond favourably to rescue and go from there; Not easily transferrable to large stranding events of large whales, especially in areas with limited facilities and expertise; More known about some species than others

Table S3. Themes of welfare concerns based on reflexive thematic analysis of expert opinion from questionnaire 1, transcribed as intelligent verbatim

Final theme	Original terms
Suffering, stress and anxiety associated with stranding	Stress from stranding process; Stress reduction through palliative care (protection from the sun, keeping the skin wet, placing the animal in the prone position and, if possible, floating); Stress; The stress of the stranding itself on the animal psychologically; Stress of stranding; Stress -including related to the stranding; Shock; Stress associated with the event (prior to coming ashore); Minimise stress; Stress inflicted on animal by circumstances; Keeping the animal's stress level to a minimum; Keep the animal calm; Anxiety; Anxiety/fear due to stranding; Distress; Stress/distress; Mental impacts; Immediate impacts of anxiety; Suffering
Effects of gravity, body weight, pressure on animal's organ function and physiology and	Weight of organs leading to pain, fluid accumulation and haemodynamic dysfunction; Cramp, metabolic acidosis, and the torsional and pressure forces from no longer being supported by the water;

causing internal injuries and pain as a result of not being supported by water	Physical damage/pain caused by gravity; Keeping the animal floating; Pain due to pressure necrosis; The animal is feeling the effects of gravity; Impact of pressure; Physical external injury by own body (i.e. Weight, thrashing); Physical internal injury by own body weight; Being on a solid surface and not in the water - the different organs can be compromised due to the weight of the body and for this reason different organs cannot receive enough oxygenation for example; Physical pain as a result of being on land; Development of organ failure (compressive pressure, lack of oxygen) and pain/discomfort associated with that; Pain from gravitational forces in absence of buoyancy; Organ failure; Stress related to diminishing oxygen levels; Organ pressure; Internal physical injury associated with the effects of gravity on internal organs; Cardio-vascular function; Compression of internal organs dependent on size and location; Discomfort (from low to extreme) [e.g., from exposure to gravity, such as pressure on sternum], blood pooling / hormone build-up [from lying on their side/exposure to gravity]; Comfortable as possible prior to and during assessment and before possible refloat; This may mean righting it, removing any undue pressure on its body (possibly by digging a suitable 'cradle' in soft substrate or using rescue pontoons); Pain from being out of water (organs, muscles); Pain due to capture myopathy; Capture-myopathy from being on beach or if transported; Muscle myopathy; Discomfort; Dyspnoea caused by weight of body on a rib cage not designed to support the weight of the animal's body; Length of time the animal has been stranded has to be of importance from the perspective of both unnatural pressure on the animal's body and stress; Effects of gravity on internal organs; Physiological; Physical and health impacts; Environmental impacts of being out of the water
Fear/anxiety and social stress caused by witnessing conspecifics in distress	Fear, from conspecifics alarm calls; Psychological stress caused by death or injury to conspecifics; Anxious vocalization from conspecifics; May be a significant individual from the social group whose loss would have wider implications; Stress related to seeing other conspecifics stranded; Social stress awareness of distress in others of the group; Concern for conspecifics; Stress/anxiety from social aspects [e.g., witnessing (including hearing) others suffering; Emotional contagion - see social companions suffering; Death of pod members; Other individuals affected by its stranding or its absence or death; Presence of other stranded and swimming conspecifics
Compromised hearing	Hearing compromised [short-term or long-term issues may arise e.g., barking dogs, helicopters may cause trauma]
Cause of stranding still present	Was the stranding human-caused or natural; Same factors that caused stranding are still potentially present (e.g., noise); Reason for stranding may be unknown e.g., are there already environmental/health/behavioural reasons that have contributed to stranding
Keeping animal alive to enable re-floatation	Keeping the animal alive; Survival possibilities; Dying processes; Cetacean survival; Keeping alive on shore; Assessing the probability of survival if refloating is attempted (health assessment)

Dehydration	Dehydration; Ill-health - dehydration; Dehydration if stranding prolonged; Dehydration internal; Dehydration internally from lack of water to drink; Thirst; Unable to maintain hydration
Disorientation, loss of balance, inability to swim	Loss of balance; Disorientation/disturbed balance to inner ear [e.g., from lying on their side], disorientation [i.e., disorientation/disturbed balance can be very mentally taxing and require time to recover from this], location-specific disorientation [associated with moving an individual - such as when surf conditions are such that it is unsafe to release at stranding location and the animal(s) are moved to another location]; Disorientation; Inability to swim; Evaluating animal's cognitive state/coordination for the ability to be held in shallow water or temporarily maintained in nearshore holding pens
Out of habitat	Access to open water; Natural habitat, out of habitat situation such as beluga in VA; Proximity of animal's natural habitat (e.g., normally a pelagic species but stranded miles up a river)
Entanglement	An entangled animal may be under additional duress; Entanglement
Weather and environmental conditions	Weather conditions; The weather may not be conducive to assisting an animal (e.g. Stormy, high seas); Environmental e.g. Safe operation for people, weather, forecast; Air temperature/weather conditions; Tides for both risk to rescuers and also to aid decision-making on treatment of animal; Ensuring protection/shielding the animal from any harsh elements/ environmental changes; Effects of the environment (non-human e.g. Heat, sea state)
Delays to deciding on euthanasia to relieve suffering	Poor decision-making leading to delays in best practice management or inappropriate decisions re management - through ignorance or through unwillingness to proceed with strategies perceived as controversial e.g. Euthanasia; In cases where return to the sea and treatment in captivity are not possible, euthanasia can be used to shorten suffering; Euthanasia; Inappropriate attempts at euthanasia; When to reach a decision with regards to euthanasia; Species some more or less suitable for humane destruction; Whether euthanasia may be ethically a better option to prevent unnecessary and protracted suffering from cetaceans that are not viable due to health and condition issues; Waiting too long to euthanise the animal; Helping the animal does not necessarily means that the animal survives, Not survival at all costs!; Ability to euthanize; Will releasing, pushing off an animal, potentially cause it more pain and suffering, is doing nothing or euthanasia the more humane option, how best to answer that question; Is euthanasia the most humane option?; Decision on euthanasia VS; Lifetime in captive rehabilitation (no or low chance of release); Time to death; Determining when humane euthanasia is an option and whether it can be humanely and safely administered; Do everything medically possible so that the animal does not suffer, including euthanasia; Releasing/refloating animals that are not suitable for release (i.e.; Too young, permanent disability, etc) or forcing animals back out to the sea even if the animal is obviously weak or even if it is re-stranding

Animal exhaustion	Exhaustion; Tiredness [particularly when event lasts more than a few hours - this is a factor on the beach and after release - particularly if the latter is into strong currents or into surf conditions or rough seas]
Eye condition	Eye damage, drying; Eye strain from exposure to sunlight, sand/wind in eyes
Inappropriate human intervention, poor handling, responder training and experience, and public pressure influencing decisions	<p>Early first responder actions which are inappropriate due to ignorance and lack of guidance; Disproportionate value put on the opinions of unqualified participants in making decisions (e.g., vocal volunteer groups; Veterinarians without experience in cetacean strandings); Releasing/refloating animals that are not suitable for release (i.e. Too young, permanent disability, etc) or forcing animals back out to the sea even if the animal is obviously weak or even if it is re-stranding; Cetacean expertise and coordinating this, possibilities for recovering on sight; Inappropriate handling, first aid and treatment, Inappropriate refloatation, Inappropriate carrying and transport, Inappropriate attempts at rehabilitation; Dogs; Human interference/interactions; Responses of the public; Coordinating activities of organisations, The press, Volunteers, Cetologists and Vets; There has been a tendency to refloat cetaceans due to public perception and pressure without justification via clinical assessment; Early release leading to further stranding and dislocation of family group, being towed by their tails as shown in whale rider; Being poorly handled especially with machines; Number of assistants and how many trained; Correct handling of the animal, training of the experts at site, experience of helpers; Maximum duration of handling, appropriateness of measures, public opinion; Human rescue attempts, especially when poorly managed; Knowledge and experience of response team; Human interactions; Trauma of being handled by humans; Presence of humans and their activities, Activities aimed at moving the cetacean back into water may cause increased physical discomfort and increase chance of injury; Degree of physical handling by humans (including treatment); How a successful and respectful handling and dealing with a stranded cetacean is conducted; Ensuring that intervention is clearly justified and carefully planned, Determining what is best for the animal rather than for the humans involved; Injuries from rescue [particularly when rescue coordinator is inexperienced or refuses to implement species-specific protocols], injury from transport [particularly when species-specific protocols are not implemented]; Assessment of condition is essential, so that appropriate decisions can follow, trained people in attendance and preferably under expert veterinary supervision; Issues around interventions e.g. Human attempts to refloat or euthanasia; Treatment by humans (stressful and potentially pain inducing); Is returning the animal back to the wild or transporting the animal to a rehab centre in the individual's or population's best interest "just because we can, doesn't always mean we should"; Do not touch the animal too much, If it kept in water help it to float; Short and long term quality of life (e.g. Rehab vs refloat, rehab releasability, failure to thrive, etc); Human/animal interactions; Effects of the</p>

	human environment (e.g. Human presence, handling, infrastructure etc); Presence of other animals e.g. Dogs on beach; Impacts of recovery attempts, and impacts of refloatation
Stress, fear, distress or pain caused by human presence, interactions, noise	Stress at being surrounded and approached by humans; Suffering from people mishandling the animal during stranding events; Stress from human interaction; Fear from human intervention; Physical or psychological stress caused by inappropriate human interventions; Overstimulation from people, dogs, etc; Excessive human activity and physical interactions with beach cast animals; Distress to animal on approach or attempted manipulation of the animal; Dogs; Human interference/interactions; All experiences while stranded (including the attendance on the animal by people) undoubtedly increase the perception of pain, discomfort, fear, and distress; Fearful (e.g. Exposure to people); Distress by the presence of people; Are humans attending them causing additional stress (well-meaning members of the public, for example); Direct interaction from people; Stress from being surrounded by people; Too many people making too much noise; Extra suffering when trying to rehabilitate an animal in poor conditions with little possibility of survival; Stress caused by close interaction with humans during a rescue; Unnaturally close proximity of and manipulations by humans; Perception of humans that are trying to help as threats whose proximity causes distress/fear; Perceiving human intervention as danger; Stress related to potential human contact; Disturbance from human interference and unnatural interaction with humans; Fear and stress resulting from human interactions, Fear, stress, pain resulting from human interventions; Pain animal suffers from care received, stress inflicted on animal by rescue efforts/treatments; Is it worth the stress on the animal to push it back out when it will just wash ashore again; Responses to human intervention; Distressing the animal beyond the distress caused by the stranding itself; Stress from the rescue [e.g., too little 'comfort' given, close proximity to humans and equipment]; Keeping people away from the animal; Minimizing any extraneous disturbance, including keeping people and dogs away; Treatment by humans (stressful and potentially pain inducing); Minimizing abrupt changes and intrusions to the animal; Mental impacts
Human welfare or safety, distress at not being able to help	Human welfare- distress and potential harm to people directly experiencing from these events, and the feeling they want to help but can't; Societal welfare- these events can be used to suggest issues with planetary health, and that can lead to wider number of people feeling stress and unease; Protecting the welfare of people who might not be cognisant of their own safety (from sea conditions / weather / zoonoses)
Animals suffering from illness, disease and underlying health conditions	Suffering from illnesses; Treatment of illnesses; Morbidity; May be ill; Poor health; Impact of any previous conditions the animal has which may have resulted in the stranding e.g. Parasitic bronchopneumonia or meningitis; Individual has an illness that can be treated; Health and condition issues; Suffering from disease; State of animals; Possible health issues driving stranding; Health and

	situation of the animal; Health parameters; Disease; Emerging diseases; Physical and health impacts; Negative impacts on health
Pain and suffering due to physical injury or trauma caused by stranding, particularly substrate	Trauma from the beaching event and subsequent manipulations; Suffering from injuries; Serious injury from prolonged periods out of water; Pain from trauma; Impacts of environment; Treatment of injuries; Physical damage/pain caused by physical abrasion; Pain due to trauma; Distress, pain, physical trauma incurred with the injury; Physical injuries; Injuries; Physical trauma; May have major or minor dermal abrasion or wounds; May be significantly injured (e.g. Ship strike, entanglement); Injured; Impact of any injuries resulting from the stranding itself which could be significant e.g. Severe wounds and fractures; Impact of any previous conditions the animal has which may have resulted in the stranding e.g. Injury; Individual has an injury that can be treated; Physical external injury by external factors; Suffering from wounds; Pain from injuries that lead to the stranding; Damage from wave action especially over rocks; Abrasion and soft tissue trauma from resting on a substrate; Pain - injury; Evidence of wounds; Trauma from stranding; Physical discomfort associated with being stranded and prolonged contact with surface of the land and risk of physical injury e.g. Abrasions, damage to fins; Stress related to injuries sustained during stranding; Avoid more lesions; External damage (wounds, oyster beds); Injury from stranding or other factors (i.e. Cause of stranding); Physical injury from running aground, external injury from being ashore for extended time; Pectoral fins trapped compression, Beaching damage cuts scrapes, stress, Teeth jaw damage, Damage from tail flailing; Injuries from the substrate [e.g., sharp rocks/shells etc], injuries from surf [e.g., rolling in surf can damage scapula-humerus joints], longer-term health implications from the event [e.g., an injury may impact mobility or a stranding may exacerbate a trauma that was already present prior to the stranding]; If the animal is in rolling surf if possible move it out of the surf - not possible for large animals; Minimize sources of repeated physical trauma; Physical pain due to trauma from ground/rocks; Comfort Position/location (sand rocks); Substrate the animal is lying on; If sharp rocks this can cause damage to the animal; Substrate also needs to be considered - e.g., if animal stranded on a rocky shore, consider moving it; Stranding-related injury; Physical and health impacts
Nutritional stress, poor body condition	Starvation; Nutritional condition; Condition of animals; Inability to feed; Starvation (in cases where stranding is associated with emaciation); Nutritional stress - lack of food; Body condition; Hunger [particularly during extended events, or for very young calves who would normally nurse frequently] [NOTE: hunger also results in potential dehydration]; Hunger; Poor body condition; Undernourishment; Unable to maintain nutrition
Fear, stress, distress or helplessness at being unable to move or help themselves	Fear and stress from being unable to move or remove itself from the situation; Unable to exercise any normal behaviours; Fear of being "trapped"; Stress consider their extreme vulnerability and lack of

	ability to help themselves; Helplessness through unable to move; Impact (physical and mental) on the stranded animal which is unable to respond; Inability to escape predators and humans; Obstruction of movement; Distress at not being able to move and dyspnoea; Distress at inability to move away from humans; Stress related to lack of ability to move back into water; Mental issues, like anxiety or stress of being in a life-threatening situation; Out of habitat - not able to move, swim, behave naturally; Behavioural impacts; Mental impacts; Unable to perform normal behaviours
Strange noises	Hearing strange noises; Noise; Acoustically, the situation is unusual and distressing, as the animal's ears are persistently in air, not in water; Noise from dogs, helicopters; Stress related to loud noises / vibrations in the ground [e.g., barking dogs, helicopters, vehicles driving too close/too fast near the animal(s)]; Keep noise to a minimum; Noise; Too many people making too much noise;
Not given enough time to recover at re-float before release	Not enough time to 'recover' given so unable to 'cope' (mentally and physically) [cetaceans should be given a chance to stretch their muscles, flex their bodies, recover their balance, orientate to the location, re-establish connections with conspecifics (physically and acoustically), before being released], upon return to the water there may be mental anguish/stress related to re-joining group/maintaining group/seeking food/returning to deep water; Impacts of refloatation
Pain and its management	Pain; Minimizing animal pain; Minimize pain; Pain animal suffers from stranding; Pain management; Suffering
Parasites	Parasites
Pathogens from humans	Transmitting pathogens to the stranded animal; Compromised health from exposure to pathogens not normally exposed to [e.g., a human rescuer may have a dermatitis condition and not be wearing gloves]
Pollution	Pollution
Fear and pain from predation	Fearful exposure to other animals such as birds; Fear of predation; Predation; Pain from antemortem scavenging; Potential exposure to predators/ scavengers; External damage from scavengers; Injuries from animals [e.g., birds pecking eyes, pecking at skin]; Presence of other animals e.g., sharks
Feasibility of rescue/re-floatation based on human and equipment resources, location of stranding, time of day, responder expertise and experience and human safety	Resources available and how best to mobilize in an attempt to release an animal; Location where the animal is found may be inaccessible or not feasible for returning the animal to the water or moving it to a location where it will not be injured (e.g., waves on rocks); Suitable rehab facility nearby? (Ideally this would be a rehab centre or sanctuary with veterinarians who can assess and treat the individual and are motivated to get him/her back with his/her social group as soon as possible; Only under the most extreme circumstances should an individual be held in a concrete tank permanently and every effort should be made to get that individual back in the ocean either free-ranging or in a sanctuary); Location, time of day, remoteness, access to resources, access to experienced personnel, likely duration and

	resource balance, numbers, presence of other cetacean species that impede rescue efforts, presence of sharks, presence of blood/carcasses in water; Not enough people to keep the animal comfortable; Location; Safety of all people handling the animals; Available utilities; Responder safety; Ability to monitor animal(s) post release; Decision on refloating/release VS; Rehabilitation; Experience of success to rehabilitate or refloat; Is appropriate expertise and equipment available and can it reach the animal in a reasonable time?; In the event of group stranding, refloating numbers of individuals may be appropriate and a suitable strategy will be needed for this; Can animals be moved safely by authorized personnel and are appropriate resources available; Effects of the human environment (e.g. Human presence, handling, infrastructure etc); Impacts would depend on how long it was stranded; Impacts of recovery attempts, and impacts of refloatation
Difficulty breathing, inhalation of water	Finding it hard to breathe; Respiratory distress; Difficulty breathing; Water over blowhole; Drowning by returning tide; Difficulty breathing/slow suffocation; Drowning as tide comes in; Impaired respiration; Difficulty in breathing/dyspnoea caused by weight of body on a rib cage not designed to support the weight of the animal's body; Respiratory function; Rolling in surf can create situations where inhalation of water is unavoidable, stress from hyperventilation (or the opposite) from rapid breathing; Stress- breathing rate; Inspiration of water; Dyspnoea
Ability to assess whether animals will re-strand	Ability to accurately determine extent of stranding and potential restranding events; Is this a group stranding? Will the presence of others from the same pod/school keep individuals coming back?
Skin damage and associated pain due to sunburn, dehydration/desiccation occurring when out of water in sun	Physical pain due to trauma from sunburn, skin dehydration; Environmental exposure (e.g. Sunburn), hyperthermia; Possibilities for shelter; Desiccation; Sunburn; Impact of desiccation; Burns due to sun; Effects of sun on skin (drying, sloughing of skin); Pain from blistering; Sunburn; Very sunny conditions possible sunburn; Dehydration external for epidermis, sunburn; Skin damage from sun and wind, drying; Dehydration [externally on skin and for eyes]; Sun can damage the skin very quickly so we use the blanket to protect the skin; Getting the animal shade from the sun where appropriate; And keeping it cool; Environmental impacts of being out of the water
Separation from conspecifics/social group, including mother-calf separation	Separation from conspecifics and/or social group; In the case of social pelagic species, distress at being separated from conspecifics; Social isolation/separation; Distress could be caused by not having companions if it is a social species; Separation from its family members- even more pronounced for the more socially complex species; Proximity to other animals (if mass stranding/mother-calf pairs especially); Family or social group in the vicinity that he/she can be released to; Mental Stress, due to separation from pod; Dependent young, animals milling offshore; Loss of contact with conspecifics; Stress from being separated from calves and other relatives; Loss of conspecific social contacts; Loss of contact with other whales, especially young; Social stress - isolation from group; Loss of ability to

	<p>perceive sounds normally through being out of water - can't communicate with conspecifics and sounds/vibrations out of water causing disorientation/fear; Stress and fear - at isolation; Separation from pod members; Possible separation from conspecifics; Cetacean being separated from their pod/social group and the repercussions of that if they are able to be rescued and released; Potential psychological trauma of being separated from calves or other conspecifics; Stress/anxiety from social aspects [e.g., separation from social network/offspring/parents/family members]; Emotional distress (e.g. Separation from conspecifics); Loss of contact with social companions; Physical separation from conspecifics, loss of social group/knowledgeable members of group; Safe access to conspecifics or mother/calf bond if present; Mixed or single species stranding; Separation from pod members; Other individuals that rely on it, Other individuals affected by its stranding or its absence or death; Presence of other stranded and swimming conspecifics; Age; Unable to responded to calls from socially or maternally dependent calves; Separation maternally dependent calves and mothers who have lost calves; May have a dependant young still at sea; Animal size/life stage of the animal(s) (e.g. Dependent calf); Age/size; Age of animal - a neonate without its mother will not be viable but mothers can be searched for; Proximity to other animals (if mass stranding/mother-calf pairs especially); Dependent young stress from being separated from calves and other relatives; Loss of contact with other whales, especially young; Potential psychological trauma of being separated from calves or other conspecifics; Safe access to conspecifics or mother/calf bond if present; Pregnancy</p>
Effect of species biology, resilience and stranding type on welfare outcomes	<p>Species (some being much more resilient than others); Species, the biology of the animal; Mixed or single species stranding; Type of cetacean stranding - single, family, mass, toothed, Baleen; Mass vs; Single stranding</p>
Length of time stranded	<p>Danger of death from prolonged periods out of water; Return to the sea as soon as it is viable using best practices to avoid suffering; Length of time stranded; Time since stranding; When did the animal/animals strand i.e. How many tides; When did salvage begin; Time of response; Resolve the situation as soon as possible; Maximum times we allow the animal to be out of water based on size and species; Length of time the animal has been stranded has to be of importance from the perspective of both unnatural pressure on the animal's body and stress</p>
Physical damage, stress, pain and thermal discomfort due to overheating, hyperthermia, heat stroke and hypothermia	<p>Physical damage/pain caused by overheating; Hyperthermia (occasionally hypothermia); Overheating & sun; Impact of heat on the body when stranded out of water, Heat Stroke; Temperature - The temperature inside the water and outside are completely different which will also influence the welfare of the animal; Hypothermia/hyperthermia; Overheating; Hyperthermia; Stress related to thermal discomfort; Internal physical injury associated with overheating; Temperature; Frostbite and other associated issues [in locations where temperatures/winds are very cold]; Hyperthermia - when a whale</p>

	<p>or dolphin is out of water they tend to overheat so we need to keep them cool by covering them in a sheet and keeping them wet; Ensuring the animal can thermoregulate properly; Environmental impacts of being out of the water</p>
<p>Fear and stress at being in a strange, novel environment</p>	<p>Panic at being on land, seeing strange sights; Distress at being out of its element; Suffering of the stranded animal from being outside their habitat; Fear from the unusual nature of the event; Visual stimuli; Unknown outcomes; Non immersion; Return to sea; Being ashore is an unusual situation that is typically life-threatening; Emotionally, the animal will be fearful, as everything that happens while ashore will be unusual and possibly completely novel, which coupled with the stranding itself will undoubtedly result in fear; Fear of novel objects including people; Distress by the circumstances leading to the stranding; Fear of alien environment; Being in a strange environment - this is a stressful event which can be detected through physiological measurements such as cortisol or endorphins and thus it is known that it also has an emotional component; Mental stress at being out of water and threats such as people being around; Unfamiliar environment; Unknown area (where stranded); Stress related to being in unfamiliar environment; Psychological trauma associated with being in extremist; Stress/anxiety from being ashore [i.e., inter alia all the compromised welfare issues listed above that may manifest itself in physical ways such as hormones, but also may manifest themselves mentally and as such compromise the way in which the individual can cope with recovery]; Its previous experiences; Physiological; Mental impacts</p>