

The Darwin Mounds: from undiscovered coral to the development of an offshore marine protected area regime

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Abstract

The first offshore Marine Protected Area (MPA) in the United Kingdom (UK) is the Darwin Mounds, an area of *Lophelia pertusa* (Linnaeus, 1758) discovered only in 1998. At the time of its discovery, this was considered to be an exceptional example of *L. pertusa*, growing on a sand base, rather than hard substratum, and exhibiting a distinctive “tail” structure not yet seen elsewhere. Damage to the area caused by deep-water trawling has been observed and in 2003, at the UK’s request, the European Commission imposed a ban on trawling in a 1380 km² area surrounding the Mounds, which became permanent in 2004. This move was made possible by the revised Common Fisheries Policy (CFP) and represents the first EC example of an offshore fisheries closure for nature conservation (rather than fish stocks). Eventually a network of offshore MPAs will be designated throughout the EU’s marine waters, including around the UK. Drawing on a detailed legal and policy analysis and a program of semi-structured interviews with stakeholders, regulators and specialists in the field, this paper explores the unique circumstances and sequence of events that led to the protection of the Darwin Mounds.

Lophelia pertusa (Linnaeus, 1758) has been known to scientists and fishermen for hundreds of years. It is a stony coral (Scleratinia, family Caryophylliidae) found globally, except in polar regions (Fosså, 2002). The rich concentration of biodiversity associated with coral reefs and the slow growth of these ecosystems is well-known (Rogers, 1999; Husebø et al., 2002; Roberts et al., 2003, 2006). Traditionally deep-water reefs were considered good sites for net and long-line fishing. With the advent of bottom-trawling, however, substantial damage to *L. pertusa* reefs has been documented (Fosså et al., 2002; Hall-Spencer et al., 2002; Wheeler et al., 2005), increasing with the development of larger vessels, more powerful trawls and gear specially adapted to reaching areas that were previously inaccessible. A recent study on *L. pertusa* found in Norwegian waters determined that between 30%–50% of their reefs had been damaged or impacted by trawling, with an associated decline in fishing success according to local fishermen (Fosså et al., 2002). Until recently, deep-sea species in European Union waters were off-quota and their exploitation came largely from vessels that had surpassed or did not hold quotas for other commercial species.

The Darwin Mounds area of *L. pertusa* was discovered in May 1998 during a seabed survey conducted for the Atlantic Frontier Environment Network (AFEN), a partnership between the oil industry and UK government agencies including the Department of Trade and Industry (DTI), the Joint Nature Conservation Committee (JNCC) and the Scottish Office Agriculture and Fisheries Department (now the Fisheries Research Services (FRS) agency of the Scottish Executive) (AFEN, 2000; Bett, 2001). AFEN was

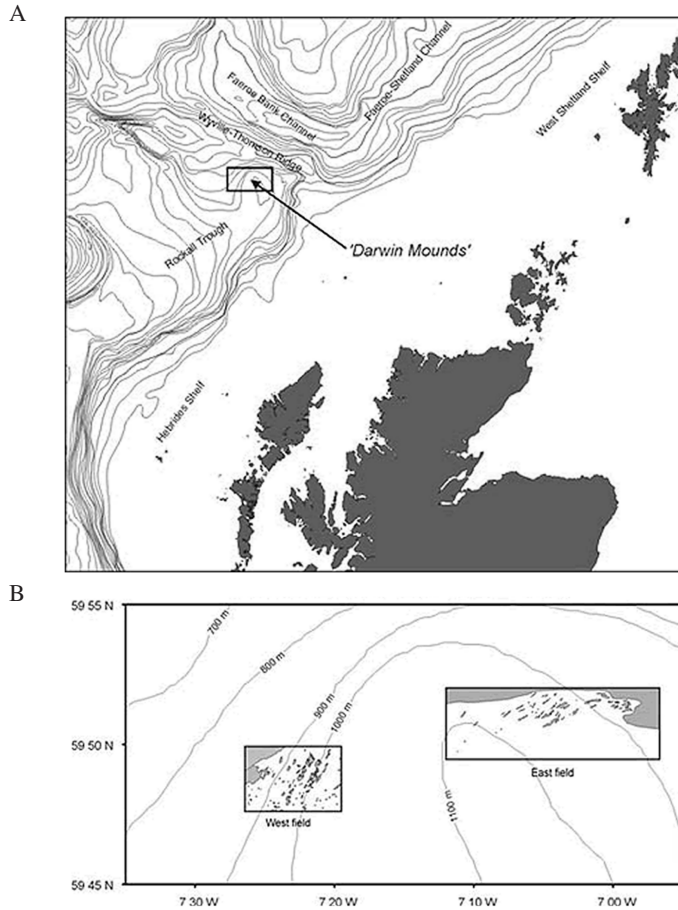
formed in 1995, a period when survey activity north and west of Scotland surged following the discovery of the Foinhaven and Schiehallion oil fields in the early 1990s, with the objective of gaining an environmental baseline for the areas being licensed.

The Mounds lie approximately 185 km to the northwest of Scotland at a depth of around 1000 m, scattered across approximately 1500 km² and supporting significant amounts of *L. pertusa* and associated biodiversity, including sessile or hemi-sessile invertebrates and giant protozoan xenophyophores (*Syringammina fragilissima* Brady, 1883) (Bett, 2001). The hundreds of mounds present in the area are approximately 100 m in diameter and 5 m in height (Bett, 2001). Figures 1A and 1B illustrate their geographical location and distribution. The Darwin Mounds were further investigated in June 1998, August 1999 and twice during the summer of 2000, when evidence of damage from trawling was visible over half of the eastern fields (Wheeler et al., 2001, 2005).

Legal framework.—A primary legal instrument for nature conservation in the European Union (EU) is the 1992 Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora, herein referred to as the Habitats Directive (Council Directive 92/43/EEC). In November 1999, following a Greenpeace Atlantic Frontier campaign to halt offshore oil exploration in UK waters, the English High Court ruled that the European territory to which the Directive applies includes areas over which Member States exercise sovereign rights beyond territorial waters (i.e., beyond 12 nmi). This ruling, commonly referred to as the Greenpeace Judgment, requires the UK to apply the Habitats Directive to the 200 nmi limit of its Exclusive Fishing Zone (EFZ) including the water column and seabed, and other Member States are following suit, designating protected areas under the Habitats Directive [referred to as Special Areas of Conservation (SACs)] in their offshore waters. In addition to its EFZ, the UK also claims jurisdiction over its Continental Shelf, extending up to 340 nmi from the baseline, but covering only the seabed.

As a result of the Greenpeace Judgment, the UK Government is revising its existing national legislation, the 1994 Conservation (Natural Habitats, etc.) Regulations, in order to transpose the Habitats Directive (and its predecessor the 1979 Birds Directive) into UK law in its offshore waters, including not only its EFZ, as stipulated in the Greenpeace Judgment, but the entire UK Continental Shelf. This process has been prolonged but the new regulations are due to come into effect in 2007. Given the total land area of the UK is 244,101 km² and that of its territorial sea is approximately 161,200 km², this extension over the UK Continental Shelf would add an additional 706,200 km², resulting in a total extent of UK area (territorial and offshore waters, and land area) subject to protection of 1,111,501 km² or a 2.74 fold increase in area protected by the UK implementation of the Habitats Directive. See Figure 2 for a map of the UK offshore area, outlining its territorial waters, EFZ and Continental Shelf limits.

The revised Common Fisheries Policy (CFP).—While the Habitats Directive provides an important framework for protecting habitats and species in Europe, the primary mechanism for enforcing areas closed to fishing in the marine environment lies in the revised Common Fisheries Policy (CFP). A complete overview of the process that went into the revision of the CFP is beyond the scope of this paper, however, some key issues can be highlighted in the context of situations where nature conservation and fisheries management overlap. The most recent reform of the CFP began in 1998, resulting in Council Regulation (EC) 2371/2002 (from this point referred to as the Basic Regulation),



Figures 1A and 1B. Location and extent of Darwin Mounds area (adapted from Johnston and Tasker, 2002. Figures courtesy of Brian Bett, National Oceanography Centre, Southampton).

which came into effect on 1 January 2003. The Basic Regulation emphasizes that: “the Community shall apply the precautionary approach in taking measures designed to protect and conserve living aquatic resources, to provide for their sustainable exploitation and to minimize the impact of fishing activities on marine ecosystems. It shall aim at a progressive implementation of an ecosystem-based approach to fisheries management” (Article 2, para. 1).

In order to implement these approaches, the Basic Regulation outlines specific technical measures including recovery and management plans and the establishment of emergency closures. In particular, Article 7 allows for the Commission to apply emergency measures “if there is evidence of a serious threat to the conservation of living aquatic resources, or to the marine eco-system resulting from fishing activities and requiring immediate action”. It was this mechanism that allowed for the initial protection of the Darwin Mounds area.

The Darwin Mounds closure.—The sequence of events that led to the closure of the Darwin Mounds area to bottom-trawling are outlined in Table 1. Following their discovery and the outcome of the Greenpeace Judgment, the Secretary of State for the



Figure 2. The UK offshore area showing the territorial sea, EFZ, and continental shelf Boundaries. (Adapted from and reproduced with permission from the JNCC).

Legend: Land, UK Territorial Seas, UK Continental Shelf area, British fishery limit extent.

Environment and Rural Affairs made a commitment in early 2001 to protect the Darwin Mounds as a SAC under the Habitats Directive. From 1999 to 2001, the UK's Joint Nature Conservation Committee (JNCC) undertook a 2-yr research project to identify offshore marine sites for protection under the Habitats and Birds Directives, resulting in the completion of a comprehensive report on implementing the Directives in UK offshore waters (Johnston et al., 2001). Another relevant report was released by WWF in May 2002, suggesting a management framework for the Darwin Mounds as the UK's first offshore SAC (Gubbay et al., 2002). In addition to the draft Regulations mentioned earlier, in late summer 2003, the Department for the Environment, Food and Rural Affairs (DEFRA) released a consultation document proposing the Darwin Mounds as a candidate Special Area of Conservation under the Habitats Directive (DEFRA, 2003). DEFRA subsequently informed the European Commission that the site will become the UK's first offshore SAC under the Habitats Directive.

While at first glance the closure of the Darwin Mounds area may appear to have been a somewhat quick and straightforward process, taking a relatively short period of time to move from a temporary to permanent ban on bottom-trawling in the area (i.e., 7 mo), it required a careful, step-wise approach on the UK's part with a certain degree of compromise. In October 2002, the UK made its first approach to the European Commis-

Table 1. Timeline of Darwin Mounds MPA Designation.

Date	Action	Outcome
1998 May	Discovery of Darwin Mounds by AFEN survey.	
1999 and 2000	Darwin Mounds revisited, damage visible.	
1999 November	Greenpeace Judgment.	UK required to extend Habitats Directive offshore.
1999–2001	JNCC process established by Defra to identify offshore Natura 2000 sites.	JNCC Report 325: Implementing Natura 2000 in UK Offshore Waters.
2000 July	European Commission requested ICES to provide advice on cold-water corals.	Reports in 2001, 2002, and 2003 on <i>Lophelia</i> in ICES waters.
2001 October	Secretary of State Beckett Announcement.	Publicity.
2002 May	WWF-UK Report on Darwin Mounds SAC.	
2002 October	UK first approached European Commission (EC) regarding protecting area.	Positive indications from Commission.
2002 December	Commission agreed on TACs for deep-sea species in 2003 and 2004.	
2003 January	Revised CFP Regulation 2371/2002 came into effect.	Provided mechanism for emergency closure.
2003 March	UK held informal discussions with EC and other Member States	Compromise on degree and extent of closure.
2003 June	UK made formal approach (in writing) to EC for action under CFP Regulation 2371/2002.	Positive response from Commission.
2003 July	UK made formal request for closure of Darwin Mounds area.	Accepted.
2003 August	Emergency closure (Regulation 1475/2003).	
2003 September	Proposal for permanent Regulation submitted.	
2004 February	Emergency closure extended a further six months (Regulation 263/2004).	
2004 March	Closure made permanent (Regulation 602/2004).	

sion, alerting them to the site and indicating a need for action to be taken, although no mechanism yet existed for implementing a protected area in offshore waters. With the advent of the reformed CFP in 2003, however, a mechanism became available and the UK began informal discussions with the Commission about whether and how to use the emergency closure provisions. As this would be the first use of the mechanism, and as it was the first closure proposed for nature conservation objectives, care was taken by both the UK and the European Commission in order to ensure that the proposal was properly assessed and that no poor precedents would be set, with the UK wanting to be certain the Commission was on board. Consequently, it aimed to provide the most solid case possible for closure based on the best evidence available and recommendations from the JNCC and the International Council for the Exploration of the Sea (ICES) Advisory Committee on Ecosystems (ACE).

The ICES advisory process had begun a bit earlier, in July 2000, when the European Commission made a request for urgent advice “to identify areas where cold-water corals may be affected by fishing” (ICES, 2001). Subsequently, ICES established a Study

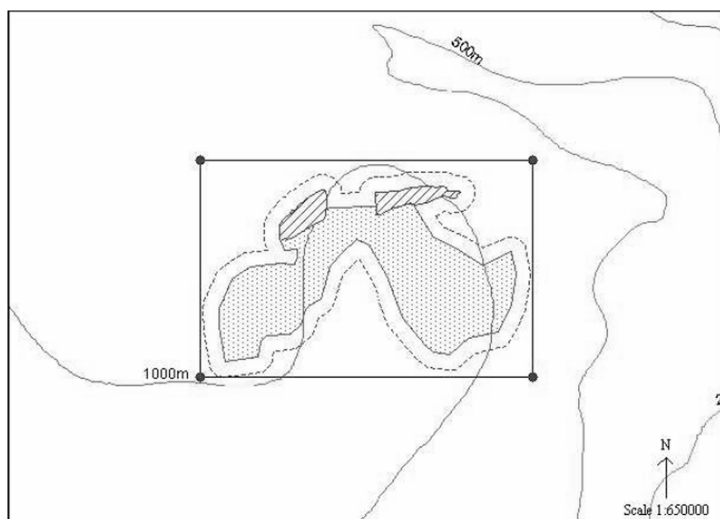





Figure 3. Darwin Mounds closure as recommended by the ICES Advisory Committee on Ecosystems. (Adapted from and reproduced with permission from ICES).

Legend:  Extent of mounds region mapped by AFEN,  limits of interpreted side-scan of Darwin Mounds East and West fields,  possible site boundary generated using simple point coordinates, - - - - 2.2 km margin from region of mounds, ——— bathymetric contour ©GEBCO Digital Atlas, British Oceanographic Data Centre on behalf of IOC and IHO 1994 and 1997

Group on Mapping the Occurrence of Cold Water Corals (SGCOR) which compiled maps identifying cold-water coral areas in the North-East Atlantic. These maps were then circulated to ACE and a selection of working group chairs for comment, in order to enable ICES (through ACE) to provide advice to the European Community (ICES 2001, 2002, 2003).

Concurrent with its aforementioned dialogue with the European Commission in 2003, the UK also pursued informal discussions with other Member States, targeting those with fishing interests in the area (primarily France and Spain) and others supportive of a closure in the area (Ireland and the Netherlands). Following pressure from France, a compromise was made regarding the extent of the area closed: the borders of the original square-shaped ICES ACE recommendation for a closed area around the Darwin Mounds were altered, with the North East and North West corners removed, resulting in a hexagon-shape. Figure 3 shows the original ICES proposal for a closure, which was modified to what is shown in Figure 4, the final area surrounding the Darwin Mounds permanently closed to bottom-trawling. The closed area is slightly larger than the extent of the feature to allow for a “buffer zone” such that trawls cannot accidentally cross the Mounds at the end of their 1.5–2 km long trawl warps. In addition, the area is closed only to bottom-trawling methods of fishing, as there was Spanish interest to keep the area open to pelagic fishing and a complete closure would not have been politically feasible.

The UK continued its step-wise approach to the Commission in subsequent months, with a formal letter expressing their intention to pursue an emergency closure in June 2003 before actually making the formal request on 24 July 2003. No objections were received from other Member States during the 5-d comment period, and a 6-mo emergency closure went forward, under Regulation 1475/2003 of 27 August 2003. This temporary

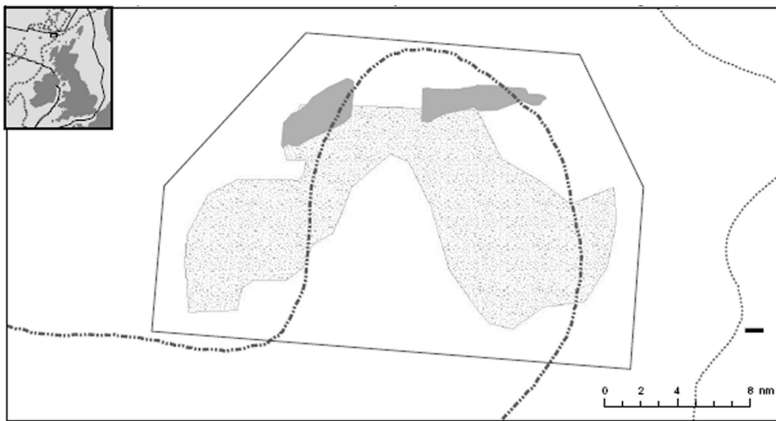


Figure 4. Permanent Darwin Mounds closure. (Adapted from and reproduced with permission from the JNCC).

Legend: East and West fields of dense mounds, extent of mounds, bottom trawling exclusion area, 1000 m isobath. GESCO bathymetry ©NERC 1994, 1997. Darwin Mounds East and West fields and mounds extent courtesy of Dr. Brian Bett, Southampton Oceanography Centre.

closure was extended for a further 6 mo under Regulation 263/2004 of 14 February 2004, during which the UK prepared a proposal for a permanent closure of the area, which involved amending Regulation 850/98 of 30 March 1998 on the conservation of fishery resources through technical measures for the protection of juveniles of marine organisms. The permanent ban on bottom-trawling in the Darwin Mounds area came into effect as Regulation 602/2004 on 22 March 2004, adding the geographical location of the Darwin Mounds area to Article 30 of Regulation 850/98 in its section on restrictions on the uses of demersal towed gears.

Why a success?—In addition to the stepwise approach made by the UK and the compromise made on the degree and extent of the closure during the negotiation process, other external factors provided incentives for the closure to succeed. First, it should be clarified that from a legal standpoint, a bifurcation between nature conservation and fisheries management exists in the European Union. While the former remains the remit of Member States, the European Commission retains exclusive legislative jurisdiction over fisheries. Consequently, when a Member State is faced with a nature conservation issue that results from fishing activity, before the provisions of the Basic Regulation came into effect there was no mechanism available to handle such a situation. As the first use of the revised CFP's emergency closure mechanism, there was an incentive for the Commission to make certain that the Darwin Mounds closure went through. For the UK's part, it was imperative that the most robust case for closure possible be made, and the role played by the JNCC report and ICES ACE recommendations to the European Commission during the negotiations process should not be overlooked. This irrefutability is of particular importance given that Article 7 of the Basic Regulation requires "evidence of a serious threat to the conservation of living aquatic resources" for the Commission to act. The fact that these corals had been revisited and damage from trawling had been clearly visible made a strong case for an immediate closure.

An important factor in their protection was the "uniqueness" of the Darwin Mounds, with their "tail-like" shapes, associated fauna and the fact that the corals had colonized

sandy rather than hard substrate. (At the time of their discovery, the Darwin Mounds were the only example of these characteristics, however since then, similar (though not identical) situations have been found for *L. pertusa* in other areas). In addition, the area under question was relatively small, covering < 1500 km², and lacked the intensive fishing history of other nearby areas containing *L. pertusa*, such as the Rockall Bank. Nevertheless, there was concern on the UK side that fishing in the area could increase in the summer of 2003 following the first allotment of Total Allowable Catch (TAC) quotas for deep-sea fish species released in 2002 (Council Regulation 2340/2002). This threat added further impetus to the UK's efforts to secure a closure as quickly as possible. In addition, momentum was maintained at both the national and European level by the environmental NGO community, notably the WWF with its aforementioned 2002 report on the Darwin Mounds as a potential SAC (Gubbay et al., 2002).

Conclusion: is it a success?—While the closure of the Darwin Mounds area can be viewed as a political success, there are several outstanding issues that need to be addressed. The current method of enforcement relies on Vessel Monitoring Systems (VMS), satellite transmitters that relay a fishing vessel's location back to shore via a Global Positioning System (GPS) satellite network. While theoretically an efficient means of tracking fishing activity, it is only recently that UK fishermen have been required to use VMS boxes without "off" switches, and this requirement is not extended throughout the EU's fishing fleets. In addition, the current system relies on data sent every 2 hrs, a rate that may not be sufficient to detect bottom-trawling activity on the edge of a closed area. For the Darwin Mounds, VMS data is supplemented with aerial surveys by the Scottish Fisheries Protection Agency (SFPA) and enforced by SFPA patrol vessels. From an enforcement point of view, however, the most easily and efficiently protected area is one that is closed to all forms of fishing (Guénette et al., 1998). Given that the closure only applies to bottom trawling, the SFPA have to prove "beyond reasonable doubt" that fishing vessels, whether observed by VMS or by air patrols, were actually trawling the seabed, as pelagic trawling is allowed. The burden of evidence in this respect can be problematic, making successful prosecutions very difficult. Boarding by a fisheries patrol vessel may be the only way to secure successful prosecutions, and this is expensive, dangerous, and logistically challenging. This also calls into question the assumption that VMS will provide for the enforcement of offshore fisheries closures. The enforcement of such protected areas is thus likely to continue to pose major challenges (Jones, 2006). With Member States designating further offshore protected areas in coming years, the question of enforcement must be taken into careful consideration as resources are stretched to meet the difficult requirement of policing areas that are spread over wide areas far from shore. To further complicate enforcement matters, in addition to the anticipated extension of the Habitats Directive over the EFZs of Member States, in 2003 the OSPAR and Helsinki Commissions called for the establishment of an "ecologically coherent network" of MPAs by 2010 in the OSPAR and HELCOM areas (i.e., the Northeast Atlantic and Baltic Sea). This network will include sites already designated as SACs under the Habitats Directive, and will also incorporate marine habitats and species not listed in the Annexes to the Directive. The JNCC released a report (JNCC, 2004) on this initiative, exploring the concept of an "ecologically coherent network" of MPAs, as this concept is not formally defined, and providing several recommendations regarding the design of such a network. From a jurisdictional perspective, the overlap between the OSPAR network and that of Natura 2000 in offshore waters may pose some

tensions with regard to enforcement, as Member States will be required to monitor those areas comprising Natura 2000 under their obligations stemming from the Habitats Directive, while the European Community will be responsible for OSPAR areas under its commitment to the OSPAR Convention. From our research on this area of institutional overlap (De Santo and Jones, 2007), it does not yet seem clear how the latter goal will be achieved. Nevertheless, there is currently a Marine Strategy Directive in development, as well as a Maritime Policy for the European Union, which may harmonize matters—this remains to be seen.

A key issue raised by the case of the Darwin Mounds is the role of the precautionary principle in the CFP. Whereas this principle, in its simplest form, calls for actions to be taken in the face of uncertainty, the Basic Regulation articles on emergency closures require a degree of scientific certainty that may not be available in all situations. With regard to the Darwin Mounds, irrefutable proof of damage from bottom-trawling was a cornerstone in the argument to close the area to fishing. This may not be the case for other areas in need of protection, and one can also argue that such an approach is counter-productive; if evidence of damage to an area of deep-water coral is required to close it to fishing, then what method is available for protecting pristine areas that are at risk of being damaged? Although the closure of the Darwin Mounds is a success in many respects, it also highlights the division between marine nature conservation and fisheries management in the European Union, a legal and political issue that will require resolution in the near future.

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