The Bottlenose Dolphins Of The Moray Firth: Cetaceans On A Precarious Knife-edge

A little Background

A massive array of wildlife make the Moray Firth their home; including many European Protected Species such as Harbour Porpoise and Minke Whale Otters, Grey Seals, Harbour Seals, seasonal visitors such as Basking Sharks and various Seabirds. However, it is the globally unique Bottlenose Dolphins (Tursiops truncatus) who are the talking point today. These mammals are global giants; growing up to 4m long, twice that of their tropical counterparts! They are the most northerly population in the world, estimated at 200 individuals, having increased 54 % since the 1990s. They have an almost global distribution, only being absent from the poles. Mostly an inshore species, sightings aren't usually beyond 10km from land, but sometimes may be spotted offshore with other cetaceans. Multiples pods totalling hundreds of animals can be sighted off the Irish Atlantic coast, but usually within inshore waters, groups of 25 or less or even single animals are typical. Bottlenose Dolphins are scarce in the Southern North Sea. Current estimates put the overall UK population at less than 600 individuals. In past centuries, the population was considerably higher and widely distributed, in areas where they are now absent, such as the Thames estuary.

They are very intelligent, social, sentient mammals; communicating through echolocation in groups of up to 100 animals. Reproduction is slow and it may take over four years between birthings, which makes this species vulnerable. The two main UK populations are situated in the Moray Firth and Cardigan Bay (Irish Sea). Smaller groups also exist around the UK coast. These populations may range long geographical distances in search for food, breeding and calving grounds. For example between 2009 and 2013, up to 46% of the Scottish East coast population frequented in shallow estuarine waters of the Tay. Similarly, 25% of the same population were found in equally shallow waters between Aberdeen and Stonehaven during the same years. In both instances, animals were observed very close to land, only within 2km of the coastline at depths of 20m or less. A 1997 study demonstrated one extreme case exemplifying the speed at which these dolphins navigate the seas, where an individual travelled 190 km in five days!

In an effort to protect the dolphins a section of the Moray Firth was designated as a special refuge for the species in 2005, as previous surveys indicated that over 50% of the population frequented in a particular area. This area is now designated as an SAC (Special Area of Conservation) under the European Law. The Moray Firth SAC ranges between the Inner Firths to Helmsdale on the north coast and Lossiemouth on the south coast. This is only one of two such protected sites in UK territorial waters, with the other one being located in Cardigan Bay, which has another very significant population of Bottlenose Dolphins (potentially 350 individuals). Cetaceans of all kinds are safeguarded under the European Protected Species (EPS) act and form a long list of species included in the EU Habitats Directive, enforced into UK law since 1994. Under this legislation, it is illegal intentionally or unintentionally injure, disturb, capture or kill these species. SACs are an addition to the Habitats Directive, ensuring extra protection for areas of considerable importance, listed under Annex I or II. The Dolphins are listed under the latter category. Extra care must therefore be taken in SAC areas to ensure the

safety of their constituent species.

“...We have been monitoring dolphins in the Moray Firth SAC for many years and its been wonderful to see stability in their numbers...Dolphin watching is a beloved activity for locals and visitors…It’s great to see a growing Bottlenose Dolphin population on the east coast”. Morven Carruthers, SNH Marine Policy and Advice Officer

A recent 2018 report by the Scottish Natural Heritage (SNH) indicates that despite variability in numbers, the long term trend for the population is stable. Additional monitoring also indicates an increase of the east coast population. The SNH suggest a ‘favourable’ or ‘recovered’ status of the species in the Moray Firth Despite, its isolation and the problems that may ensue as a result. The Aberdeen Harbour area appears to be an important feeding location for Bottlenose Dolphins and is also an important calving site. This area undergoes considerable shipping traffic and dredging activity, so the importance of these waters needs to be re-assessed to see if the SAC needs to expanded in the future. So how is the future looking for these cetaceans?

Is the Future Certain? A Combination of Threats.

The Moray Firth is a particularly busy area, with multiple potential threats to Bottlenose Dolphins such as; oil and gas exploitation and production, marine developments, chemical pollution, fishing gear and various built and proposed renewable developments. These activities are furthering the pressures imposed on this species. Although the designation of the SAC in 2005 was a huge milestone in furthering the protection of Bottlenose Dolphins in the Moray Firth, it only encompasses a small percentage of their entire range and they frequently explore other unprotected haunts along the Scottish East coast.

Worryingly, in circumstances where dolphin pods are forced out of their resident zones, they will usually face competition with other conspecifics (members of the same species) that already inhabit their newly chosen territory or be pushed into less favourable areas. It’s simple, dolphins cannot migrate out of their current residencies in the face of crisis and experience no consequences. This is why in such circumstances, dolphins have been shown to stay in their current residential areas, even when conditions temporarily become very unfavourable.

Marine developments are a cause for concern, particularly from pile driving for wind-turbines. In 2006, two wind turbines were installed off NE Scotland, in deep water, approximately 25km from the Moray Firth SAC, posing a threat to the protected population of Bottle nose Dolphins. Researchers measured pile-driving noise at a distance of 0.1 to 80km and found that these sound levels reached the noise exposure criteria for marine mammals. In the case of Bottlenose Dolphins, auditory injury would only have occurred within 100m of the pile driving but behavioural disturbance as far as 50km away! More recently, a 2014 study near Aberdeen Harbour indicated that current noise levels are not causing behavioural changes or physical damage to the dolphins yet. However since then, a new windfarm has been constructed 3 km from the shore of Aberdeen Bay. The EOWDC generates up to 70% of Aberdeen’s domestic electricity requirements and 23% of the city’s entire electrical demand and is invaluable asset to the city. In the face of climate change and the impending energy crisis, prioritisation of renewables is paramount. However, it is equally important to fully assess renewable impacts on marine life.

Another study from 2018 demonstrated the extremely adverse impacts shipping noise has on cetaceans; causing a reduction in their calling distance, chronic stress (confirmed by hormone analysis), irreversible lung and ear damage, miscarriage of calves and even death of adults. Currently, trials are being undertaken to increase the acoustic detectability of fishing nets and trawls in order to reduce the instances of by-catch. However, such laudable trials come with their own risks, as similar audio devices fitted on nets of salmon farms (designed to deter seals) have been shown to cause negative auditory effects on dolphins, again disrupting their communication and dispersal.

Illegal salmon netting poses a serious threat to dolphins due to entanglement risk; commonly leading to death. Significant numbers of dolphins are caught in pelagic trawls (these target fish such as bass, tuna, mackerel and herring). A recent post-mortem examination of 138 dolphins washed ashore from UK seas confirmed that an alarming 62% of those animals had been killed due to by-catch. Shipping activities such as merchant, recreational, military and seismic enterprises pose threats by physical trauma to the animals (such as collisions and propeller strikes) as well as auditory harm. It is now estimated that between 5 to 13 million tonnes of plastic leak into the planet's oceans annually. Cetaceans can die due consuming plastic bags or after becoming tangled in packaging and nets. Plastic pollution is a rapidly growing, insidious issue, which will only worsen as the human population increases.

Here, Bottlenose Dolphins are a major tourist attraction, generating over £4 million to the local economy. In Scotland as whole, coastal ecotourism contributes £57 million to it's economy and creates approximately 2500 jobs annually and all set to double in the next decade. Whilst this is fantastic news for the people of Scotland and a vital asset to the country's economy, the potential impacts associated with growing ecotourism infrastructure need continuous assessment.

Various anthropogenic enterprises may lead to contamination of the sea via chemical pollution. Organochlorines may impact dolphin reproductive potential or cause suppression of their immune systems. High concentrations of bioaccumulating chemicals have been detected in the tissues of marine mammals. Although not in the Moray Firth, a recent post-mortem study concluded that a dead Bottlenose calf from Cardigan Bay contained one of the highest contaminant contents (including mercury, PCBs and DDT) to have ever been found in any mammal to date. This has adverse conservation implications for all Bottlenose Dolphins and other cetaceans in UK waters.

Climate change is disrupting Bottlenose Dolphin social patterns.

Climate changes is potentially one of the most significant influencing factors in disrupting the social cohesion and organisation of Bottlenose Dolphins according to a 2004 study. It looked at North Atlantic Oscillation (NAO) impacts on Atlantic salmon runs and the subsequent pod sizes of Bottlenose Dolphins in the Moray Firth. The NAO is an annual, irregularly fluctuating atmospheric phenomenon that shifts the positions of high and low pressure in the North Atlantic region. Positive NAOs generally warm the North-eastern Atlantic by allowing low pressure systems originating from the Gulf of Mexico, to bring warm, moist air masses over North West Europe. A strong correlation between Positive NAO years and subsequently smaller salmon stocks (Atlantic Salmon have a preference for cooler water) was observed; causing subsequent reductions in Bottlenose Dolphin pod size as competition for food increased. Whilst the

vacillation between warm and cool NAO conditions is completely natural, climate change may impact the severity of the Oscillation's effects; prolonging conditions of high and low phase (cool and warm). Climate change will continue to pose many uncertainties, as it shifts the ranges of native fish species northwards on which many predators depend.

Genetic research from 2002 found that despite the Moray Firth dolphins being located a considerably large geographical distance from those of cardigan Bay, that they were actually more closely related to them than their neighbours in the Outer Hebrides. The study highlighted a major cause for concern, as it confirmed a very limited gene pool/genetic diversity between individuals within the Moray Firth.Therefore, despite the SNH's study clearing them of instability, due to their limited genetic diversity, this could compromise them in the face of disease and natural selection, because genetically robust populations tend to have a statistically better chance of survival. The dolphins could be at risk of entering the 'extinction vortex', where a vicious cycle consisting genetic instability and selection pressures drive species toward extinction.

An earlier 1997 study, revealed that considerable numbers of dolphins in the Moray Firth exhibited lesions and deformities. A staggering 95% of dolphins had one or more types of lesion, over 61% had three or more and some unfortunate individuals had seven variations of lesion. A worrying 6% of the sampled population showed physical deformities. These findings are a massive cause for concern and whilst the causes for these health issues cannot be indefinitely ruled out as being anthropogenically caused, there is a very good chance that human infrastructure is partly to blame. New research is required to confirm the extent to which humans are responsible for this. Sadly, many argue that not enough is being done to protect the dolphins, despite the overwhelming evidence of threats. This is largely due to the inconclusiveness of this evidence, despite its quantity. This reiterates the need for more research into the impacts of all potential threats.

It's not all bad news!

Organisations such as the WDC (Whale and Dolphin Conservation) are working very hard work to protect dolphins and other constituent species in the Moray Firth. Achieving this by educating the public, conducting and supporting vital research in association with Universities including Aberdeen and St. Andrews. Such research has led to the creation of the Moray Firth's SAC. They also lobby for decision-makers and campaign for better overall protection, as well as conducting their own surveys to gather more information about habitat requirements of Bottlenose Dolphins. This research is then fed to government agencies and often influences legislation. The WDC also form part of the Dolphin Space Programme Steering Group, who collaborate with boat operations in the Moray Firth to guarantee guidelines are within acceptable requirements for dolphins, as well as operating exhibitions and events at their visitor centres to encourage public appreciation for these remarkable and iconic mammals. You yourself can help by adopting a dolphin or by volunteering with the WDC and contribute to their species saving work. For more information, please visit https://uk.whales.org/

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