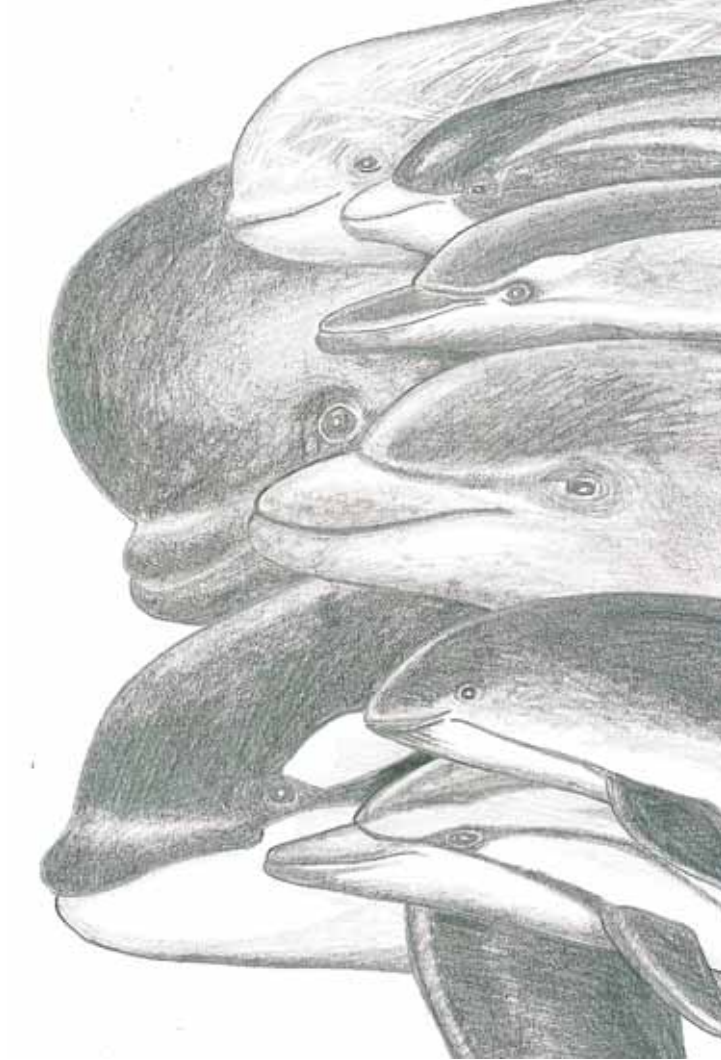


# **Risso's Dolphin Conservation Plan** **for waters west of the UK.**



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### **Executive summary**

Current nature conservation legislation (at international, European and national levels) imposes certain obligations on the UK regarding the whales, dolphins and porpoises found in UK waters. The major driver is the EU Habitats and Species Directive, which requires the conservation of habitats and species of European Community interest. The Directive also requires that Member States undertake surveillance of the conservation status of these habitats and species, which includes all species of whales, dolphins and porpoises.

This Conservation Plan focuses on Risso's dolphins (*Grampus griseus*) in waters west of the UK – which encompasses a number of identified hotspots for the species. There are few population estimates for this species, and the present status of Risso's dolphins in UK waters is unknown. This Conservation Plan aims to define the conservation needs of Risso's dolphins in waters west of the UK, identify specific management and research actions necessary to ensure these needs are met, identify research methods to elucidate and mitigate both anthropogenic and natural threats to the Risso's dolphins, and therefore to ensure the long-term viability of the population.

Natural factors such as diet, social organisation, reproductive parameters and disease may affect the population viability and recovery. Anthropogenic threats identified on a local level include: disturbance, pollution from various sources (especially sewage and oil industries), depletion of food sources and entanglement in fishing gear. A gradual increase in recreational craft has the potential to cause acoustic disturbance to cetaceans, in addition to physical damage through collisions with vessels or propellers. The cumulative impacts of such vessels and other disturbances may result in cetaceans being displaced from favoured areas.

This Conservation Plan seeks to address these threats and to identify areas of critical habitat to improve the protection of the species. Critical habitat is the habitat that is necessary for the survival or recovery of the species, and/or areas of consistent and prolonged seasonal occupancy. Defining critical habitat for any species is challenging, but especially so for highly mobile marine animals such as Risso's dolphins. An ongoing study by WDSCS has revealed the importance of the waters around Bardsey Island as a feeding area for Risso's dolphins. The presence of nursery groups of mothers and calves indicates this may also be an important nursery area. Mechanisms for the protection of this critical habitat are also identified.

Knowledge gaps are identified and future plans and research programmes to fill these data gaps are outlined. In order to fill these data gaps, co-ordinated monitoring and further research needs to be undertaken. It is essential to implement research and monitoring programmes to obtain the scientific information necessary to inform management. It is also important that standardised research methods are used so as to enable the comparison of results over time and from one area to another. Research priorities include: collaborative work consisting of data sharing/pooling; habitat modelling; continuation of existing monitoring surveys; and a schedule of studies to identify critical habitat. A better understanding of the anthropogenic and naturally occurring factors that regulate or limit Risso's dolphin populations will make it possible to rank threat factors and prioritise recovery actions.

Research objectives are prioritised to allow for effective use of available resources. As further information becomes available as a result of research actions outlined in this Conservation Plan, the objectives can be revisited and priorities may be revised. Analysis of these objectives allows for the identification of conservation actions. The success of these conservation actions should be reviewed annually, and the goal, objectives and broad strategies in this Conservation Plan reviewed every two years or as new data become available.

The time frame for adoption and implementation of this plan is 5 - 10 years. Initial research and collaboration aimed at achieving the identified actions is expected to begin in 2009 (subject to funding) and run for 3 - 5 years. Subject to review, monitoring work should continue beyond 5 years.

## Introduction

This Conservation Plan aims to fulfil a number of obligations imposed on the UK under current nature conservation legislation. The main driver for this is the Habitats and Species Directive<sup>1</sup>, which forms the cornerstone of Europe's nature conservation policy.

The Habitats and Species Directive seeks to "...maintain or restore, at favourable conservation status, natural habitats and species of wild flora and fauna of Community interest."

The Directive is built around two pillars. Which pillar applies to which species is specified in the Annexes to the Directive. The two pillars are:

- 1) conservation of natural habitats and the habitats of species, *i.e.* via the establishment of Special Areas of Conservation (SACs) known as the Natura 2000 network (Annex II),
- 2) strict species protection measures (Annex IV).

A listing in Annex II was chosen for species for which the conservation of their (often quite specific) habitat is the principal factor determining their survival and well-being. The protection and management of sites was selected as the appropriate instrument, which includes not only the maintenance of species' habitats but also, where appropriate, their restoration. Annex II lists animal and plant species of Community interest whose conservation requires the designation of Special Areas of Conservation (Natura 2000 sites) – this includes **bottlenose dolphins** and **harbour porpoises**.

The group of species listed in Annex IV may be better suited to conservation by 'physical' protection of the actual species as well as the protection of the most important parts of their habitat (*i.e.* their breeding sites and resting places) throughout the territory of a Member State. This is because of the specific threats they face, the measures needed to counteract them, the species' pattern of occurrence (for example scattered) or the type or specific character of their habitat. Annex IV lists animal and plant species of Community interest in need of strict protection – this includes **all species of Cetacea** (more commonly known as the **whales, dolphins and porpoises**).

Article 11 of the Habitats and Species Directive requires that "Member States shall undertake surveillance of the conservation status of the natural habitats and species referred to in Article 2" – which includes **all** cetaceans. Risso's dolphins are rare (Reid *et al.*, 2003), with a low reproductive rate, and there is the existence of a variety of anthropogenic threats – with the potential to prevent recovery or to cause further decline.

However, the development of assessments of conservation status proves difficult since there are few systematically collected, robust data that enable powerful assessment of the natural range, population size, or habitat area, and changes in these parameters, for most cetacean species in European waters. This Conservation Plan seeks to address this.

In the context of species conservation, 'recovery' is the process by which the decline of an endangered or threatened species is arrested or reversed, and threats are removed or reduced to improve the likelihood of the species' persistence in the wild. A species will be considered to have 'recovered' when its long-term persistence in the wild has been secured. This Conservation Plan sets goals and objectives and identifies the main areas of activities to be undertaken to promote recovery and effectively conserve Risso's dolphins in waters west of the UK. Detailed planning will take place at the action plan stage. Action plans will be developed to define and guide implementation of the Conservation Plan using specific activities for recovery and mitigation.

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<sup>1</sup> Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.

It is likely that some threats can be mitigated through the use of existing legislation or policies, e.g. Biodiversity Action Plans (BAPs) for cetacean species, and Grouped Species Action Plans. However, in other cases new actions, including new laws and improved enforcement may be required and sometimes the threat and/or the potential mitigation measure(s) will require further research or evaluation before recommendations on specific actions or activities can be formulated.

Good knowledge of a species (range/distribution, occurrence, biology, ecology, threats and sensitivity, conservation needs etc.) and regular surveillance of its conservation status over time (as required in Article 11) are essential preconditions for any meaningful conservation strategy. Co-operation at EU level and trans-boundary co-operation might be essential for certain species.

N.B. This is a draft document, which will require further input from organisations (governmental and non-governmental) and individuals able to provide professional information and advice. It is also an evolving document, which aims to be both extensive and inclusive, and will be further developed in close collaboration with others in the field. Timescales for implementation, revision and attainment of targets are provided in the Conservation Goals section of the document.

## 1. Background

- Taxonomy

|          |                   |
|----------|-------------------|
| Class    | Mammalia          |
| Order    | Cetacea           |
| Suborder | Odontoceti        |
| Family   | Delphinidae       |
| Genus    | <i>Grampus</i>    |
| Species  | <i>G. griseus</i> |

The Risso's dolphin is the only species of dolphin in the *Grampus* genus.

- species information: description and general biology

Risso's dolphins (*Grampus griseus*) are large odontocetes with a blunt rounded head, a large melon, no beak and a v-shaped groove which creases the forehead, forming a distinctive cleft down the face (Atkinson & Gill, 1996). The mouth curves upwards towards the eye. The Risso's dolphin is the fifth largest of the delphinids (Culik, 2004) - they typically measure 2.8-3.3m in length and, like most dolphins, males are generally slightly larger than females ([www.acsonline.org/factpack/rissosdolphin](http://www.acsonline.org/factpack/rissosdolphin)). The stocky, robust body is torpedo-shaped and tapers behind the dorsal fin to the tail fluke. The dorsal fin is tall, erect and falcate, set at the mid-point of the body and is one of the tallest in proportion to body length of any cetacean (Culik, 2004). The pectoral fins are long, narrow and curved. The tail flukes are dark and broad, with a distinct median notch, pointed tips and an overall concave outline ([www.crru.org.uk/education/factfiles/risso](http://www.crru.org.uk/education/factfiles/risso)). Risso's dolphins have a large, anchor-shaped light grey patch on their chest area. Fully-grown Risso's dolphins weigh between 350-500kg ([www.acsonline.org/factpack/rissosdolphin](http://www.acsonline.org/factpack/rissosdolphin)).

At sea, the best identification characteristic is the colouring and scarring. Adults range from uniform grey to nearly white as the animal ages. In ageing animals, the majority of dorsal and lateral surfaces become covered with distinctive linear scars (Culik, 2004). Older animals can appear completely white on the dorsal surface (Baird, 2002). At birth, Risso's dolphins are a uniform light grey colour, but this darkens to a chocolate brown as the animal ages (Atkinson & Gill, 1996). Large animals are typically silver-grey and covered with scratches and scars inflicted from conspecifics or the sharp beaks of their cephalopod prey, with age, turning to

light grey as scars accumulate. It has been suggested (MacLeod, 1997) that intraspecific scarring in odontocete cetaceans, such as Risso's dolphins, may be an indicator of male 'quality'. If this is the case, it would be expected that relatively less intraspecific scarring would be found in female animals.

Risso's dolphins have reduced dentition specialised for taking cephalopod prey. There are no teeth in the upper jaw and between 2-7 pairs of relatively large, conical teeth in the lower jaw (Carwardine, 1995).

The age at which these animals reach sexual maturity is not known, though it appears to be when the dolphins are approximately 3m in length, and at least 3-4 years of age. It appears that the breeding season may be extended and variable and may differ with geographical location. In the UK, births are likely to occur between July and December (Atkinson & Gill, 1996). Gestation has been estimated to be 13-14 months. Hybridisation with bottlenose dolphins in the wild and in captivity has been recorded (Sylvestre & Tasaka, 1985).

## 2. Distribution: global range, 'local' range

Risso's dolphins are widely distributed throughout tropical and temperate regions (Leatherwood *et al.*, 1980; Baird, 2002). They show a preference for deep offshore waters but will inhabit coastal areas around oceanic islands and narrow continental shelves.

In the eastern Atlantic, sightings range from the Shetland Islands, Scotland (Turner, 1982; Fraser, 1953) to the Cape of Good Hope (Barnhard, 1954), with sightings recorded from Norway (Oen, 1987), Sweden (Schultz, 1970; Lepiksaar, 1974), the Outer Hebrides and Inner Hebrides (Evans *et al.*, 1993) and the Mediterranean and Adriatic seas (Trois, 1883; Pilleri, 1970; Duguay *et al.*, 1978; Bayed & Beaubrun, 1987; Raga *et al.*, 1986).

In some areas, Risso's dolphins are reportedly migratory (Walker *et al.*, 1968). In the UK, Risso's dolphins seem equally common throughout the year in some areas, and show no evidence of seasonal migration (Fraser, 1953). In the northwest of Scotland, sightings indicate possible year-round residency. However, sightings are more frequent in this region over the summer and autumn months (Atkinson & Gill, 1996).

In the UK, 'hotspots' for Risso's dolphins can be found off the Western Isles in Scotland, the Isle of Man, Anglesey and the Lleyn peninsula (North Wales), Pembrokeshire (Southwest Wales) and the southwest of Ireland (Reid *et al.*, 2003). Comparative census studies of cetacean species in near-shore areas tend to indicate relatively low local abundance for Risso's dolphins in coastal habitats, though rigorous census data are not available (Gaspari *et al.*, 2007). An ongoing study of cetaceans around Bardsey Island, Wales (WDCS, 2006) has yielded sightings of large groups (10-12 animals) of Risso's dolphins off the north end of the island. Sightings of such large groups, and especially mother/calf nursery groups, indicate the potential importance of the area for this species (albeit likely to be on a seasonal basis).

The distribution of prey plays an important role in the distribution of Risso's dolphins. Available data suggest a diet dominated by cephalopod prey (Würtz *et al.*, 1992; Cockcroft *et al.*, 1993). Risso's dolphins off the coast of Scotland predominantly take lesser octopus (*Eledone cirrhosa*) (Atkinson & Gill, 1996; Santos *et al.*, 1994). Risso's dolphins are known to frequent subsurface seamounts and escarpments where they are thought to feed on vertical migrant and mesopelagic prey (Norris & Dohl, 1980b; Madsen & Herman, 1980; Clarke & Pascoe, 1985). Local submarine topography associated with the continental slope may concentrate prey by creating upwelling, convergence and divergence zones and current ridges, which may serve to increase productivity. Risso's dolphins are most abundant over the areas of steepest bottom topography, which also cause upwelling and thus prey aggregation (Atkinson & Gill, 1996). However, little is known of the pelagic distribution of squid and its relationship with seabed topography. Theoretical models of squid distribution suggest that animals aggregate along thermal fronts prior to spawning (Thompson & Frey, 1975). It is possible that Risso's dolphins are attracted to these areas rich in prey species.

Similarly, it has been suggested that the seeming importance of the waters around Bardsey Island and the Lleyn Peninsula to this species might be linked to the presence of local beds of *Modiolus modiolus*, the horse mussel. For example, Risso's dolphins were encountered on three days in September 2007 and on each occasion were found to be feeding on the horse mussel reef in Pen Llyn a'r Sarnau SAC (McMath pers comm.). It is thought likely that they were attracted to the reef by the presence of favoured prey in the form of cephalopod species, normally found in the deeper trenches offshore, but temporally inshore laying their eggs on the horse mussel reef. The reef has recently been mapped and appears to have been there for some 150 years and covers some 370 hectares (3,700,000 metres<sup>2</sup>) (Lindenbaum *et al.*, 2008).

Analysis of the stomach contents of a Risso's dolphin stranded in Borth, Wales, revealed a predominance of beaks of *Eledone cirrhosa* (Merrett, 1998). Boyle (1986) has shown that this species is especially common inshore (in Scottish waters) during the summer months (July – September). This coincides with peak inshore sightings off Bardsey Island and the Lleyn Peninsula (WDCS, 2005). It is also interesting to note that *Eledone cirrhosa* is a normal and regular predator of large crustaceans caught in commercial traps (Boyle, 1986). This might explain observations of Risso's dolphins foraging in the vicinity of lobster pots set around Bardsey Island (Morgan-Jenks, 1998).

### 3. Population size and trends: global & 'local'

The Risso's dolphin is classed as *Data Deficient* on the IUCN Red List ([www.iucnredlist.org](http://www.iucnredlist.org)) since there is insufficient information to assess their extinction risk. This information is currently out of date and awaiting revision. However, it is not expected that this classification will change.

The North and Baltic Sea populations of Risso's dolphin are listed on Appendix II of the Convention on Migratory Species (CMS). However, populations off the East and West coast of North America also seem to migrate along the coast and this is also the case for animals off SE South Africa. Culik (2004) suggests that *Grampus griseus* as a species should be included in CMS Appendix II.

There are very few population estimates in the recent literature: Forney and Barlow (1998) observed that the abundance of Risso's dolphins off California was almost an order of magnitude higher in winter (n=32,376) than in summer (n=3,980). Population estimates off Sri Lanka ranged from 5,500 to 13,000 animals (Kruse *et al.*, 1999). In the eastern Sulu Sea, Dolar (in Culik, 2004) estimated the population size at 950 individuals.

There are examples of long-term changes in abundance and distribution, e.g. in the Southern California Bight (Kruse *et al.*, 1999). In the late 1950s, Risso's dolphins were rarely encountered in this area, and between 1975 and 1978, they were still considered to be a minor constituent of the cetacean fauna of the Bight, representing only 3% of the cetaceans observed. Since the El Niño of 1982/83, however, numbers of Risso's dolphins have increased, especially around Santa Catalina Island where they are now considered to be common.

Herds tend to be small to moderate in size (1-100 individuals), averaging 30 animals, but groups of up to 4,000 have been reported, presumably in response to abundant food resources (Culik, 2004). Risso's dolphins commonly associate with other species of cetaceans such as gray whales (*Eschrichtius robustus*), Pacific white-sided dolphins (*Lagenorhynchus obliquidens*), northern right whale dolphins (*Lissodelphis borealis*), Dall's porpoises (*Phocoenoides dalli*), sperm whales (*Physeter catodon*), short-finned pilot whales (*Globicephala macrorhynchus*), bottlenose dolphins (*Tursiops truncatus*), common dolphins (*Delphinus delphis*), striped dolphins (*Stenella coeruleoalba*), spotted dolphins (*Stenella attenuata*), false killer whales (*Pseudorca crassidens*), and pygmy killer whales (*Feresa attenuata*) (Kruse *et al.*, 1999).

Essentially nothing is known about population structure in this species, as they rarely mass strand and seem to prefer the offshore continental slope as a main habitat where they are difficult to study (Kruse *et al.*, 1999; Baird, 2002). The UK Risso's dolphin population is genetically differentiated from the Mediterranean population, and also has a lower level of

genetic diversity (Gaspari *et al.*, 2007). For this reason, the UK Risso's dolphin population should be identified as a separate management unit when considering conservation strategies in light of potential anthropogenic impacts (Gaspari *et al.*, 2007).

A photo-iD study in the North Minches of Scotland has identified at least 142 individuals (Atkinson *et al.*, 1998) but no population estimate has yet been made. An ongoing small-scale photo-iD study of Risso's dolphins around Bardsey Island, Wales has yielded few re-sightings of known individuals over nine years (WDCS, pers. Comm.).

A study into association patterns of Risso's dolphins in the Mediterranean Sea revealed that the population appeared to live in a fission-fusion society (Gaspari *et al.*, 2001), similar to that observed in many oceanic dolphins. Analysis of 128 photo-identified individuals in the Ligurian Sea outlined the existence of four social groups (Gaspari *et al.*, 2000). However, recent work in the Azores (Hartman *et al.*, 2008) presented a new model for Risso's dolphin societies known as 'stratified social organisation', which differs from the fission-fusion and matrilineal society models. The authors found that social structure was stratified based on age and sex classes, and showed strong associations between adult males and adult females – with clusters forming the basic units of Risso's dolphin society.

A study of a group of Risso's dolphins killed in a drive fishery in Japan (Amano & Miyazaki, 2004) revealed some general traits of group organisation. Young dolphins seemed to stay in the natal group until around puberty, mature females of similar reproductive condition group together, and mature males move among schools. These findings agree with the observations of Kruse (1989) who recognised distinct groups of large, calf-less animals, juveniles, and females with calves in highly fluid groups. Firm subgroups of large adults, presumably males, also remained in the groups.

An ongoing study into the social ecology of Risso's dolphins in the Pelagos Sanctuary of the Ligurian Sea (Airoldi *et al.*, 2000) photo-identified approximately 300 individuals, with individual re-sightings ranging between 1-4 in different years. Within-season re-sightings ranged between 1-9 times. The re-sighting rate for many animals suggests a high degree of site fidelity during the summer, although the study area is likely to represent only a part of the greater home range. The authors suggest that the increasing rate of discovery indicates that only part of the marked individuals frequenting the study area have been photo-identified so far. The relatively small group size (mode=4), compared with greater Pacific aggregations that form in response to abundant food resources, may be indicative of relatively scattered or scarce food resources in this area (Airoldi *et al.*, 2000).

No population assessment exists for Risso's dolphins in north-east Atlantic waters - the SCANS II survey found no Risso's dolphins ([www.biology.st-and.ac.uk/scans2](http://www.biology.st-and.ac.uk/scans2)). This means that the present status of Risso's dolphins occurring in UK waters is not known sufficiently to evaluate properly the extent to which population changes have taken place.

#### 4. Natural factors affecting population viability and recovery

- biological limiting factors  
diet, social organisation, reproductive parameters, mating behaviour, survival and longevity, reproductive age and natural mortality
- other natural factors  
entrapment or beaching, disease, parasitism and algal blooms

#### 5. Threats

Human impacts on Risso's dolphin populations are not well documented, but include impacts from chemical contamination (Kim *et al.*, 1996; Marsili & Focardi, 1997; Shoham-Frider *et al.*, 2002), and sound pollution (Jepson *et al.*, 2005).

On a global scale, the main threats to Risso's dolphins are catch, bycatch, culling and pollution (Culik, 2004). Risso's dolphins are hunted regularly in Japan, with reported catches in recent years ranging from 388 (2002) – 511 (2004) (information from IWC). They are also a major target of artisanal hunting, and are often taken in gillnets and other fishing gear in Sri Lanka and the Philippines. Populations in these areas with large kills have not been properly assessed (IUCN, 2003). Activities recognised as currently likely to be detrimental to Risso's dolphins in European waters are: activities leading to ecosystem changes; interactions with fisheries; disturbance (including noise pollution and boat activities); and contaminant inputs ([www.ukbap.org.uk](http://www.ukbap.org.uk)). Evans (1997) has noted that Risso's dolphins have been known to become entangled in fishing gear.

- Activities leading to ecosystem changes

The degradation of coastal habitats due to the expansion of human developments is known to have important effects on cetacean populations (Sini *et al.*, 2005). This is especially true for species which mainly inhabit coastal areas, where human activity is concentrated. Ecosystem changes resulting from the widespread over-exploitation of marine biological resources in European waters have the potential to affect energy budgets and therefore the reproduction and survival of all UK dolphin species. High-seas fisheries extract vast amounts of fish and squid biomass from the world's oceans, and transform biological communities in the process (Jakobsson, 1985). Among key uncertainties is the extent to which cetaceans switch to alternative prey species as the availability of preferred prey declines.

- Disturbance

Despite the difficulty in conducting impact assessments on free-ranging cetaceans, studies have quantified the effects of vessel traffic on behaviour (Lusseau, 2003; Williams *et al.*, 2002b), activity and energetic budgets (Lusseau, 2004; Williams *et al.*, 2006), habitat use and reproductive success (Bejder, 2005). All these studies demonstrated significant negative impacts on cetaceans – including short-term displacement reactions, longer-term area avoidance, alteration of swimming speeds, diving rates and predicted paths, and a reduction in female reproductive success. Bejder (2005) found that tourism operations (such as tour boats) may displace sensitive individuals from areas of critical habitat, which raises questions regarding the long-term sustainability of the cetacean watching industry. Boat activities (such as merchant shipping, seismic surveys, military activities and recreational craft) pose threats to dolphins by direct physical damage from collisions and propeller damage ([www.wdcs.org](http://www.wdcs.org)), and by noise introduced into the marine environment. The English Channel is one of the most intensively used waterways in the world, and the North and Irish Seas are also subject to heavy use. Human-introduced noise has been documented to induce short-term behavioural reactions including cessation of feeding, socialising and vocalising, changes in diving behaviour as well as avoidance or attraction. In addition, noise has been documented as causing displacement of cetaceans from preferred habitats. If these impacts were of only short duration they would not necessarily be significant. However, if these disturbances are repeated or are of long duration, they may cause stress, debilitation and ultimately mortality (Simmonds *et al.*, 2003). The noise sources of primary concern are ships, seismic exploration, sonar systems of all types and some acoustic harassment devices (AHDs). While documented disturbance reactions of individual animals are becoming more common in the literature, there is still a lack of understanding of whether or how anthropogenic noise may affect populations of marine mammals (Nowacek *et al.*, 2007).

- Contaminant inputs

Contaminant inputs to the marine environment are many and varied. One report estimated 2,400 lipophilic and persistent organic pollutants (POPs) in global waters - 390 of which were known toxins with the potential for bioaccumulation (O'Shea *et al.*, 1998). These pollutants include organochlorines such as DDT (dichlorodiphenyl trichloroethane) and PCBs (polychlorinated biphenyls) and other groups of compounds, for example oil and oil-derived polyaromatic hydrocarbons (PAHs), perfluorochemicals (PFCs), flame retardants such as polybrominated diphenylethers (PBDEs) and anti-fouling agents such as tributyltin (TBT). Contaminants can impact the reproductive potential or cause immune suppression in marine mammals, including dolphins (Reijnders, 1996). High concentrations of bioaccumulating chemicals have been detected in the tissues of marine mammals, and long-lived animals such as cetaceans are more at risk of accumulative heavy pollution burdens than shorter-lived ones (Tanabe, 2002). Jepson *et al.* (2008) have recently suggested that there may be a link between peaks in environmental concentrations of one group of organochlorines, the PCBs, and decreases in bottlenose dolphin populations. Very high levels of PCBs found in stranded bottlenose dolphins in Cardigan Bay on the Welsh coast are amongst the highest reported in dolphins anywhere in the world (Law *et al.*, 1995). The source of such high levels has been somewhat mysterious but is likely to react to past industrial activities within the range of this population. Given that Risso's dolphins in the Irish Sea overlap in range with bottlenose dolphins they too may be exposed to high levels from the same or similar sources. Differences in diet will, however, affect exposures.

Heavy metals may affect the immune system of cetaceans. The results of a study on bottlenose dolphins and the effects of mercury, cadmium and lead supports the hypothesis that exposure to these contaminants (particularly mercury and cadmium) could lead to a reduction in host resistance to disease in these animals (Cármara Pellissó *et al.*, 2008).

A recent study by Capelli *et al.* (2008) on stranded cetaceans from the Ligurian Sea revealed extremely high mercury concentrations in Risso's dolphins, compared to other cetacean species studied. This compares well with values in the literature, which are often higher still (Storelli *et al.*, 1999; Frodello *et al.*, 2000; Shoham-Frider *et al.*, 2002). The highest mercury concentrations were found in the liver, though high concentrations of total mercury were also observed in other organs involved in the detoxification and elimination processes (such as spleen, lung and kidney). Selenium followed similar trends to mercury, with the maximum selenium concentrations found in the Risso's dolphins. Lead levels were found to be particularly high in the livers of the Risso's dolphins studied. Cadmium levels were found to be high in the liver and kidneys of the Risso's dolphins. This is in keeping with other studies such as Reijnders (1996) on long-finned pilot whales in the Faeroes, which revealed high concentrations of mercury and cadmium in their tissues. The specialist feeding habits of Risso's dolphins are likely to increase exposure to contaminants bioaccumulated in their prey as cadmium, copper and zinc are found in high concentrations in squid (Storelli *et al.*, 1999).

There may be a threat to cetaceans from radioactive discharges to the sea but nothing appears to have been published about this.

Global climate change may also have an effect on small dolphins but impacts on marine mammals are very difficult to predict. It is widely anticipated that climate change impacts on marine mammals will be mediated primarily via changes in prey distribution and abundance and that the more mobile (or otherwise adaptable) species may be able to respond to this to some extent. Within the last few years direct observations have been made of several marine mammal populations that illustrate reactions to climate change. These observations indicate that certain species and populations may be especially vulnerable, including those with a limited habitat range (Simmonds & Isaac, 2007).

- Threats to Risso's dolphins in waters west of the UK

On a more local level, threats to Risso's dolphins in Welsh waters are likely to include: disturbance, pollution from various sources (especially sewage and oil industries), depletion of food sources and entanglement in fishing gear (Morgan-Jenks, 1997). A gradual increase in recreational craft (especially speedboats and jet skis) (Morgan-Jenks, 1997) has the

potential to cause acoustic disturbance to cetaceans, in addition to physical damage through collisions with vessels or propellers. The cumulative impacts of such vessels and other disturbances may result in cetaceans being displaced from favoured areas. Increased seismic activity and discharges from oil exploration rigs could pose a serious threat to the long-term health of these waters (FoCB, 1995).

## 6. Protection: international and national

There are several pieces of international and national legislation relating to nature conservation and Risso's dolphins:

- *Convention on International Trade in Endangered Species* (CITES 1986, EC Reg No 3626 as amended) lists all cetaceans in Appendix II. This strictly regulates trade in animal parts or live individuals.
- *Convention on the Conservation of Migratory Species of Wild Animals* (Bonn Convention or CMS) includes Risso's dolphin in Appendix II. This requires signatories to draw up international agreements for their conservation and management.
- *Convention on the Conservation of European Wildlife and Natural Habitats* (Bern Convention) includes Risso's dolphin in Appendix II. This imposes a legal obligation to protect all important breeding and resting sites.
- *European Community Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora* (Habitats Directive – Council Directive 92/43/EEC) lists all species of cetacean on Annex IV. These species require physical protection of the species themselves, as well as protection of the most important parts of their habitat.
- *European Marine Strategy Directive (MSD) 2007* is designed to have a more holistic approach to the way Europe's oceans are managed. The Directive contains the crucial commitment to achieving 'Good Environmental Status' for Europe's seas by 2020. It also includes commitments to use an ecosystem approach to manage human activities, phase out pollution and provide a network of fully protected Marine Reserves.
- *Wildlife and Countryside Act (WCA) 1981* consolidates and amends existing national legislation to implement the Bern Convention. The Act makes it an offence to intentionally kill, injure, take, possess or trade in any wild animal listed in Schedule 5 (which includes all cetaceans), and prohibits interference with places used for shelter or protection, or intentionally disturbing animals occupying such places.
- *Conservation (Natural Habitats &c.) Regulations 1994* and the *Conservation (Natural Habitats &c.) (Amendment) Regulations 2007* transpose the Habitats Directive into national law in the UK. The Regulations provide for the designation and protection of 'European sites' and for the protection of 'European protected species' – which includes all species of cetacean.
- *Offshore Marine Conservation (Natural Habitats &c.) Regulations 2007* applies the Habitats Directive beyond 12 nautical miles.
- *Countryside and Rights of Way Act (CROW) 2000* amends the WCA 1981. This applies to England and Wales only. Schedule 12 strengthens the legal protection for threatened species by creating a new offence of 'reckless disturbance' and enabling heavier penalties on conviction of wildlife offences.
- *Nature Conservation (Scotland) Act 2004* applies to Scotland only. Part 3 and Schedule 6 of the Act amend the WCA 1981. This strengthens the legal protection for threatened species by making it an offence to intentionally disturb a cetacean. The Act also amends and enhances the provisions for enforcement.
- *Wildlife (Northern Ireland) Order 1985* makes it an offence to intentionally kill, injure, take, possess or trade in any wild animal listed in Schedule 5 (which includes all cetaceans), and prohibits interference with places used for shelter or protection, or intentionally disturbing animals occupying such places.

- *Conservation (Natural Habitats etc.) Regulations (Northern Ireland) 1995* provide for the designation, protection and management of 'European sites' and the protection of 'European protected species'.
- *Draft UK Marine Bill* provides for the designation of marine conservation zones (MCZs), both for protection of individual habitats and species and also for the creation of a network of sites representing marine ecosystems around the UK. The draft Bill also provides for measures to prevent activities from damaging designated sites. The UK Marine Bill will require appropriate devolved legislation in Wales and Northern Ireland. Consultation is currently underway on a *Marine Bill for Scotland*.

Conservation and protection of Risso's dolphins is also the subject of a number of agreements and action plans:

ASCOBANS – the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas was concluded in 1991 under the auspices of the Convention on Migratory Species and entered into force in 1994. Originally only covering the Baltic and North seas, as of February 2008 the ASCOBANS area was extended westwards to include the North East Atlantic and Irish Seas. The agreement is now referred to as the "Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas". The ten Parties and four Range States who are currently signatories to the Agreement undertake to co-operate closely in order to achieve and maintain a favourable conservation status for small cetaceans. Parties apply conservation, research and management measures as prescribed in the Annex to the Agreement.

UK Biodiversity Action Plan (UKBAP) – this is the UK Government's response to the Convention on Biological Diversity (CBD) signed in 1992, and commits a detailed plan for the protection of these biological resources. The *Grouped Species Action Plan for Small Dolphins* aims, in the short-term, to maintain the current range of small dolphins and to maintain the current abundance of small dolphins. In the longer term, it seeks to increase three ranges of small dolphin populations where appropriate. Specific actions include: the inclusion in Environmental Impact Assessments (EIAs) of a detailed evaluation of seasonal use, to determine dolphin distribution within any proposed licence block; to ensure that SAC management schemes recognise the need for appropriate measures to protect against disturbance and contaminant inputs; to commission population ecology research of all UK dolphin species to identify appropriate management needs; and to support research into predicting the effects of climate change on small cetaceans.

Although existing legislative instruments provide an important framework for the conservation of cetaceans and the protection of their habitat, implementation and enforcement of these instruments may not have been consistently effective.

## 7. Critical habitat

Critical habitat is the habitat that is necessary for the survival or recovery of the species, and/or areas of consistent and prolonged seasonal occupancy.

Defining critical habitat for any species is challenging, but especially so for highly mobile marine animals such as Risso's dolphins.

A study by Baumgartner (1997) on the distribution of Risso's dolphin in the Gulf of Mexico investigated possible relationships with the physiographic variables of water depth and depth gradient. This study found that sighting rates in the steep sections of the upper continental slope were 5-6 times higher than the sighting rates in other regions. It is unlikely that physiography alone attracts the dolphins. The shelf edge and upper continental slope are frequently sites of increased biological activity due to the formation of oceanic fronts along the shelf break. These fronts generally separate cooler, fresher shelf waters from warmer, saltier slope waters, and aggregations of prey species along these fronts may be the primary influence on the distribution of Risso's dolphins (Baumgartner, 1997). Other evidence of this

species' relationship to steep topography exists (Kenney & Winn, 1986; Würtz *et al.*, 1992), suggesting that it may be possible to define a habitat for Risso's dolphins in terms of physiography.

This apparently favoured habitat may also explain why Risso's dolphins appear to take advantage of a wide variety of cephalopod prey (Clarke & Pascoe, 1985; Würtz *et al.*, 1992; Santos *et al.*, 1994; Atkinson *et al.*, 1998). The upper continental slope and shelf break region is a transition zone between two distinct ecosystems, the continental shelf and oceanic waters. A physical mechanism that may explain this diet is the shelf/oceanic water exchange in this zone. A predator situated on this boundary is therefore able to benefit from the advection of a number of prey species in and out of the area. Movements onto the shelf or to deep waters may be related to this foraging strategy (Baumgartner, 1997). As fronts move onto or off the shelf and upper continental slope, Risso's dolphins may move with them to continue to take advantage of prey aggregations.

The local submarine topography around Bardsey Island may concentrate prey by creating areas of upwelling, which in turn will increase productivity. Two primary fronts (the West Irish Sea front and the Celtic Sea front) are found at either end of the St. Georges Channel, with a secondary front where Cardigan Bay meets the cooler, mixed waters of the St. Georges Channel (Morgan-Jenks, 1998). Kruse (1989) notes a number of studies suggesting enhanced feeding opportunities around bathymetrically-induced circulation as the main factor affecting the distribution and localised abundance of pelagic delphinids.

An ongoing study by WDCS has revealed the importance of the waters around Bardsey Island as a feeding area for Risso's dolphins (WDCS, 2005). The presence of nursery groups of mothers and calves indicates this may also be an important nursery area.

Many of the threats faced by the dolphins may also affect their habitat. This is of particular concern for the critical habitat.

The following activities have the potential to result in the destruction of critical habitat, *e.g.*

- Abiotic
  - Habitat destruction and degradation from industrial activities such as construction, drilling, pile-driving and dredging
  - Acoustic degradation (seismic, sonar, industrial and from commercial and pleasure craft)
  - Chemical and biological contamination
- Biotic
  - Reduction in the presence and availability of prey

Once critical habitat has been identified for Risso's dolphins, mechanisms for the protection of this habitat must be established. See Table 1.

**Table 1.** Mechanisms for the protection of critical habitat

| Threat                                 | Recommended measures   |
|--|--|
| Disturbance from industrial activities | <ul style="list-style-type: none"> <li>• Ensure all habitat alterations and marine spatial planning incorporates assessment of Risso's dolphin critical habitat</li> <li>• Advocate a precautionary approach to industrial activities and development in areas where critical habitat has not yet been identified</li> <li>• Raise awareness of effects of threat on critical habitat</li> </ul> |
| Acoustic degradation - seismic         | <ul style="list-style-type: none"> <li>• Re-draft currently ineffective JNCC Guidelines for minimising acoustic disturbance to marine mammals from seismic surveys</li> </ul>  |

|  |   |
|--|---|
|  | <ul style="list-style-type: none"> <li>• Evaluate JNCC Interim guidance on the deliberate disturbance of marine European Protected Species</li> <li>• Apply precautionary approach in areas where critical habitat has not yet been identified</li> <li>• Raise awareness of effects of threat on critical habitat</li> </ul> |
| Acoustic degradation – sonar               | <ul style="list-style-type: none"> <li>• Review current/existing EIAs on sonar use</li> <li>• Apply precautionary approach in areas where critical habitat has not yet been identified</li> <li>• Raise awareness of effects of threat on critical habitat</li> </ul>   |
| Acoustic degradation – industrial activity | <ul style="list-style-type: none"> <li>• Ensure all SEA, EIA, ES and AA for industrial development adequately consider Risso’s dolphins</li> <li>• Apply precautionary approach in areas where critical habitat has not yet been identified</li> <li>• Raise awareness of effects of threat on critical habitat</li> </ul>    |
| Acoustic degradation – pleasure craft      | <ul style="list-style-type: none"> <li>• Investigate area use by pleasure craft</li> <li>• Further investigate effects of this disturbance on animals</li> <li>• Raise awareness of threat on critical habitat</li> </ul>   |
| Chemical contamination                     | <ul style="list-style-type: none"> <li>• Improve identification and understanding of key contaminants and their sources and aim to greatly reduce inputs to the local marine environment</li> <li>• Raise awareness of effects of threat on critical habitat</li> </ul>   |
| Presence and availability of prey          | <ul style="list-style-type: none"> <li>• Investigate Risso’s dolphin prey and improve understanding of the animals’ prey requirements. Ensure that future management plans provide for an adequate supply of prey for the animals – especially with regard to changing climate scenarios</li> </ul>                           |

## 8. Knowledge gaps

Since little is known about this ‘population’ of Risso’s dolphins, it is clear that key information is still needed to assist their recovery and protection<sup>2</sup>. However, directions set in this Conservation Plan are sufficient to begin involving communities, land-users and conservationists in recovery implementation. Measures to prevent the reduction or loss of the species should *not* be postponed for lack of full scientific certainty.

### Previous studies

WDCS has been studying cetaceans in the waters off Bardsey Island, Wales for seven years. The survey aimed to generate baseline data on the distribution and habitat use of cetaceans in this part of north Wales, and to develop cost-effective survey methods; for example using Bardsey Island as a platform of opportunity from which to view cetaceans and a range of habitats. The results of previous surveys have shown that the waters around Bardsey Island encompass a number of important habitats for small cetaceans, including Risso’s dolphins. Indeed, Risso’s dolphins are the second-most commonly seen cetacean reported by the Bardsey Bird Observatory after the harbour porpoise (de Boer *et al.*, 2002). The WDCS methodology combined systematic land-based visual surveys from a number of platforms, boat-based photo-iD studies, static acoustic monitoring using T-PODs and boat-based line

<sup>2</sup> The present status of Risso’s dolphins occurring in UK waters is not known sufficiently to evaluate properly the extent to which population changes have taken place. In order to identify effective conservation goals, once a population estimate has been made, this can be assumed to be the maximum historic level. The long-term maintenance of a steady or increasing size for the population is an interim measure of recovery success.

transects (employing both visual data collection and acoustic surveys using a towed hydrophone).

Risso's dolphins were frequently sighted from the land, prompting the boat-based photo-iD survey, and, on occasion, photo-iD was also attempted from the land-based platforms. However, the animals have proved to be remarkably illusive and only a very low level of re-sightings has been achieved to date. Nonetheless, the repeated presence of this species around the island has been confirmed and groups were often seen to include calves, hence these waters appear to be of importance to them.

The waters around Bardsey Island are notoriously difficult to navigate and survey, being strongly affected by powerful tides and currents. There is relatively little fishing (apart from some potting) and with safe harbourage some miles to the north or south, leisure craft numbers tend not to build up. These factors and the relative remoteness of the Llyn peninsula, combined with access to suitable prey, may help to explain why this relatively rare and 'shy' species continues to be present. Bardsey Island lies at the northern edge of Cardigan Bay and de Boer *et al.* (2002) and Green and Simmonds (2006) have highlighted the importance of these waters to cetaceans.

WDCS has also previously supported research into Risso's dolphins off the west coast of the Hebrides in Scotland.

### Future plans

WDCS aspires to continue its long-term study and to focus its efforts on Risso's dolphins. Increased use of static acoustic monitoring using T-PODs will enable the determination of areas of important and critical habitat. When Risso's dolphins are sighted during systematic land-based watches, boat-based photo-iD surveys will be undertaken to help build a catalogue of known individuals.

Public awareness and education programmes are extremely important for conservation-orientated management. To this end, WDCS hopes to recruit a Local Lookout Co-ordinator for the Pen Llyn area. This role will help to train and manage a small team of volunteers to undertake regular, systematic surveys for cetaceans. This will extend the survey to cover all seasons and greatly increase sightings data collection. The team will also be trained in photo-iD and have the ability to undertake photo-iD surveys when Risso's dolphins are sighted during land-based watches.

A lack of information about diet and distribution may be a major knowledge gap that impedes understanding of the principal threats facing the population. The following knowledge gaps must be addressed to fully understand these threats.

- Population size/density
- Distribution – seasonal patterns
- Critical and important habitat
- Year-round diet and energetic requirements
- Consequences of changes in key prey populations
- Population level consequences of low population size and its effects on the sustainability and viability of the animals
- Long- and short-term effects of physical disturbance on the animals
- Long- and short-term effects of acoustic disturbance on the animals
- Range of environmental contaminants to which the animals are exposed, identification of their source and effects on animals, their prey and habitat
- Effects of climate change on prey species and habitat

### Research priorities

In order to fill these data gaps, co-ordinated monitoring and further research needs to be undertaken. It is essential to implement research and monitoring programmes to obtain the scientific information necessary to inform management. It is also important that standardised research methods are used (*i.e.* the UK's Joint Cetacean Protocol, see [www.jncc.gov.uk](http://www.jncc.gov.uk)) so as to enable the comparison of results over time and from one area to another.

As a first step, collaborative work consisting of data sharing/pooling is required. There are a number of groups and individuals working on Risso's dolphins in waters west of the UK: WDCS, Sea Watch Foundation, Manx Whale and Dolphin Watch, Irish Whale and Dolphin Group (IWDG), Sea Trust South Wales, Marine Awareness North Wales and Hebridean Whale and Dolphin Trust (HWDT).

Groups working on a larger geographical scale who are also likely to be able to contribute data include: Euroflukes, Organisation Cetacea (ORCA) and the Biscay Dolphin Research Programme (BDRP).

- These groups need to work together to collate existing sighting data to establish the distribution and abundance of this population.
- Collation of existing photo-iD data from waters west of the UK is also required. This may go some way to establishing a population estimate, and potentially reveal information on habitat use and long-range movement patterns, population dynamics, demographics and association patterns within groups. WDCS currently holds a large number of fin shots of Risso's dolphins around Bardsey Island. These will be catalogued, analysed and will form the basis of a larger database containing all available fin shots for Risso's dolphins.

It is likely that following the collation and analysis of these data, revisions to the Conservation Plan will be required. Workshops would provide opportunities for experts to discuss available evidence with one another and with experts from different disciplines, local stakeholders and managers. This is intended to be a working document and needs to be updated when new information becomes available.

- Whilst the pooled data are being analysed, habitat modelling should also be undertaken to attempt to predict where the Risso's dolphins are likely to be, and the reasons for this.
- Habitat modelling will allow for the identification of critical habitat for the animals.
- The model can then be tested using the pooled data.
- Existing monitoring surveys should be continued and expanded to assess whether distribution and habitat use is seasonal (these include visual and acoustic surveys).
- Results of these surveys should be used to further test and refine the habitat model.
- If the habitat model suggests areas likely to be utilised by the Risso's dolphins that have not yet been investigated, seasonal surveys and monitoring should be undertaken in these areas to assist with evaluation of the model.

A schedule of studies to identify critical habitat is likely to include:

- Year round surveys to identify areas and degrees of occupancy (both visual surveys and acoustic surveys using T-PODs)
- Identification of key feeding areas throughout the year to determine whether they should be identified as critical habitat
- Identification of activities other than foraging that may be important components of critical habitat
- Identification of sources of acoustic disturbance that may negatively impact or affect access to critical habitat
- Identification of sources of physical disturbance that may negatively impact or affect access to critical habitat

- Identification of sources of biological and chemical contaminants that may negatively impact critical habitat
- Identification and mitigation of factors that may negatively affect an adequate and accessible supply of prey in areas of critical habitat
- Development of models of population dynamics and demographics would allow for improved understanding of the population. These models could be tested using data from the photo-iD studies.

Contaminant analysis may allow for the identification of regional differences in exposure. This may then be related to population abundances and trends.

A better understanding of the anthropogenic and naturally occurring factors that regulate or limit Risso's dolphin populations will make it possible to rank threat factors and prioritise recovery actions.

The results of this monitoring strategy are required to define and evaluate the success of the interim indicators and to work towards a quantitative goal.

This monitoring strategy requires close collaboration with a number of cetacean researchers and stakeholders. It is suggested that a Project Co-ordinator be employed to direct efforts and to ensure that work by all groups is complementary. This role would also be responsible for co-ordinating meetings of involved groups and revisions to the Conservation Plan. It is likely that further funding will be required to drive this work forward. The Project Co-ordinator would also take the lead on this. It is anticipated that this monitoring strategy will form part of a collaborative project bid for INTERREG funding to address cetaceans in the Irish and Celtic seas area.

## 9. Conservation goals

This Conservation Plan aims to define the conservation needs of Risso's dolphins in waters west of the UK, identify specific management and research actions necessary to ensure these needs are met, identify research methods to elucidate and mitigate both anthropogenic and natural threats to the Risso's dolphins, and therefore to *ensure the long-term viability of the population*.

Risso's dolphins are top-level predators, and as such will always be less abundant than most other species in their environment. Unfortunately, little is known concerning the historic sizes of Risso's dolphin populations, or the factors that ultimately regulate them.

In light of these inherent characteristics and uncertainties, the following has been identified as an interim measure of recovery success – *the long-term maintenance of a steady or increasing size for the population (currently at known historic maximum level)*.

The overarching goal is *to ensure that this population of Risso's dolphins attain favourable conservation status*<sup>3</sup>. In the context of this Conservation Plan, "favourable conservation status" can be understood to mean that the population needs to be maintained at its current level or higher. Whenever research allows assessment of the extent of past occurrence of Risso's dolphins in waters west of the UK, allowing the animals to regain their entire former range will represent the long-term management objective to be pursued. The species' low intrinsic growth rate means that the time frame for recovery is likely to be more than one generation.

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<sup>3</sup> A broad definition of the term "favourable conservation status" is given in the EU Habitats Directive (Article 1 of the Directive, Annex I): "Conservation status of a species means the sum of the influences acting on the species concerned that may affect the long-term distribution and abundance of its populations within the territory referred to in Article 2. The conservation status of a species will be taken as 'favourable' when: 1) population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats; 2) the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; 3) there is, and will probably continue to be, a sufficiently large habitat to maintain its population on a long-term basis."

This basic management objective and the working definition of “favourable conservation status” on which it is based may be revised at a later stage to account for new findings related to Risso’s dolphin stock discreteness, population size, dynamics and demographics, migratory behaviour etc. As new information becomes available as a result of research actions outlined in this Conservation Plan, more refined and quantitative recovery targets will be defined.

### Conservation objectives and strategies to achieve objectives

There is a need to identify the prime anthropogenic threats affecting this population of Risso’s dolphins, and to then identify objectives that directly address these threats and contribute to the recovery of the population. Actions need to be integrated into comprehensive national management frameworks and programmes.

Given the current knowledge, the prime anthropogenic threats to the long-term survival of Risso’s dolphins appear to be 1) degradation of potential critical habitat, 2) disturbance, and 3) reduced prey availability. Three objectives are identified below that directly address these threats and contribute to achieving the conservation goal of a steady or increasing population size (as stated above). These objectives direct the broad strategies that will be used to specifically mitigate and/or eliminate each of the threats facing Risso’s dolphins and their habitat, and to better address gaps in knowledge.

#### Objective 1

- identify critical habitat for Risso’s dolphins and identify additional important areas for designation and protection

#### Strategies to achieve Objective 1

- develop a year-round comprehensive survey program for Risso’s dolphins (this can also be cost-effectively linked to survey work for other cetaceans)
- identify key feeding areas and other critical habitat of Risso’s dolphins throughout the year
- protect critical habitat areas through assessment and mitigation of human activities that result in contamination, and physical and acoustical disturbance
- ensure that prey are available to Risso’s dolphins in their critical habitat
- ensure trans-boundary cooperation in the identification and protection of critical habitat

#### Objective 2

- ensure that disturbance from human activities does not prevent the recovery of this population of Risso’s dolphins

Both physical and acoustic disturbance from human activities may be key factors causing depletion or preventing recovery of this Risso’s dolphin population.

#### Strategies to achieve Objective 2

- determine the short- and long-term effects of chronic and immediate forms of disturbance (including vessels and noise) on the physiology, foraging and social behaviour of Risso’s dolphins
- determine baseline ambient and anthropogenic noise profiles and monitor sources and changes in the exposure of Risso’s dolphins to underwater noise

- develop and implement regulation, guidelines and other measures, and designate sanctuary areas to reduce or eliminate physical and acoustic disturbance of Risso's dolphins
- develop protocols, regulations, guidelines and/or other measures for the use of underwater seismic surveys and high energy sonar testing

Objective 3

- Ensure that Risso's dolphins have an adequate and accessible food supply to allow recovery

This objective identifies the need to learn more about the year-round diet of Risso's dolphins, and to understand and mitigate the threats to key prey populations and their habitat.

Strategies to achieve Objective 3

- Determine the seasonal and annual diet and energetic requirements of Risso's dolphins
- Identify key prey populations and feeding areas for Risso's dolphins
- Establish long-term monitoring programs capable of detecting changes in the abundance, distribution and quality of Risso's dolphin prey
- Ensure that Risso's dolphin prey populations and their habitat are adequately protected from anthropogenic factors such as exploitation and degradation, including contamination, which will allow for the recovery of Risso's dolphins

These objectives have been prioritised to allow for effective use of available resources. As further information becomes available as a result of research actions outlined in this Conservation Plan, the objectives can be revisited and priorities may be revised.

Evaluation and the status of conservation strategies

The success of these conservation actions should be reviewed annually, and the goal, objectives and broad strategies in this Conservation Plan every two years or as new data become available.

The following are examples of performance indicators that may be used to assess the effectiveness of the objectives and strategies, and to determine whether recovery remains feasible (see Table 2). Detailed performance indicators will be identified more fully during the development of the action plans. Action plans should be completed within 2 years of the establishment of this Conservation Plan.

The time frame for adoption and implementation of this plan is 5 - 10 years. Initial research and collaboration aimed at achieving the identified actions is expected to begin in 2009 (subject to funding) and run for 3 - 5 years. Subject to review, monitoring work should continue beyond 5 years.

**Table 2.** Examples of performance indicators

| Objective   | Strategy                       | Performance indicators  |
|---|--------------------------------|---|
| Conservation goal – <i>ensure the long-term viability of the population</i> | Collate existing sighting data | Completion of integrated database containing all sightings records from waters west of the UK |
|   | Collate existing photo-iD data | Completion of integrated  |

|  |   |   |
|--|---|---|
|  |   | database containing all photo-iD records from waters west of the UK   |
|  | Continue and expand existing surveys  | Data generated on distribution and abundance of Risso's dolphins throughout the year                                    |
|  | Undertake habitat modelling   | Models developed that indicate potential areas of habitat for Risso's dolphins. Models tested using current survey data |
|  | Establish new surveys in potential areas of Risso's dolphin habitat as highlighted by model   | Completed surveys generating new data on Risso's dolphins   |
|  | Develop models of population dynamics and demographics  | Models completed that indicate potential composition of population. This can be tested using sighting and photo-iD data |
| <i>Identification and protection of critical habitat</i>                       | Develop a year-round comprehensive survey program for Risso's dolphins                        | Distribution of Risso's dolphins in waters west of the UK well understood   |
|  | Identify key feeding areas and other critical habitat of Risso's dolphins throughout the year | Prey species of Risso's dolphins in waters west of the UK identified and distribution understood                        |
|  | Protect critical habitat areas through assessment and mitigation of human activities          | Measurable reduction in contamination and disturbance   |
|  | Ensure that prey are available to Risso's dolphins in their critical habitat                  | Key prey populations identified in critical habitat   |
|  | Ensure trans-boundary cooperation in the identification and protection of critical habitat    | Agreement between UK, Ireland and devolved UK administrations on areas of important and critical habitat identified     |
| <i>Ensure that disturbance from human activities does not prevent recovery</i> | Determine the short- and long-term effects of chronic and immediate forms of disturbance      | Studies of boat interactions and disturbance completed  |
|  | Determine baseline ambient and anthropogenic noise profiles and monitor sources               | Completed studies of acoustic profiles of vessels using the waters west of the UK                                       |
|  | Develop measures to reduce  | Established Code of Conduct   |

|   |   |   |
|---|---|---|
|   | or eliminate physical and acoustic disturbance of Risso's dolphins  | for boat-users  |
|   | Develop measures for reducing disturbance from high energy sound sources  | Revised protocols for seismic and military sonar use  |
| <i>Ensure adequate and accessible food supply</i> | Determine seasonal and annual diet and energetic requirements   | Year-round distribution of prey species identified<br><br>Sampling from stranded animals undertaken |
|   | Establish long-term monitoring programs capable of detecting changes in abundance, distribution and quality of prey | Population assessment undertaken for species identified as important prey species                   |
|   | Ensure that prey populations and their habitat are adequately protected from anthropogenic factors                  | Incorporation of Risso's dolphin predation into fisheries management plans                          |

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