

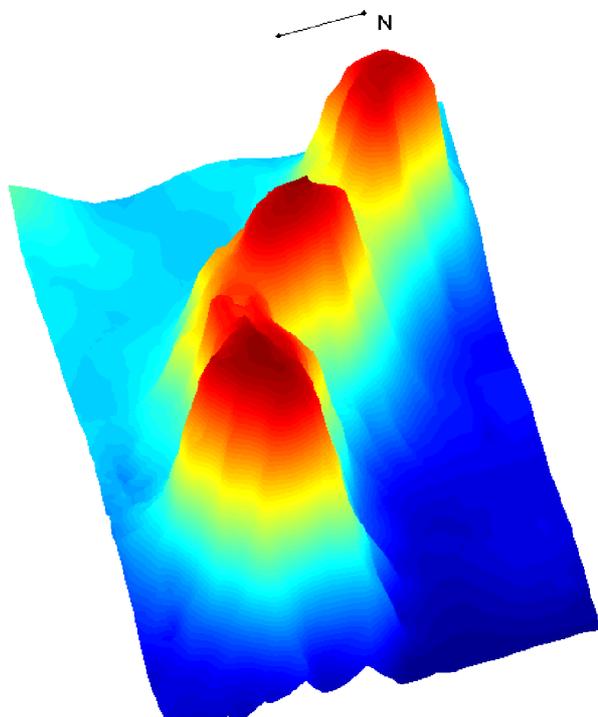
OASIS

Oceanic Seamounts: An Integrated Study
A project funded by the European Commission
Contract No. EVK3-CT-2002-00073-OASIS

Toward the Conservation and Management of the Sedlo Seamount

Para uma Proposta de Gestão para o
Monte Submarino Sedlo

Susan Gubbay



Susan Gubbay:
Toward the Conservation and
Management of the Sedlo Seamount

published by OASIS

© 2005 OASIS

Cover graph: Bathymetric map of
Sedlo Seamount
by I. Bashmachnikov

Contact:
Dr. Bernd Christiansen
Universität Hamburg,
Institut für Hydrobiologie und
Fischereiwissenschaft
Zeiseweg 9
D-22765 Hamburg
Germany
bchristiansen@uni-hamburg.de

Preface

Seamount-associated communities and ecosystems, which are often remote and deep below the ocean surface, but nonetheless within human reach, have proven to be highly vulnerable to the impact of human activities. Globally, seamount and cold water coral habitats and species, which often go along with each other, are considered a priority for developing conservation and sustainable management measures within and beyond national jurisdiction. Apart from the implementation of regulatory controls of sectorial activities for a wider sea area, seamounts may be good candidates for site-based management such as by means of marine protected areas, due to their singularity and isolation. The ultimate goal will be to link a network of seamount marine protected areas into the envisaged global representative network of marine protected areas, as agreed in Johannesburg 2002. However, it is still a long way to go.

In the North-East Atlantic, so far, there are only two seamounts managed as marine protected areas, both in the waters of the Azores. Sedlo Seamount will be the third seamount to benefit from special conservation measures by the Autonomous Regional Government of the Azores which therefore stands out as a „lighthouse“ for its engagement in marine conservation, and for a regional fisheries management aiming at longterm environmental and socioeconomic sustainability. The cooperation and sympathetic awareness of the local fishing industry are also remarkable. Despite a significant reduction of the exclusive regional fishing zone by a recent EU regulation, local fishermen not only support MPAs as conservation tools but they accept a sectoral management which includes fisheries closures like the one proposed for Sedlo, rather than to insist on the exploration and exploitation of new fishing grounds. On the contrary, experimental closures closer to port are desired.

„Towards a Management Plan for Sedlo Seamount“ is a draft management plan which has been prepared as a contribution of the EU-funded project OASIS (Oceanic Seamounts: An Integrated Study) to the work of the Regional Government of the Azores and the University of the Azores on marine biodiversity conservation. The long term purpose of the plan is to provide a framework for the management of activities and interests of the Sedlo Seamount. The proposals presented in the draft management plan need to be examined, refined, and agreed by the Regional Government of the Azores, including a presentation to the European Commission which will need to examine and agree proposals for the management of fisheries under their jurisdiction. However, this MPA proposal should not be viewed in isolation. The envisaged MPA would benefit from being set into the context of a longterm fisheries strategy as well as a biodiversity conservation strategy for the Azores EEZ.

The project OASIS integrates physical, biogeochemical and biological studies to provide a holistic assessment of seamount ecology in the NE Atlantic using two sites as case studies, and to apply the scientific knowledge to developing possible options for sustainable management. „Towards a Management Plan for Sedlo Seamount“ is one of the final products of the OASIS project with regard to the management aspects, following the „Offshore MPA toolbox“ (Schmidt & Christiansen, 2004) which is a more generic tool compiling the most important information relevant for the selection, designation and in particular management of seamounts protected areas in the North-East Atlantic, including a summary of legal issues.

Bernd Christiansen
OASIS project coordinator

Ricardo S. Santos
IMAR/DOP Univ. Azores

Stephan Lutter
WWF

OASIS

Toward the Conservation and
Management of the Sedlo Seamount

Executive Summary

Oceanic Seamounts: An Integrated Study (OASIS), is a project funded by the European Commission (2002-2005) to describe the functioning characteristics of seamount ecosystems. The project is using two seamounts in the North East Atlantic, Sedlo and Seine, as case studies to address five key objectives (work packages);

- (i) Identification and description of the physical forcing mechanisms effecting seamount systems
- (ii) Assessment of the origin, quality and dynamics of particular organic material within the water column and surface sediment at seamounts
- (iii) Description of aspects of the biodiversity and the ecology of seamount biota, to assess their dynamics and the maintenance of their production
- (iv) Modelling of the trophic ecology of seamount ecosystems
- (v) Application of scientific knowledge to practical conservation

This report is a contribution to objective (v) which acknowledges the critical need for the timely input of appropriate scientific advice for the development of marine policy such as the establishment and management of marine protected areas (MPAs). Building on the "Seamounts Report" (Gubbay, 2003) and the "Offshore MPA toolbox" (Schmidt & Christiansen, 2004), it takes the form of a draft management plan for the Sedlo seamount and is intended to illustrate the issues, actions and role of science in the management of seamount ecosystems. It has been prepared as a contribution to the work of the Regional Government of the Azores and the University of the Azores on marine biodiversity conservation. The long term purpose is to provide a framework for the management of activities and interests of the Sedlo seamount.

Seamounts are undersea mountains which are typically cone shaped, rising relatively steeply from the seabed but which do not emerge above the surface. They are a distinct and different environment from much of the deep sea. Their biological resources have been the targets of intensive exploitation, as they include commercially valuable finfish, shellfish and corals. The result has been over-exploitation and major crashes in various stocks on some seamounts. There has also been a massive impact on the benthos of some of the seamounts that have been studied.

Growing awareness of the value and threat to seamounts by various global and regional political fora has resulted

in calls for the protection and management of seamount habitats and their associated biodiversity. The next step is to develop proposals for specific conservation areas (Marine Protected Areas - MPAs) and to present them to the relevant authorities with associated management plans that set out what needs to be achieved and how this might be done. The outline management plan presented in this report undertakes this task for the Sedlo seamount as a case study in seamount conservation and management.

The draft management plan set out in Section 4 is presented in the format being finalised by the Marine Working Group for Natura 2000 for the proposed marine SACs. This is comparable to the format recommended for OSPAR MPAs (OSPAR, 2003-18).

The starting point was a desk study to *review* published information and grey literature relating to Sedlo, mostly relying on the contributions from the scientific investigations during the OASIS project. The initial proposals were circulated to OASIS members for internal review and a revised draft was prepared for wider circulation to key stakeholders as an outline management scheme which could be considered a first draft management plan. The outline management scheme was discussed at a number of meetings with stakeholders held in the Azores during the week of 10-14th October, 2005. Three sectors were targeted: OASIS scientists, representatives of the Regional Government of the Azores, and user groups.

The outline management scheme was revised in light of comments received by stakeholders and edited to form the *management proposals* which are presented in the report. These should be viewed as the start of a process towards the management and conservation of the Sedlo seamount rather than a comprehensive and complete scheme of management.

The Sedlo seamount lies within the 200nm EEZ of Portugal in the autonomous region of the Azores. The legislative authority for establishing a Marine Protected Area around Sedlo therefore lies with the Government of Portugal and the Regional Government of the Azores. The options for legal protection are to establish a regional or national protected area, or designation as a Special Area of Conservation under the EU Habitats & Species Directive. In both cases the MPA could then contribute to the OSPAR network of MPAs.

It can be assumed that the environment is relatively undisturbed as there are few indications of human activity in the area, including a lack of directed demersal seamount fishery, from local as well as foreign vessels.

Given its apparently unspoiled nature, Sedlo may be an ideal representative example of an isolated, steep, basaltic seamount near the Mid Atlantic Ridge.

In view of the characteristics shown in Box 1 and the assumed overall naturalness of the area, the draft management plan proposes to establish a marine protected area with the *overall goal* to “manage human activities around Sedlo in a way that protects its ecosystem function, biodiversity and significance as an unexploited example of a seamount within a network of marine protected areas in the Azores EEZ”.

In consultation with the stakeholders the *boundaries* for a future Sedlo MPA were agreed. The relatively large option chosen included the physical feature of Sedlo as well as the principal area of influence as suggested by modelling of water currents, which might act as a buffer zone. The boundaries are delimited by the following coordinates: 40°40'N, 25°15'W; 40°40'N, 26°29'W; 40°6'N, 27°15'W; 40°6'N 26°29'W. This encloses an area of around 7,040ha (approximately 17,399 acres) and extends across the 100nm zone where the Regional Government of the

Azores has exclusive competence for management of fisheries. The area is entirely within the zone which the European Council have agreed is to exclude any bottom trawling, gill netting and/or trammel netting.

Given the presently low commercial interest, but considering its potential for supporting a deep water fishery, the draft management plan for Sedlo proposes to establish a *strictly protected area* around Sedlo, effectively closing the area to all fisheries. There was no stakeholder support for a multiple use area open to all activities, and a full closure was seen to make enforcement easier. Such a conservation measure could be a model of precautionary management as well as a safeguard against the uncertainty of the area being targeted for commercial fishing in the future.

Research was considered to be essential for reporting on the effects of the MPA and on the success or otherwise of the management measures. Scientific activity was therefore considered acceptable but with an emphasis on non-invasive techniques, invasive techniques being subject to licencing by the MPA management body.

Box 1: Description of the ecosystem characteristics of Sedlo

Sedlo is an example of an isolated detached seamount. It has an elongated shape, rising steeply from a depth of around 2,800m to 750 m in the southeast. The flat-topped topography is very unusual for seamounts around the Azores. The substrate is predominately rocky with some patches of gravel and sediment. Away from the seamount, the base site and far field sites revealed fine sediment habitats.

Studies of localised currents around Sedlo reveal an anticyclonic circulation with observations and modelling suggesting that there may be an enclosed circulation cell (Taylor cap) around each peak. There is also evidence for the deflection of the far field flow around the seamount and a lee side shadow zone with evidence of eddies generated downstream. The current regime will have implications for the benthic fauna. The relatively weak currents at the mid and lower flanks are likely to promote deposition of material or at least not re-suspend settled material. Stronger velocities at the summit might promote a different fauna with bottom currents strong enough to re-suspend seabed material and establish a dynamic bottom flow regime.

Analysis of annual chlorophyll concentrations from 1998-2004 showed seasonally a typical spring and autumn bloom, and inter-annually a high variability over the seamount. In the climatological mean a clear seamount effect can be found. However, no increase in primary production was detected. A typical zooplankton distribution pattern was observed at all sampling dates, independent of daytime, with reduced biomass concentrations in the upper 100 m above the summit of Sedlo Seamount, as compared to the slopes and those stations which were not influenced by the seamount (far field).

Density and composition of the benthic epifaunal community varied with depth and between slopes. The summit community was dominated by chiefly Hexacorallia and sponges. Solitary cup coral (order Scleractinia) is the most abundant coral on the summit. The saddle and gully on the col between the two eastern peaks of Sedlo were characterised by a high diversity of corals (octocorals and Hexacorallia) and sponges. Dense aggregations of soft corals were present in localised areas. Broken and dead coral was present in places, possibly suggesting some disturbance. The bedrock on the steeply sloping NE edge of Sedlo had an unexpectedly low density of corals. On the deep southwest slope, sponges and Anthozoa again dominated the epifauna with sea whips (gorgonians) especially abundant. Ophiuroids (brittle stars) were also present. Animal traces on the sediment surface (lebensspuren) were noticeable.

Sedlo was identified as an important reproductive zone for orange roughy, slender Alfonsino and Cardinal fish, all three deep water, seamount-associated species of commercial importance/potential. Thirty species of fish were collected over the seamount, including some new descriptions for the area, which together represent 14 % of all fish species recorded for the Azores.

Species sighted within an 80 nm² area around Sedlo between 1998-2004 include fin whale (*Balaenoptera physalus*), sperm whale (*Physeter macrocephalus*), common dolphin (*Delphinus delphis*) and bottlenose dolphin (*Tursiops truncatus*). Seabird sightings from the area include Cory's shearwater (*Calonectris diomedea borealis*) and great shearwater (*Puffinus gravis*)

Providing information and raising awareness about Sedlo will be essential to its successful management. *Stakeholders* are interested in the ecological effects of such a closed area and therefore transparency is the key to gaining their longterm support for this and other MPAs in the Azores. Regular monitoring of biological parameters is as vital for the credibility of the management arrangements as a good surveillance and enforcement programme.

Designation, review and reporting of MPAs in the Azores EEZ falls within the remit of the Environment Directorate, however, a multi-agency group should be set up to be the overseeing management committee for the MPA, in which a wide range of stakeholders should be represented.

While the majority of proposed management measures (see Table 4) require the introduction of some *regulations* these requirements could be brought together into a few key statutes as part of the designation of the MPA by the Regional Government of the Azores. Regulation of fishing activity beyond the 100nm zone will require separate provisions from the European Commission and possibly ICAAT.

The draft management proposals presented need to be examined, refined, and agreed by the Regional Government of the Azores, including a presentation to the European Commission which will need to examine and agree proposals for the management of fisheries under their jurisdiction. The

option for Sedlo to have international recognition as part of the *Natura 2000* protected area network or OSPAR MPA network should also be considered.

Stakeholder participation is essential at all stages of the MPA process from site selection through to day to day management of activities within and around any MPA. Some initial work has been done with stakeholders as part of this project, bringing the issue of a potential MPA at Sedlo to the attention of regional stakeholders and starting discussion of the detail of possible management measures. It is important to build on these initial contacts and discussions, reaching out to a wider audience and establishing a pattern of dissemination of information, collaboration and feedback. A clear message from the initial steps of consultation is that there is not only support for the principle of Marine Protected Areas in the Azores, but also for this type of management measure to be taken forward at Sedlo. Equally important is the view that the MPA proposals should not be viewed in isolation but rather that they would benefit from being set into the context of a fisheries strategy as well as a biodiversity conservation strategy for the Azores EEZ.

OASIS

Toward the Conservation and
Management of the Sedlo Seamount

Prefácio

Nas profundezas do oceano, mas ao alcance do homem, os montes submarinos e as suas comunidades associadas têm provado ser altamente vulneráveis à actividade humana. À escala global, os montes submarinos, os seus habitats e espécies, como por exemplo os corais de profundidade, são já uma prioridade para a conservação e gestão sustentável, quer dentro quer fora de zonas de jurisdição nacional. Para além da implementação de regulamentações de actividades sectoriais para uma área mais alargada, os montes submarinos podem ser bons candidatos para uma gestão espacial e localizada, enquanto áreas protegidas marinhas, devido à sua singularidade e isolamento. O objectivo final será o de ligar uma rede de montes submarinos protegidos a uma rede global de áreas protegidas marinhas, de acordo com o acordado em Joanesburgo 2002. Contudo, existe ainda um longo caminho a percorrer.

No Atlântico Nordeste, apenas dois montes submarinos são considerados áreas protegidas marinhas, ambos nas águas dos Açores. O Monte Submarino Sedlo será o terceiro, também nos Açores, a beneficiar de medidas especiais de conservação. Por este motivo, o Governo da Região Autónoma dos Açores, destaca-se como „farol“ pelo seu empenhamento na conservação marinha e por levar a cabo uma gestão regional das pescas que tem como objectivo uma sustentabilidade ambiental e socioeconómica a longo prazo. A cooperação e a consciência solidária da indústria de pescas local são também de realçar. Apesar de uma redução significativa da zona exclusiva regional de pescas decretada, recentemente, pela União Europeia, os pescadores locais apoiam a criação de APMs como instrumentos de conservação e aceitam a proibição das pescas em algumas dessas zonas, tal como o proposto para o Sedlo. Os pescadores vão mais longe ao sugerir que são desejáveis encerramentos experimentais de locais de pesca perto de costa.

“*Para uma Proposta de Gestão para o Monte Submarino Sedlo*” é um protótipo de plano de gestão preparado como uma contribuição do projecto OASIS, com o apoio da União Europeia (Montes Submarinos Oceânicos: Um Estudo Integrado), para o trabalho do Governo Regional dos Açores e da Universidade dos Açores sobre a conservação da biodiversidade marinha. O objectivo a longo prazo deste plano é o de servir de base de trabalho para a gestão de actividades e interesses do Monte Submarino Sedlo. As propostas apresentadas no plano serão futuramente examinadas, discutidas, aperfeiçoadas e aprovadas pelo Governo Regional dos Açores, e terão que ser posteriormente apresentadas à União Europeia que necessita de examinar e aprovar as propostas para a gestão das pescas sob sua jurisdição. Contudo esta proposta de AMP não deve ser vista em isolado, mas sim no contexto de uma estratégia a longo prazo de gestão das pescarias e de conservação da biodiversidade marinha na ZEE Açoriana.

O projecto OASIS foca áreas de investigação diversas como a física, a biogeoquímica e a biologia, integrando-as de forma a obter-se uma avaliação holística da ecologia dos montes submarinos no Atlântico NE, usando dois sítios alvo de estudo e para aplicação de conhecimento científico de modo a implementar possíveis opções para um desenvolvimento sustentável. “*Para uma Proposta de Gestão para o Monte Submarino Sedlo*” é um dos produtos finais do projecto OASIS no que respeita os aspectos da gestão, seguindo o „Offshore MPA toolbox“ (Smidt & Christiansen, 2004) que é uma ferramenta mais genérica, que compila a informação pertinente mais importante para a selecção, designação e, em especial, a gestão das áreas protegidas dos montes submarinos no Atlântico Nordeste, incluindo uma síntese das questões jurídicas.

Bernd Christiansen
Coordenador projecto OASIS

Ricardo S. Santos
IMAR/DOP Univ. Açores

Stephan Lutter
WWF

Síntese

Montes Submarinos Oceânicos: Um Estudo Integrado (OASIS) é um projecto apoiado pela Comissão Europeia (2002-2005) para descrever as características principais do funcionamento dos ecossistemas dos montes submarinos. O projecto baseia-se em dois montes submarinos no Atlântico Nordeste, o Sedlo e o Seine, como alvo de estudo para abordar cinco objectivos importantes (conjunto de tarefas);

- (i) Identificação e descrição dos processos oceanográficos físicos que se geram em torno dos montes submarinos e que afectam o seu ecossistemas
- (ii) Avaliação da origem, qualidade e dinâmica da matéria orgânica particulada existente na coluna de água e nos sedimentos dos montes submarinos
- (iii) Descrição de aspectos relacionados com a biodiversidade e ecologia do biota dos montes submarinos, para avaliar a sua dinâmica e manutenção da sua produtividade
- (iv) Modelação da ecologia trófica dos ecossistemas dos montes submarinos
- (v) Aplicação do conhecimento científico à conservação de montes submarinos

Este relatório é um contributo para se atingir o objectivo (v), que reconhece a necessidade vital da contribuição científica para o desenvolvimento de uma política de gestão marinha adequada, e que pode incluir a criação e gestão de áreas marinhas protegidas (AMPs). Tendo por base o "Seamount Report" (Gubbay, 2003) e o "Off-shore MPAs toolbox" (Schmidt & Christiansen, 2004), este relatório toma a forma de um protótipo de plano de gestão para o monte submarino Sedlo e tem como objectivo alertar para as problemáticas relacionadas com estes ecossistemas, bem como as sugerir acções para a sua gestão e demonstrar o papel que ciência pode desempenhar para se atingir este objectivo. Este relatório é um contributo para o trabalho que o Governo Regional dos Açores e a Universidade dos Açores estão a desenvolver sobre a conservação da biodiversidade marinha. O objectivo a longo prazo deste protótipo é fornecer um enquadramento para a gestão das actividades e interesses do monte submarino Sedlo.

Os montes submarinos são montanhas subaquáticas, normalmente de aspecto cónico, que se erguem de forma íngreme, no fundo dos oceanos e que têm o seu cume abaixo da superfície da água. Os ecossistemas que albergam são únicos e bastante distintos dos que se encontram em oceano aberto. Os seus recursos biológicos incluem espécies comercialmente valiosas como o peixes, moluscos e corais e, por isso, têm sido alvo de intensiva exploração. O resultado tem sido uma sobre-exploração dos vários recursos e o colapso de vários mananciais em alguns montes submarinos espalhados pelo mundo. O impacto das actividades humanas tem, também, afectado

as comunidade bentónica dos montes submarinos, ricas em corais de profundidade e outros organismos de uma grande longevidade.

Uma consciência cada vez maior do "valor" dos montes submarinos e das ameaças que enfrentam, por parte dos vários fóruns políticos regionais e mundiais, resultaram em recomendações para a protecção e gestão dos habitats dos montes submarinos e da biodiversidade a eles associada. O passo seguinte desenvolver propostas para áreas específicas de conservação (Áreas Marinhas Protegidas – AMPs) e apresent-las às autoridades competentes com os respectivos planos de gestão que estabelecem os objectivos dessas AMPs e o modo de os atingir. O projecto do plano de gestão apresentado neste relatório refere-se ao monte submarino Sedlo como objecto de estudo no que refere a conservação e gestão dos montes submarinos.

O projecto do plano de gestão constante na Secção 4 está apresentado no formato a ser finalizado pela Rede Natura 2000 para as Zonas Especiais de Conservação, ZECs. É comparável ao formato recomendado para as AMPs da Convenção para a Protecção do Atlântico Nordeste (Convenção OSPAR, 2003-18).

O ponto de partida para este plano foi um estudo aprofundado do conhecimento existente sobre o monte submarino Sedlo, através da avaliação de informação publicada na literatura, nomeadamente as contribuições das investigações científicas do projecto OASIS. As propostas iniciais circularam pelos membros do projecto OASIS para uma avaliação e discussão. A versão revista pelos membros do projecto, foi amplamente distribuída pelos principais utilizadores e interessados no monte Sedlo. Esta versão, que pode ser considerado o primeiro protótipo do plano de gestão, continha as linhas gerais de possíveis esquemas de gestão para o monte submarino Sedlo. Estas linhas gerais do esquema de gestão foram discutidas em inúmeras reuniões com utilizadores e outros sectores interessados, realizadas nos Açores durante a semana de 10-14 de Outubro de 2005. Os sectores visados nestas reuniões foram: os cientistas do OASIS, representantes do Governo Regional dos Açores e grupos de utilizadores do monte Sedlo.

As linhas gerais do esquema de gestão foram revistas de acordo com os comentários recebidos pelos interessados e coordenadas de modo a constituírem as *propostas de gestão* que são apresentadas neste relatório. Estas devem ser consideradas o início de um processo que visa a gestão e conservação do monte submarino Sedlo, mais do que um esquema de gestão completo e abrangente.

O monte submarino Sedlo fica situado dentro das 200 milhas náuticas da ZEE de Portugal, na Região Au-

tónoma dos Açores. Assim, a autoridade legislativa para o estabelecimento de Áreas Marinhas Protegidas é o Governo da República Portuguesa e o Governo Regional dos Açores. As opções para protecção legal são: 1) estabelecer uma área nacional ou regional protegida, ou 2) a designação de Zona Especial de Conservação, de acordo com a directiva da UE relativa aos Habitats e Espécies. Em ambos os casos, a AMP podia contribuir para a rede OSPAR de AMPs.

Pensa-se que o monte submarino Sedlo está relativamente prístino pois existem poucos registos e vestígios de actividade humana, incluindo a ausência de pesca demersal quer de embarcações regionais ou estrangeiros. Dada a sua natureza aparentemente não deteriorada, o Sedlo pode ser o exemplo ideal de um monte submarino isolado, íngreme e basáltico junto à Dorsal Médio-Atlântica.

Devido a estas características e ao suposto estado prístino da área, o projecto de plano de gestão propõe estabelecer uma área marinha protegida com o *objectivo geral* de “controlar a actividade humana em redor do Sedlo, de modo a proteger o ecossistema, a biodiversidade e importância, como um exemplo de um monte submarino não-explorado dentro de uma rede de áreas marinhas protegidas na ZEE dos Açores”.

Numa consulta aos interessados, estes princípios básicos foram aceites e foram acordadas as *fronteiras* da futura AMP do Sedlo. A opção escolhida, relativamente vasta, teve em conta as características físicas do Sedlo bem como sua área de influência, de acordo com o modelo das correntes marinhas, que podem funcionar como zona tampão. As fronteiras estão limitadas pelas seguintes coordenadas: 40°40'N, 25°15'O; 40°40'N, 26°29'O;

Box 1: Descrição das características do ecossistema do Sedlo

O Sedlo é um excelente exemplo de um monte submarino isolado e destacado. Tem uma forma alongada, elevando-se abruptamente de uma profundidade de cerca de 2800 metros até aos 750 m. O topo aplanado deste monte, é uma topografia pouco usual nos montes submarinos dos Açores. O substrato é predominantemente rochoso com algumas zonas de seixos e sedimento. Na base do monte submarino e em zonas afastadas do monte, o substrato é constituído por sedimento fino.

Estudos das correntes existentes em torno do Sedlo revelam uma circulação anticiclónica. Algumas observações *in situ* bem como alguns modelos matemáticos que foram desenvolvidos sugerem ainda a existência de uma célula de circulação fechada (conhecida por coluna de Taylor) em redor de cada um dos cumes. Existem também indicações de deflexão da corrente distante à volta do monte submarino e uma zona de sombra no lado de sotavento com remoinhos formados a jusante. O regime de correntes observado terá algumas implicações para a fauna bentónica. As correntes relativamente fracas nos flancos médio e inferior ajudam à deposição de matéria orgânica ou, pelo menos, que a matéria aí depositada não fique entre em resuspensão. As zonas de corrente mais aceleradas, como por exemplo no cume, podem desenvolver uma fauna bentónica diferente, isto porque as correntes de fundo vão provocar a resuspensão da matéria orgânica, que assim fica disponível para a fauna que aí habita.

As análises de concentração de clorofila *a* durante o período 1998-2004 demonstram a existência de blooms de produtividade sazonais, na Primavera e Outono. Estas séries temporais, demonstram ainda a existência de uma grande variabilidade inter-anual nos valores de clorofila *a* do monte submarino Sedlo. Em termos gerais, o efeito de monte submarino é claramente observado. Contudo, não foi detectado nenhum aumento da produção primária ou da concentração de clorofila *a* em seu redor. Foi observado um padrão típico na distribuição de zooplâncton em todas as datas da amostragem, independentemente da hora do dia, com concentrações de biomassa reduzidas nos 100 m acima do cume do monte submarino Sedlo, em

comparação com as vertentes e as estações que não eram influenciadas pelo monte submarino (distantes).

A densidade e composição da comunidade bentónica epifaunal variam com a profundidade e entre vertentes. A comunidade do cume era dominada principalmente por Hexacorallia e esponjas. O coral-taça solitário (ordem das Scleratinia) é o coral mais abundante no cume. A sela e a ravina na garganta entre os dois cumes orientais do Sedlo foram caracterizados por uma grande diversidade de corais (octocorais (“corais macios”) e Hexacorallia) e esponjas. Deu-se conta da existência de grandes agregações de corais macios em áreas específicas. A existência de corais danificados e mortos sugere, possivelmente, alguma perturbação. O substrato rochoso na vertente inclinada da crista NE do Sedlo revelou a existência de uma inesperada baixa densidade de corais. Na vertente sudoeste profunda, esponjas e Anthozoa dominam a epifauna, com chicotes do mar (gorgónias) especialmente abundantes. Também foram observados ofiuróides (estrelas do mar) e foram visíveis vestígios de animais na superfície do sedimento (lebenspurren).

O Sedlo foi identificado como importante zona reprodutiva de peixe-relógio, alfonsim e escamuda. Estas três espécies de peixe são de águas profundas, estão associadas a montes submarinos e possuem grande importância comercial. No monte Sedlo, foram identificadas cerca de trinta espécies de peixe, sendo que alguns dos registos são novos para a região. Estas trinta espécies representam 14% de todas as espécies de peixe conhecidas para os Açores.

Foram avistadas algumas espécies à superfície, dentro das 80 milhas² em redor do Sedlo. Durante o período entre 1998-2004 foram avistadas algumas espécies de cetáceos: baleia comum (*Balaenoptera physalus*), cachalote (*Physeter macrocephalus*), golfinho-comum (*Delphinus delphis*) e roaz (*Tursiops truncatus*). As aves avistadas em redor do Sedlo foram: o cagarro (*Calonectris (Diomedea) borealis*) e a pardela de bico preto (*Puffinus gravis*).

40°6'N, 27°15'O; 40°6'N 26°29'O. Estes limites rodeiam uma área de cerca de 7,040ha (aproximadamente 17,399 acres) e estende-se pela zona das 100 milhas náuticas onde o Governo Regional dos Açores tem a competência exclusiva da gestão das pescas. A área está inteiramente dentro da zona onde o Conselho Europeu concordou excluir qualquer pesca de arrasto, rede de emalhar e/ou tresmalho.

Dado o presente baixo interesse comercial, mas considerando o seu potencial para suportar pescarias de profundidade, o projecto do plano de gestão para o Sedlo propõe o estabelecimento de uma *área estritamente protegida* em redor do Sedlo, fechando, efectivamente, a área a todo e qualquer tipo de pescaria. Não houve apoio dos interessados para uma área que fosse aberta a algumas actividades, e o completo encerramento foi considerado o meio mais fácil para a aplicação prática. Esta medida de conservação poderia ser um modelo de gestão precaucionária bem como uma salvaguarda contra a incerteza de a área vir a ser alvo de pesca comercial no futuro.

A *investigação* foi considerada essencial por permitir avaliar os efeitos da AMP e o sucesso ou não das suas medidas de gestão. A actividade científica foi, por isso, considerada aceitável mas dando ênfase às técnicas não-invasivas, estando estas sujeitas a licenciamento pelos órgãos de gestão da AMP.

A divulgação de informação e uma consciencialização cada vez maior sobre a importância do Sedlo serão essenciais para o sucesso das medidas de gestão. *Os interessados* estão empenhados em verificar os efeitos ecológicos desta área fechada e por isso, a transparência na sua gestão é a chave para se obter o seu apoio a longo prazo, para esta e outras AMPs nos Açores. A monitorização regular dos parâmetros biológicos é tão vital para a credibilidade dos acordos de gestão como uma boa vigilância e aplicação do programa.

A designação, reavaliação e relato de AMPs na ZEE dos Açores estão sob a alçada da Direcção Regional do Ambiente, contudo, um grupo multi-institucional deverá ser

constituído para supervisionar a comissão de gestão para a AMP, na qual um vasto leque de interessados devem estar representados.

Embora a maioria das medidas de gestão propostas (ver Quadro 4) exija a introdução de alguma *regulamentação*, estas podem ser efectuadas pelo Governo Regional dos Açores como parte da designação da AMP do Sedlo. A regulamentação da actividade pesqueira para além da zona das 100 milhas náuticas irão exigir disposições legais próprias da Comissão Europeia e possivelmente da ICAAT.

As propostas do projecto de plano de gestão apresentadas, necessitam de ser examinadas, aperfeiçoadas e aprovadas pelo Governo Regional dos Açores. Têm, também, que ser apresentadas à União Europeia que necessita de examinar e aprovar as propostas relacionadas com gestão das pescas sob sua jurisdição. Deve também ser considerada a opção de que o Sedlo tenha reconhecimento internacional como parte da rede de áreas protegidas Natura 2000 ou da rede OSPAR para as AMPs.

A participação de utilizadores e interessados em todas as fases do processo da AMP é essencial, desde a selecção do sítio até à gestão quotidiana de actividades. Algum do trabalho inicial com os grupos de interessados no Sedlo foi realizado durante o projecto OASIS, o que colocou a questão de uma potencial AMP no Sedlo na agenda do dia e favoreceu o início da discussão das possíveis medidas de gestão. É importante cimentar estes contactos e discussões iniciais, alargando-os a um público mais vasto e estabelecendo um padrão de divulgação da informação, colaboração e reacções. Uma mensagem deixada clara nos passos iniciais da consulta é que não existe apenas o apoio no "princípio" das Áreas Marinhas Protegidas dos Açores, mas também existe o apoio efectivo para a criação da AMP do Sedlo.. Igualmente importante é a perspectiva de que as propostas de AMP não devem ser vistas isoladamente, mas antes deverão beneficiar se forem colocadas no contexto da estratégia de pescas, e da estratégia de conservação da biodiversidade para a ZEE dos Açores.

Acknowledgements

I would like to thank to the OASIS team for allowing me access to their research results, help with interpreting the findings for the draft management plan, and constructive comments on the proposals in this report. My thanks also for access to POPA (ORPAM: InterReg/FEDER) and CEPROPESCA (IFADAP/FEDER), the Turtle-by-catch experiment (IMAR and NOAA/NMFS) and Programa Minimo (RAA/FEDER) data bases which are held at IMAR and DOP.

Stakeholder views were essential in helping to draft ideas for the management of a Sedlo MPA. I would therefore like to thank all those who took part in the October workshops for their valuable contributions and interest in the project, especially the Regional Directorate of Fisheries of the Azores, the Sub-Secretary of Fisheries (Mr. Marcelo Pamplo-na) and the representatives of fisheries organizations and industry.

My thanks also to the staff and researchers at the DOP, University of the Azores for organising the stakeholder work-shops, giving feedback on the draft plan and providing computer graphics.

Special thanks are due to Ricardo Serrão Santos, Sabine Christiansen, Gui Menezes, Telmo Morato and Bernd Chris-tiansen for their support and guidance in developing this work and bringing it to fruition.

This report was prepared under contract for OASIS. OASIS is a research project supported by the European Com-mission under the Fifth Framework Programme and contributing to the implementation of the Key Action “Sustain-able Marine Ecosystems” within the Energy, Environment and Sustainable Development, Contract n°: EVK3-CT-2002-00073-OASIS

Table of Contents

1. Background	1
2. Introduction	3
3. Methodology	5
4. Draft Management Plan for a proposed Sedlo Marine Protected Area	7
4.1 Introduction	7
4.1.1 Purpose & scope of plan	7
4.1.2 Legislative authority for the plan	7
4.2.1 Regional setting: location & access	9
4.2.2 Conservation status of the site	9
4.2.3 Resources	9
<i>Physical</i>	9
<i>Benthic habitats</i>	10
<i>Water masses</i>	11
<i>Particulate Organic Matter</i>	12
<i>Biological</i>	13
<i>Cultural</i>	17
4.2.4 Existing uses	17
<i>Scientific Research</i>	17
<i>Commercial fisheries</i>	17
4.2.5 Existing legal & management framework	19
4.2.6 Existing & potential threats and implications for management	21
4.2.7 Existing gaps of knowledge	21
4.3 Management Plan	23
4.3.1 Goals & objectives	23
4.3.2 Management tactics	23
<i>Boundaries & zoning</i>	23
<i>Regulations</i>	27
<i>Education and public awareness</i>	27
4.3.3 Administration	27
4.3.4 Surveillance & enforcement	27
4.3.5 Monitoring & evaluation of plan effectiveness	28
4.3.6 Timetable for implementation	29
5. Concluding comments	31
<i>Bibliography</i>	33
<i>Appendix 1</i>	
Participants Attending OASIS Project Workshop, 12-13th October, 2005, Horta	A1
<i>Appendix 2</i>	
Participants Attending General Stakeholder Workshop, 14th October, 2005, Horta.	A2
<i>Appendix 3</i>	
Stakeholder consultations on the draft management plan: 2nd OASIS/DOP/WWF stakeholder workshop	A3

OASIS

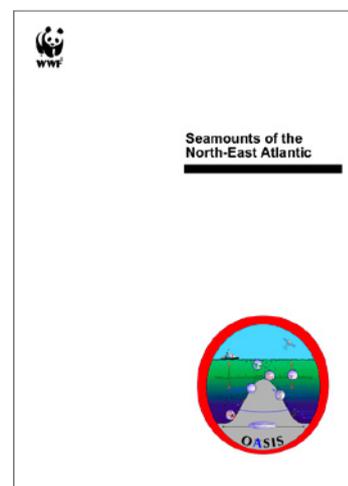
Toward the Conservation and
Management of the Sedlo Seamount

1. Background

Oceanic Seamounts: An Integrated Study (OASIS), is a project funded by the European Commission to describe the functioning characteristics of seamount ecosystems. The project is using two seamounts in the North East Atlantic, Sedlo and Seine, as case studies to address five key objectives;

- (i) Identification and description of the physical forcing mechanisms effecting seamount systems
- (ii) Assessment of the origin, quality and dynamics of particular organic material within the water column and surface sediment at seamounts
- (iii) Description of aspects of the biodiversity and the ecology of seamount biota, to assess their dynamics and the maintenance of their production
- (iv) Modelling of the trophic ecology of seamount ecosystems
- (v) Application of scientific knowledge to practical conservation

This report is a contribution to objective V which acknowledges the critical need for the timely input of appropriate scientific advice for the development of marine policy such as the establishment and management of marine protected areas (MPAs). Building on the "Seamounts Report" (Gubbay, 2003) and the "Offshore MPA toolbox" (Schmidt & Christiansen, 2004), it takes the form of a draft management plan for the Sedlo seamount and is intended to illustrate the issues, actions and role of science in the management of seamount ecosystems.



2. Introduction

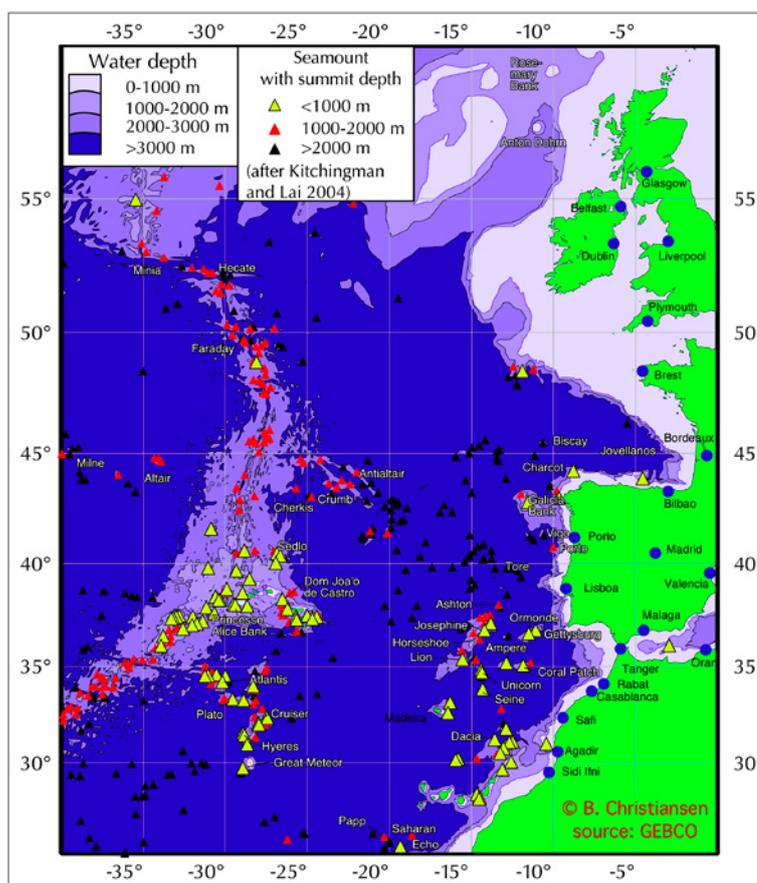
Seamounts are undersea mountains which are typically cone shaped, rising relatively steeply from the seabed but which do not emerge above the surface. They are a distinct and different environment from much of the deep sea. Their steep slopes, which are often current-swept, and the predominance of hard exposed rock surfaces provide a marked contrast to the characteristically flat and sediment-covered abyssal plain.

The biological resources of seamounts have been the targets of intensive exploitation, as they include commercially valuable finfish, shellfish and corals. The result has been over-exploitation and major crashes in various stocks on some seamounts. There has also been a massive impact on the benthos of some of the seamounts that have been studied (eg. Collie *et al.* 2000; Koslow *et al.* 2000; Watson & Morato 2004).

Growing awareness of the value and threat to seamounts has resulted in calls for the protection and management of seamount habitats and their associated biodiversity (eg. Santos *et al.*, 1995; Gjerde & Breide, 2003; OSPAR, 2004). Seamount conservation has been discussed at the United Nations General Assembly and its advisory body the United Nations Informal Consultative Process on Oceans and Law of the Sea (UNICPOLOS). This led to the adoption of a resolution in 2004 calling for States and Regional Fisheries Management Organisations to “*take action urgently to address the impact of destructive fishing practices, including bottom-trawling that has adverse impacts on vulnerable marine ecosystems, including seamounts, hydrothermal vents and cold water corals located beyond national jurisdiction.*”

The Convention on Biological Diversity has designated seamount and cold water coral conservation as priorities; seamounts are one the habitat types which will form part of the network of marine protected areas being promoted by the OSPAR Convention; and these features are also likely to form part of the Natura 2000 network of protected areas which is being established by Member States of the European Commission.

The next step is to develop proposals for specific MPAs and to present them to the relevant authorities with associated management plans that set out what needs to be achieved and how this might be done. The outline management plan presented in this report undertakes this task for the Sedlo seamount as a case study in seamount conservation and management.



Seamounts in the NE Atlantic, compiled after Kitchingman and Lai 2004

3. Methodology

The draft management plan set out in Section 4 is presented in the format being finalised by the Marine Working Group for Natura 2000 for the proposed marine SACs¹. This is comparable to the format recommended for OSPAR MPAs (OSPAR, 2003-18). Steps in the process of preparing this draft management plan are summarised in Figure 1.

The starting point was a desk study to *review* published information and grey literature relating to Sedlo. This was heavily reliant on data drawn from the OASIS archive and therefore on work undertaken during the OASIS project, but was supplemented with other information where available. The principal OASIS references were cruise reports, project reports and newsletters.

The initial proposals were circulated to OASIS members for internal review and a revised draft, taking account of their comments was prepared for wider circulation to key stakeholders as an *outline management scheme* which could be considered a first draft management plan.

The outline management scheme was discussed at a number of meetings with stakeholders held in the Azores during the week of 10-14th October, 2005 building on the OASIS stakeholder workshop held in April 2004. Three sectors were targeted: OASIS scientists, representatives of the Regional Government of the Azores, and user groups. The approach and objectives of these stakeholder consultations is summarised in Table 1.

The outline management scheme was revised in light of comments received by stakeholders and edited to form the *management proposals* which are presented in this report. These should be viewed as the start of a process towards the management and conservation of the Sedlo seamount rather than a comprehensive and complete scheme of management. The draft proposals need to be examined, refined, and agreed by the Regional Government of the Azores and necessary supporting work undertaken, such as the drafting of legislation and other measures for implementation. The option for Sedlo to have international recognition as part of the *Natura 2000* protected area network or OSPAR MPA network should also be considered. These future steps and an indicative timetable is presented in Section 4.3.6 of this report.

Finally, it is important to stress that proposals should not be viewed in isolation but rather that they need to be set into the context of a biodiversity conservation strategy for the Azores EEZ and other related strategies such as fisheries.

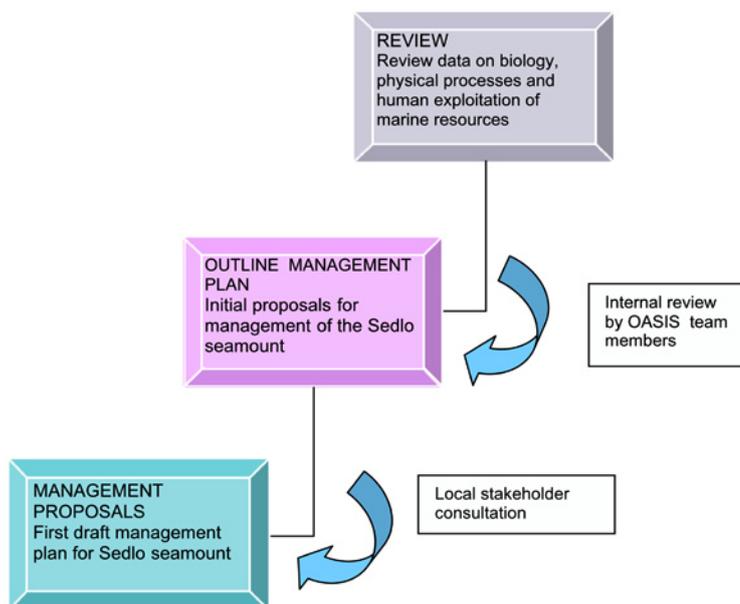


Figure 1: Steps in the preparation of management proposals for the Sedlo Seamount under the OASIS project.

¹ European Commission in cooperation with Natura 2000 Marine Working Group. Guidelines. Natura 2000 network in the marine environment. Application of the Habitats and Birds Directives. Working draft May 2005

Table 1: Consultations undertaken as part of the OASIS project

Stakeholder group	Key objectives	Process
OASIS & other scientists.	<ul style="list-style-type: none"> To ensure a key group of stakeholders are informed and involved in the process. To ensure accurate interpretation and use of the scientific data To discuss possible boundary options for a Sedlo MPA, developed in light of research findings to date. To identify any supplementary data sources 	Presentation followed by discussion as part of OASIS team meeting 12 -13 October (see Appendix 1 for attendance list).
Officials from the Regional Government of the Azores and of user groups	<ul style="list-style-type: none"> To ensure a key group of stakeholders are informed and involved in the process. To explain & promote the idea of a management plan for Sedlo To get feedback on initial proposals for a Sedlo MPA especially in relation to potential objectives, existing and potential activities in the area, boundary options and management proposals. To identify any supplementary information 	Meeting with stakeholder representatives from the Regional Government of the Azores, user groups and other interested parties. (Representations of the central Government of Portugal were invited but could not be present.) Meeting held in Portuguese. Presentation followed by discussion session using a questionnaire to structure and record feedback. 14 th October. (see Appendix 1 for attendance list)

4. *Draft Management Plan for a proposed Sedlo Marine Protected Area*

4.1 Introduction

4.1.1 Purpose & scope of plan

This draft management plan has been prepared as a contribution to the work of the Regional Government of the Azores and the University of the Azores on marine biodiversity conservation. The aim is to use scientific data to inform the management of the marine biodiversity interest of Sedlo and its surrounding waters and to illustrate the sorts of management measures that may be targeted at activities taking place around seamounts. The long term purpose is to provide a framework for the management of activities and interests of the Sedlo seamount.

Purpose e3 scope of plan

4.1.2 Legislative authority for the plan

The Sedlo seamount lies within the 200 nm EEZ of Portugal in the autonomous region of the Azores. The legislative authority for establishing a Marine Protected Area around Sedlo therefore lies with the Government of Portugal and the Regional Government of the Azores. There are two main legal frameworks under which this might be achieved;

Legislative authority for the plan

- Designation as a Special Area of Conservation under the EU Habitats & Species Directive (92/43/EEC). Seamount habitats have been proposed for protection under this Directive within the category of “reefs”. Once proposed sites have been approved by the European Commission for the relevant biogeographic region (in the case of waters around the Azores this is the Macronesian biogeographic region) they become ‘Sites of Community Importance (SCI)’. Portuguese law “DL no.140/99, gives automatic protection to all SCIs. The Macaronesian list of SCIs was agreed by the European Commission in 2002 however it has been kept open for additional sites in light of further knowledge and research with respect to the habitat category of “reefs”.
- A Marine Protected Area designated by the Regional Government of the Azores (see DL 19/93 of 23rd January – adapted to the Autonomous region of the Azores by DLR 21/93/A of 23rd December and amended by DL 227/98 of 17th July). This requires regulations specific to the site, such as that issued for the Formigas & Dollabarat Bank Nature reserve in the Azores (DLR 26/2003/A, 27th May) and expected to be regulated until May 2006.

The site may also be designated as an OSPAR MPA especially as seamounts are included in the OSPAR list of threatened and declining habitats and species for which action is needed. There is no additional legislative authority for OSPAR MPAs at present, therefore within the national territory of the Azores such MPAs will need to be established under the legal frameworks described above.

Supporting legislation will be required especially in relation to the management of fisheries within a potential MPA for Sedlo. The existing legal regime for this is described below in Section 4.2.5.

4.2 Description of the site and its features

4.2.1 Regional setting: location & access

Sedlo seamount is located in the North East Atlantic, in the Azorean sub-area of the Portuguese EEZ, at 40°25' N, 26°55' W. In terms of biogeography, this is within the Macaronesian shelves; Azores subprovince. The nearest land is the Azorean island of Graciosa which lies approximately 180 km south west of Sedlo.

4.2.2 Conservation status of the site

The OASIS study has provided a wealth of information about Sedlo as a result of the intensive three year research programme. This is now one of the better studied seamounts in the region as well as having a scientific basis for the development of management proposals. The short time period of study does however mean that there is limited temporal information making it difficult to discuss any changes in the Sedlo ecosystem in recent decades. There does however appear to be very little human activity in the area, with no directed seamount fishery and no indication of any other exploitative activities focused on or around the seamount. Russian trawlers are known to have been operating along the Mid-Atlantic Ridge and close to the Azores in the 1970s, before the establishment of the Azorean EEZ, however no details are available to determine whether Sedlo was one of the areas targeted. Under these circumstances it is reasonable to assume that the environment is relatively undisturbed. In terms of conservation status, Sedlo is therefore likely have a high degree of naturalness.

Seamount classifications are still being developed but once these are agreed is it likely that representative examples of different types of seamount will be included in networks of Marine Protected Areas. Given its apparently unspoilt nature, Sedlo may be an ideal representative example of a particular type of seamount.

4.2.3 Resources

The following description of the resources of the Sedlo seamount is largely based on the findings of the European Commission funded OASIS project. As the work is on going, many of the findings are still in the grey literature of cruise reports and project progress reports. A bibliography of useful references is provided at the end of this report and it is expected that many of the findings will be reported in scientific journals in due course.

Physical

The dominant physical seabed feature in this part of the North-East Atlantic is the Mid-Atlantic Ridge (MAR). The archipelago of the Azores lies across the MAR in a region known as the triple junction, where the American, Eurasian and African

Regional setting: location & access

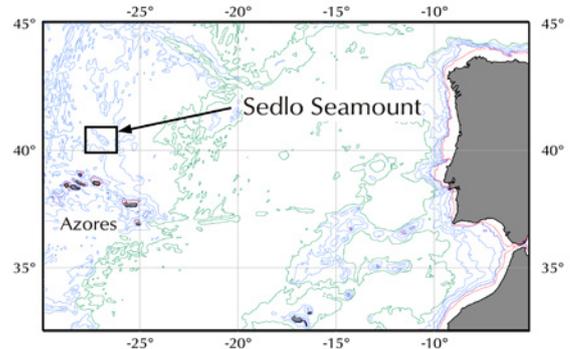


Figure 2: The location of Sedlo seamount in relation in the Azores and mainland Portugal.

Conservation status of the site

Resources

Resources: Physical

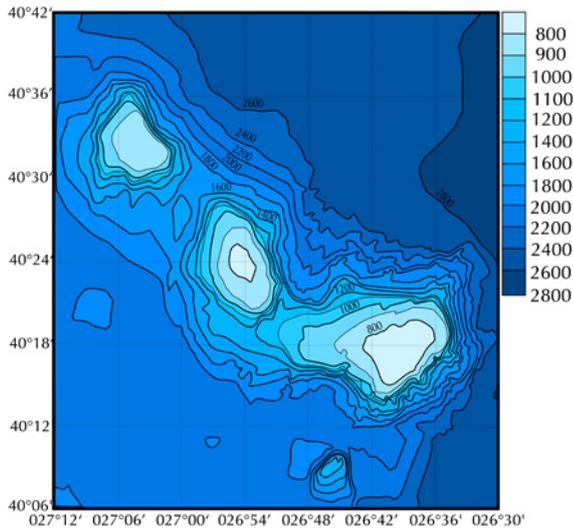


Figure 3: Bathymetry of Sedlo seamount

plates meet. The Sedlo seamount lies to the north of the central group of islands of the Azores archipelago.

Sedlo is an example of an isolated detached seamount. It has an elongated shape, approximately 75 km long and 30 km at its widest point, with three peaks, rising steeply from a depth of around 2,800 m (Figure 3). The shallowest part is over the south eastern peak where the depth is around 750 m. The flat-topped topography at this depth is very unusual for seamounts around the Azores.

Benthic habitats

Benthic habitat types were examined during the OASIS project using video and photography transects at stations around the east summit of Sedlo, the saddle region between the east and middle summit, and three sites to the south east of the seamount (Figure 4). A five point classification scale was used to describe the different benthic habitat types.

Resources: Benthic habitats

1. Sediment
2. Gravel, coarse sediment, or sediment and cobbles/boulders
3. Cobbles, or sediment and bedrock
4. Boulders or bedrock protruding through sediment overlay
5. Bedrock, or predominately bedrock

All stations on Sedlo were predominately rocky with some patches of gravel and sediment. Away from the seamount, the base site and far field sites revealed fine sediment habitats (Figure 5).

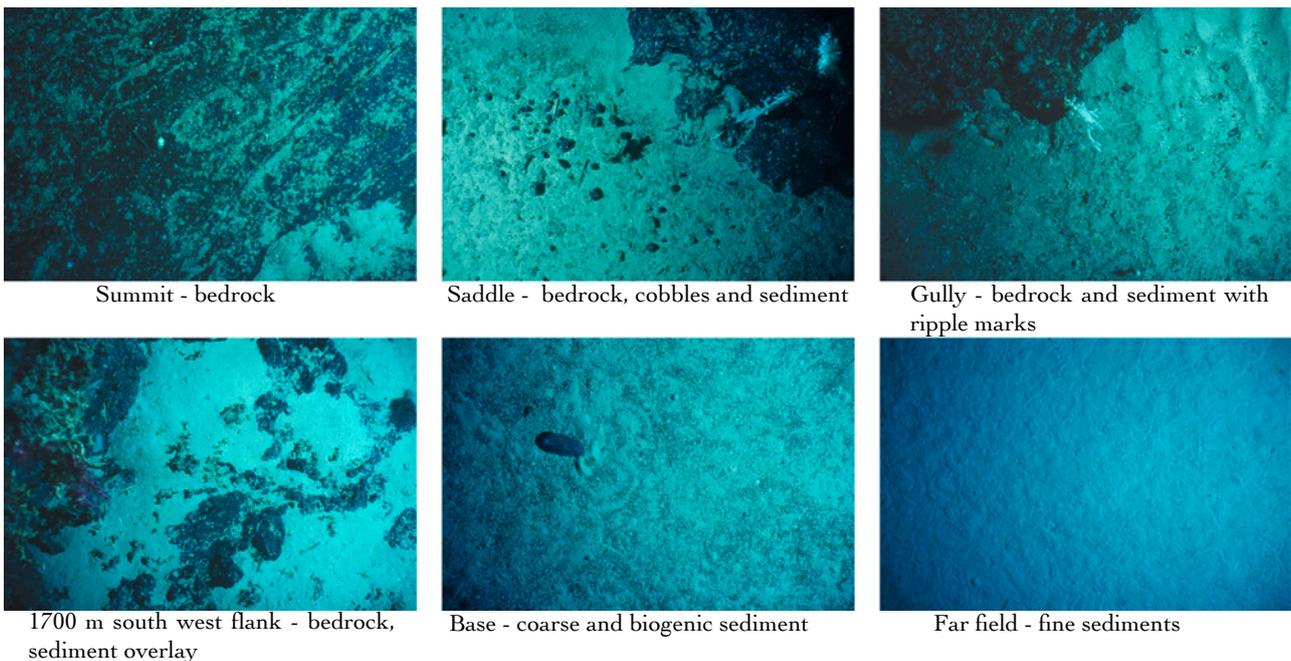


Figure 4: Examples of benthic habitats photographed on and around Sedlo

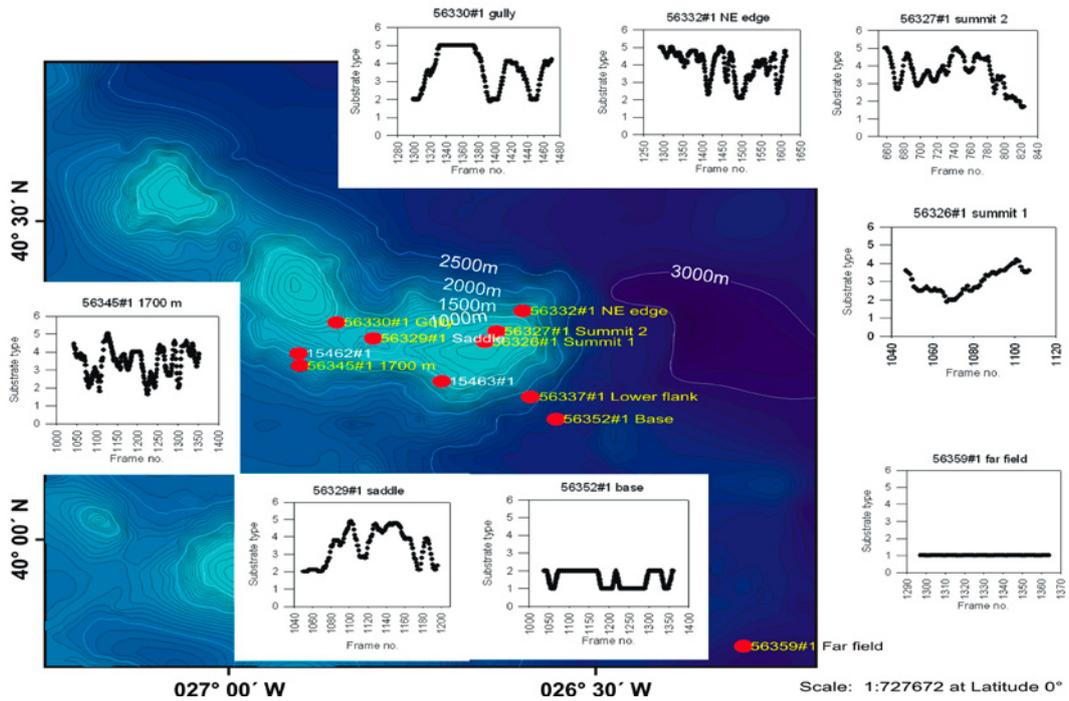


Figure 5: Map of Sedlo station positions and substrate type

Water masses

Sedlo is located in the sub-tropical North East Atlantic basin and is affected by the water masses which dominate different depth zones in this part of the Atlantic. The upper layers (<650 m) are influenced by North Atlantic Central Water, while at intermediate depths there is a weak and patchy influence of Mediterranean Water and some evidence of Sub-Arctic Intermediate Water. Currents around the seamount mix the Mediterranean Water so that although it is present to the east of the seamount, the characteristics typical of this water mass are weak although observable just a few miles to the west of the seamount. Depth regions greater than 1600 m are dominated by Labrador Sea Water.

The seamount and its associated fauna are also influenced by impinging far field currents. Sedlo lies within a weak and variable flow between the Azores current and the North Atlantic current originating from a branch of the Gulf Stream recirculation. The dominant influence changes with the seasons. The surface flow is mostly from the northern quadrant during winter and spring and from the west and south-west in summer. In the autumn there is a weak flow from the west. Superimposed on these patterns is significant variability in direction and strength on timescales of weeks to months.

Studies of more localised currents around Sedlo reveal an anti-cyclonic circulation with observations and modelling suggesting that there may be an enclosed circulation cell (Taylor cap) around each peak (Figure 6). There is also evidence for the deflection of the far field flow around the seamount and a lee side shadow zone with evidence of eddies generated downstream. Some amplification of tidal flows over the seamount has been recorded although comparatively weak. The flow is bottom

Resources: Water masses

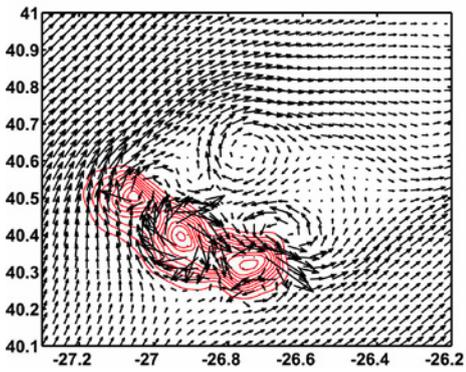


Figure 6: Modelled currents at 850 m depth

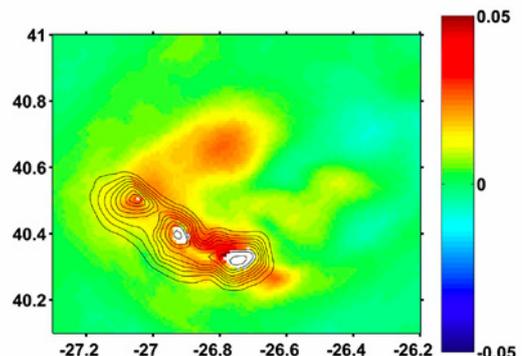


Figure 7: Density distribution and circulation at 850 m depth

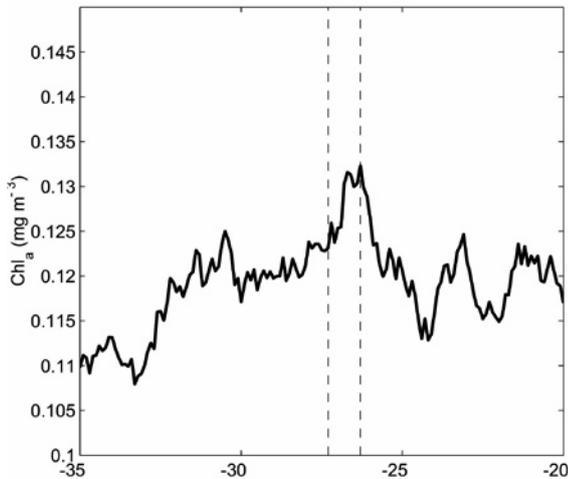


Figure 8: Distribution of Chlorophyll a at Sedlo Seamount: climatological mean for August

Resources: Particulate Organic Matter

intensified with a maximum at summit depths and weakens towards the surface and along the deeper flanks.

The current regime will have implications for the benthic fauna. The relatively weak currents at the mid and lower flanks are likely to promote deposition of material or at least not re-suspend settled material. Stronger velocities at the summit might promote a different fauna with bottom currents strong enough to re-suspend seabed material and establish a dynamic bottom flow regime.

Data on salinity and temperature were collected during OASIS cruises from sampling stations at different depths around Sedlo. These provide evidence of the formation of a dome of cold, less saline, dense waters (isopycnal doming) with highest density water recorded over the peaks (Figure 7). Sea surface temperature in the vicinity of Sedlo increases from March/April to August and decreases thereafter. Satellite imagery data showed a diurnal annual temperature mean of 18°C in 2001 and 17.8°C in 2002. There was also seasonal variation in chlorophyll, typical of spring and autumn blooms around the seamount. Analysis of annual chlorophyll concentrations from 1998-2004 showed a high inter-annual variability over the seamount and a strong patchiness of chlorophyll levels of the same scale around the seamount. However, a clear seamount effect can be found in the climatological mean (Figure 8).

Particulate Organic Matter

Marine particulate organic matter (POM) is the main food source for many deep ocean ecosystems, therefore determination of its quality and supply is important. Seamounts have the potential to alter the nature of POM transport as they impinge on currents and may induce upwelling and/or anticyclonic circulation that can concentrate and retain material around them.

In Sedlo in particular, suspended particulate organic carbon (POC) concentrations at the base of the mixed layer (50 m depth) are similar between its summit and flanks (1-4 $\mu\text{moles L}^{-1}$), usually being higher in the summer. This is not surprising because the summit at ~750 m, does not penetrate into the mixed layer and is therefore not expected to influence particulate organic matter productivity close to the surface. Certain lipid molecules such as poly-unsaturated fatty acids (PUFAs) are used to infer POM sources (biomarkers) and as proxies for its quality (more PUFAs = high POM quality). These labile compounds indicate that dinoflagellates are an important component of the phytoplankton in the area but their distributions are similar in all sampled stations at 50 m water depth, including one far field station, and their concentrations do not show an enrichment above the summit at this depth (indeed they are more abundant away from the seamount).

On the other hand although sPOC and lipid concentrations show a typical open ocean decreasing profile with depth, PUFAs still comprise a significant proportion of lipids right above

the seamount summit (~750 m only in summer) and in the trough area between the peaks at 800 m and few metres above the bottom. This shows that, although sPOM concentrations are low at these depths, their quality remains high when compared with sPOM from similar depths at the flanks and away from the seamount. This may reflect the mode of sPOM transport in these areas. There is the potential of retaining high OM quality, but it is not clear whether this involves differential vertical transport (there is some evidence for Taylor column formation in Sedlo) or lateral advection of “fresh” organic material from neighbouring areas. Organic contributions from benthic and/or benthopelagic organisms (e.g. fish or zooplankton eggs) can not be ruled out either. Regardless the source of this enrichment at depth, its occurrence is important as it may provide benthic and benthopelagic ecosystems in these areas with a rich food source.

Biological

Primary Productivity

The net community production (Pn) gives an estimate of the amount of organic carbon available to be exported to the ocean interior and/or used by higher trophic levels. The lowest Pn values (negative values) and the highest community respiration (Rd) values were measured during winter time. The highest value for Pn was registered at the surface, during summer, between the two south eastern peaks. An increase in Pn values was found at south-eastern flank and south off Sedlo. The gross community production (Pg) depends mostly on Rd. The ratio between the primary production and plankton respiration is at metabolic balance in the most part of the stations sampled. There is no clear increase in primary production over Sedlo, in fact, this data are comparable to values from open-ocean oligotrophic regions.

Zooplankton

Net sampling and acoustic techniques were used to study the zooplankton communities around Sedlo, and their possible interactions with the topography of the seamount. The hydroacoustic surveys were performed with a 38 kHz Acoustic Doppler Current Profiler (ADCP). Low frequencies like 38 kHz register mainly organisms larger than 2 cm like fish larvae, fish and bigger crustaceans. The records showed continuous daily migration patterns in the vicinity of the seamount (Figure 9). During the night, enhanced densities were found close to the surface, whereas at daytime part of the scatterers moved down to 300-400 m and dispersed in deeper water layers, respectively.

The net samples were conducted in discrete layers with a 1 m² Double-MOCNESS (Multiple opening and closing net and

Resources: Biological

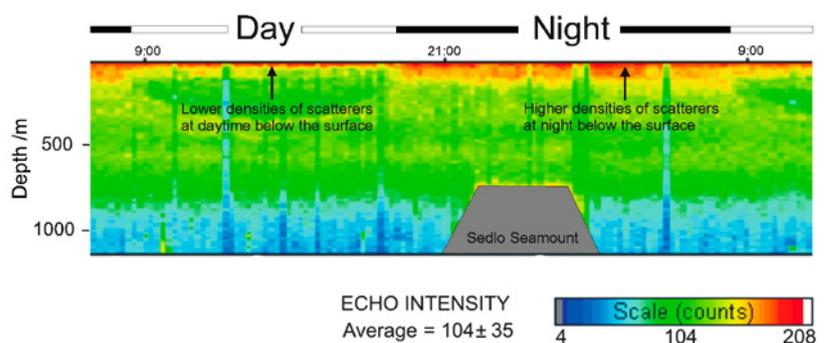


Figure 9: Time series (33 h 44 min) of sound scattering in the vicinity and above Sedlo Seamount during autumn 2003, recorded with a 38 kHz ADCP

environmental sensing system) with 20 nets, mesh size 333 μm . Most of the animals caught by this gear were crustaceans smaller 2 cm, mainly copepods. The size class larger than 2 cm consisted of fish, crustaceans like decapods and mysids, and chaetognaths.

A diel migration of the animals smaller 2 cm was not clearly recognisable in the net catches but the distribution of bigger organism shows a diel pattern with higher densities near the surface at night, and at 600-1000 m during the day. However, an analysis of the biomass of organisms > 2 cm indicates that part of the bigger animals migrate to the upper 200 m at night.

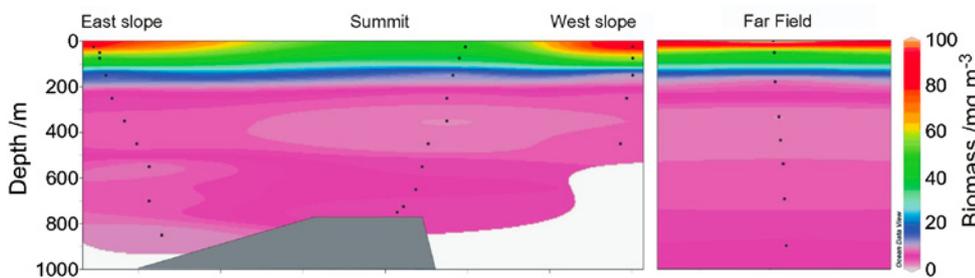


Figure 10: Zooplankton biomass of organisms <2 cm above Sedlo Seamount (left) and at the far field station (right) in autumn 2003. The black dots represent the average sample depth of a net.

A prominent distribution pattern was observed at all sampling dates, independent of daytime, with reduced biomass concentrations in the upper 100m above the summit of Sedlo Seamount, as compared to the slopes and those

stations which were not influenced by the seamount (far field). Figure 10 shows an example of the biomass concentration in autumn 2003, including data from several night hauls.

Table 2: Standing stock (biomass) of zooplankton < 2 cm

	Sedlo summit	Sedlo Far Field
Autumn 2003	107 g m⁻² upper 750 m, day/night average	134 g m⁻² upper 1000 m, day/night average
Summer 2004	25 g m⁻² upper 700 m, day	78 g m⁻² upper 1000 m, night

Consequently, the total standing stock of organisms smaller 2 cm was lower above the summit than at the far field station in both seasons, with a generally lower biomass in summer than in autumn (Table. 2). The reason for the reduced biomass above the summit is not yet clear. Predation by the seamount fish fauna or an influence of seamount-induced currents could be possible explanations.

Benthic macrofauna

Benthic habitats and the associated fauna on and around Sedlo have been described using information collected by video and photography transects at eleven stations.

The main (east) summit of Sedlo seamount, investigated in a depth range of 730-770 m, was rocky with cobbles and boulders in places. The rocky habitat was covered with a thin layer of coarse sediment. The build up of thicker layers of sediment in this area may be prevented by current flow. On the summit, the benthic epifaunal community was dominated by sessile megabenthos (chiefly Hexacorallia [anemones and true corals] and sponges). Solitary cup coral (order Scleractinia) is the most abundant coral on the summit. Some giant protozoans (xenophyophores) were found at one of the summit stations.

The saddle and gully are located on the col between the two eastern peaks of Sedlo seamount. Here the habitat was rocky with some cobbles and patches of coarse and biogenous (biogenic) sediment. Some ripple marks in the sediment indicated

the presence of strong currents over the col. Sessile forms dominated the megabenthos and the diversity of corals (octocorals and Hexacorallia) and sponges was high. Dense aggregations of soft corals were present in localised areas. Broken and dead coral was present in places, possibly suggesting some disturbance.

On the steeply sloping NE edge of Sedlo at a depth of around 1000 m, the habitat was composed of bedrock covered by coarse and biogenic sediments. The megabenthos was dominated by sessile sponges. Coral density was unexpectedly low, although corals are usually associated with the habitat type found at this location.

On the south west side of Sedlo seamount, the habitat down the slope at a depth of around 1700 m was composed of bedrock with patches of fine sediments. Sessile megabenthos (sponges and Anthozoa) again dominated the epifauna with sea whips (gorgonians) especially abundant. Ophiuroids (brittle stars) were also present. Animal traces on the sediment surface (lebensspuren) were noticeable.

Stations at the base and further away from the seamount, in the depth range of 2720-2790 m were almost exclusively covered in fine sediments like the surrounding abyssal plains. These sediment habitats were very low in epifaunal abundance when compared to other sites on the seamount. The megafauna was dominated by motile (or errant) holothurians. Enteropneust worms and their associated enigmatic spiral traces occurred only near the base of the seamount. In terms of visible epifaunal megabenthos, the far field site furthest from Sedlo was the least diverse of all sites. High densities of lebensspuren occur at this site indicating a low current environment.

The mean density of epifauna for all sites on Sedlo was around 4100 individuals per hectare (ind. ha⁻¹). The total abundance of fauna differed among stations, with the base and far field sites having much lower faunal densities than the sites on the seamount (Figure 11).

There were large differences in faunal abundance according to habitat types with the areas of cobbles, or sediment and bedrock; boulders or bedrock protruding from sediment; and areas of predominantly bedrock, supporting almost six times as much epifauna as other habitats on Sedlo (Figure 12). Porifera (sponges) and Cnidaria (chiefly Class Anthozoa – anemones, corals and sea pens) occurred at high densities of around 1500 – 3500 ind. ha⁻¹ on the rocky seamount sites. Giant protozoans (xenophyophores) were abundant at site “1700 m” where sediment habitat was present in addition to hard substrata. The sediment habitat sites away from Sedlo had the lowest faunal densities of only a few 10s - 100s ind. ha⁻¹.

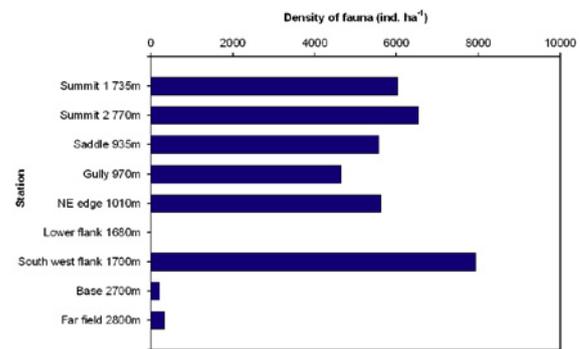


Figure 11: Total faunal abundance at each station.

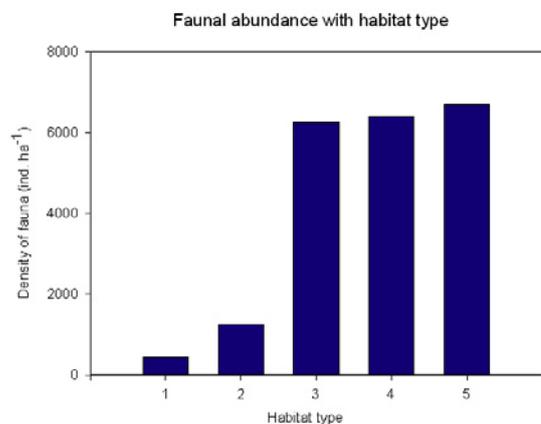


Figure 12: Faunal abundance on different habitat types

Fishes

Experimental fishing surveys were undertaken in 2001 & 2002 around Sedlo. Important findings included the identification of species new to the Azores and spawning aggregations of the orange roughy (*Hoplostethus atlanticus*) making Sedlo an important reproductive zone for this species. This finding, together with catches from OASIS fishing surveys indicating spawning aggregations of Slender alfonsin (*Beryx splendens*) and Cardinal fish (*Epigonus telescopus*) suggests that Sedlo is an important spawning ground for several demersal and deep-water fish species of commercial importance. To date Sedlo seamount is the only identified reproductive area for these species in the Azores. Some small juvenile Orange Roughy were also caught during the experimental fishing but as the fishing gear was designed to target adult fish it is not possible to determine whether Sedlo is also a nursery area for this species (Melo & Menezes, 2002).

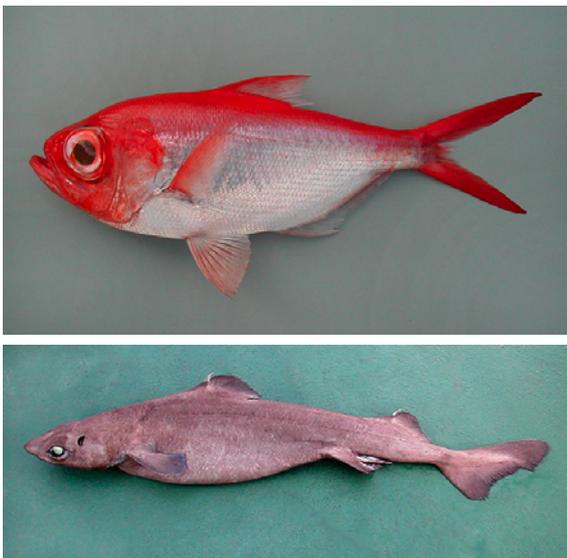


Figure 13: Slender alfonsino (*Beryx splendens*) and gulper shark (*Centrophorus squamosus*) two of the abundant fish species found at Sedlo

Thirty species of fish were collected over the seamount during the OASIS studies. When combined with fish data from experimental fishing surveys the slender alfonsino (*Beryx splendens*) was numerically the most abundant of the teleosts and the cardinal fish (*Epigonus telescopus*) the most abundant fish species by weight. In the case of elasmobranchs, the gulper shark (*Centrophorus squamosus*) was the most abundant and made up the greatest catch weight (Figure 13). When combined with the catch information from the experimental fishing the diversity of fish species found at Sedlo represents nearly 14 % of all fish species for the Azores as recorded by Santos et al (1997).

Genetic studies of the Orange roughy and Black scabbard fish have been undertaken with samples taken from Sedlo and a number of other seamounts in the region. In the case of the Orange roughy a distinct population was not apparent from any of the seamounts whereas for black scabbard fish there appears to be a distinctive group in the vicinity of south of Pico. The reason for these differences is not immediately apparent and requires further investigation.

Mammals and seabirds

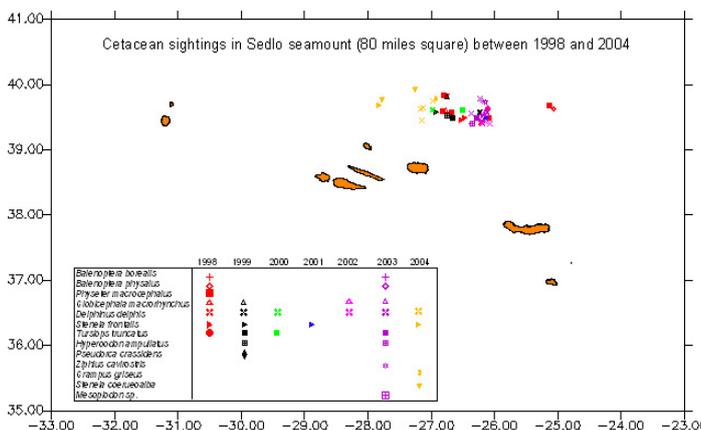


Figure 14: Cetacean sightings around Sedlo – POPA records, 1998 – 2004

Marine mammals sightings and observations of seabirds are available from the observer programme for the fisheries of the Azores (POPA). Species sighted within an 80 sq mile area around Sedlo between 1998-2004 include fin whale (*Balaenoptera physalus*), sperm whale (*Physeter macrocephalus*), common dolphin (*Delphinus delphis*) and bottlenose dolphin (*Turssiops truncatus*). Seabird sightings from the area include Cory's shearwater (*Calonectris (diomedea) borealis*) and great shearwater (*Puffinus gravis*) (Figure 14).

No information could be found on whether chemical contamination was present in seabirds or marine mammals frequenting the waters around Sedlo.

Cultural

There does not appear to be any archaeological information relating to the Sedlo seamount, or records of historic relics, such as shipwrecks or other submerged structures of historic interest. There is no information to suggest that the area has a particular cultural significance.

4.2.4 Existing uses

There appears to be little human activity taking place around the Sedlo seamount and no record of any traditional uses, rights and management practices (see Table 3 next page). The principal activity at this time appears to be scientific research. There has been some exploratory fishing targeting Orange roughy (*Hoplostethus atlanticus*) in the region but no documented commercial fisheries except for Swordfish (*Xiphius gladius*) and Blue shark (*Prionace glauca*).

Existing uses

Table 3: Overview of activities taking place around the Sedlo seamount (Low, medium, high refers to level of activity – see comments for reasoning)

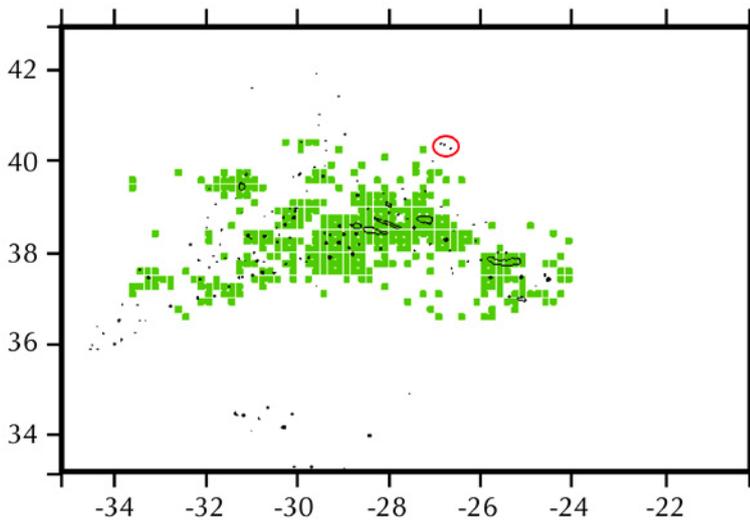
Activity	Absent	Present	Low	Medium	High	Comment
NAVIGATION						
Shipping		?	X			Not on a major shipping route. May be some occasional vessel traffic
RECREATION						
Boating	?					No data but unlikely due to distance from nearest land.
Sports fishing	X					No activity at present and unlikely to occur in the future.
STRUCTURES						
Cables	X					Terrain unsuitable and not on any likely routeing for cables or pipelines
Pipelines	X					
WASTE DISPOSAL						
Garbage	X					Prohibition on the dumping of wastes and presumption against ballast water exchange under MARPOL. No evidence to suggest other wastes disposed at site
Ballast water	X					
Other	X					
MINERAL EXTRACTION						
Oil & gas	X					No known mineral resources, no current extraction activities, and no proposed mineral extraction in the area
Minerals	X					
Aggregate	X					
FISHERIES						
Handlining	X					Most handlining close to coasts and less than 600m depth; bottom longliners could operate in the area but generally work between 200-800m. Swordfish & tuna fisheries could take place but generally too far for local boats to travel to Sedlo. No mid-water trawling. Bottom trawling prohibited. Black scabbard fish fisheries operate between 1200-1800 but not around Sedlo
Bottom longlines	X					
Pole & line (tuna)		?	X			
Surface longlines		X	X			
Mid-water trawling	X					
Bottom trawling	X					
Traps	X					
RESEARCH						
Observational		X	X			Small number of research cruises conducted as part of OASIS project and demersal cruise by DOP/UAÇ - Observational and sampling, no seismic studies.
Sampling		X	X			
Seismic	X					

Scientific Research

Sedlo is one of two seamounts in the North East Atlantic that are the being studied as part of the OASIS project. There have been four cruises to the seamount conducting studies on the physical and biological environment. One final cruise is planned for November 2005. Data from the field work, together with modelling studies being brought together to give an overview of the seamount ecosystem. This information is being used to inform the development of management plan for Sedlo which is presented here.

Commercial fisheries

There does not appear to be any significant demersal fishing activity around Sedlo at the present time (Figure 15).



Around 90% of the demersal fishery operates at depths between 200-600 m, with 70% between 300-500 m.

The satellite based monitoring, enforcement and surveillance system (MONICAP) introduced by the Fisheries Inspectorate provides records of the location and routes of Portuguese fishing vessels in Azores waters which are installed with a 'blue box' (the Portuguese VMS system). Since January 2005 only three fishing vessels have been reported in the vicinity of Sedlo. Two may have been engaged in exploratory fishing and the third was a longliner which targets swordfish and tuna. There may therefore be some pelagic longlining in the area but there are no data on catches.

Figure 15: Distribution of demersal fishing activity around the Azores (2001-2004). (Location of Sedlo indicated by circle)

Since 2004 foreign fishing vessels have been permitted to fish up to the 100 nm zone around the Azores. As Sedlo is just within this zone there is the possibility that some vessels may have operated in its vicinity however there is no evidence from the MONICAP monitoring system to suggest that there is any regular commercial fishing in the area. Some fishing activity at a very low level and on an *ad hoc* occasional basis has been observed.

The potential for the area to support deep-water fisheries was investigated during an exploratory fishing study carried out in 2001/2. Experimental trawls were made to establish if stocks of orange roughy (*Hoplostethus atlanticus*) and other deep-sea species occurred in the Azores EEZ, and to evaluate their abundance, distribution, and the possibility for sustainable long-term exploitation of such resources. Orange roughy was caught at several seamounts and pinnacles in the Azores EEZ, including the Sedlo. Catches were made between 830-1500 m but with the majority between 1000-1200 m. It appears likely that the spawning season for this species in the Azores begins in January and at least one spawning aggregation was ob-

served during the study. Analysis of stomach contents shows a diet of small deep-sea fish species cephalopods and shrimps. (Melo & Menezes, 2002)

Despite confirmation of the occurrence and distribution of the Orange roughy around Sedlo and other locations in the Azores the development of a small scale trawl fishery targeting this species was not permitted as a precautionary measure and because of the associated risk of environmental degradation or the destruction of the habitat where this species occurs. The absence of any other trawl fishery in the region and the lack of

4.2.5 Existing legal & management framework

Sedlo lies within the 200 nm EEZ of the Azores and is therefore within the jurisdiction of the Regional Government of the Azores. It is also within ICES Area X. The two most relevant legal and management frameworks for the conservation of Sedlo are those which relate to biodiversity conservation and fisheries.

The designation of a Marine Protected Area around Sedlo falls under the remit of the Environment Directorate of the Regional Government. Options include designation as one or all of the following; a national Marine Protected Area, a Special Area of Conservation (under the EC Habitats & Species Directive) and an OSPAR MPA. There are already examples of national MPAs and marine SACs on seamounts in the Azores eg. Formigas/Dollabarot Marine Nature Reserve and D.João Castro marine SAC. The Formigas Bank is also being considered as a potential OSPAR MPA. The proposal has been submitted to OSPAR and is pending a decision by the OSPAR Commission and its various sub-committees.

The most recent legal provisions for regulating fishing activities in waters under Portuguese jurisdiction and relevant to the Azores are Decree No. 7/2000 and Ordinance 1102-C/2000 (for hook and line fisheries). Within Azorean waters the Regional Government and, in particular, the Fisheries Directorate can introduce fisheries regulations. These need to be consistent with the EU Common Fisheries Policy, which applies out to the 200 nm limits of the EEZ.

Since 2000 access to fishing grounds within the Azores has been based on vessel size and fishing method in three zones; up to 1nm from the coast (around São Miguel island), 3nm from the coast (all other islands and equivalent to the 1nm zone of São Miguel) and 12-200 nm from the coast. Key regulations are;

- Decree No. 27/1998 which introduces an annual minimum limit of fish landed linked to renewal of annual fishing licenses
- Decree No. 101/2002 which introduces technical measures for the hook and line fisheries, including the establishment of a coastal “fisheries box”.

Existing legal & management framework

A Total Allowable Catch (TAC) is set for Blackspot seabream (*Pagellus bogaraveo*) and Black scabbardfish (*Aphanopus carbo*) for the ICES area X under the Regulation (EC) No 2270//2004. The catch of deep-water sharks in the ICES Area X is also limited according to the Council Regulation (EC) No 860/2005, amending the Regulation (EC) No 2270//2004.

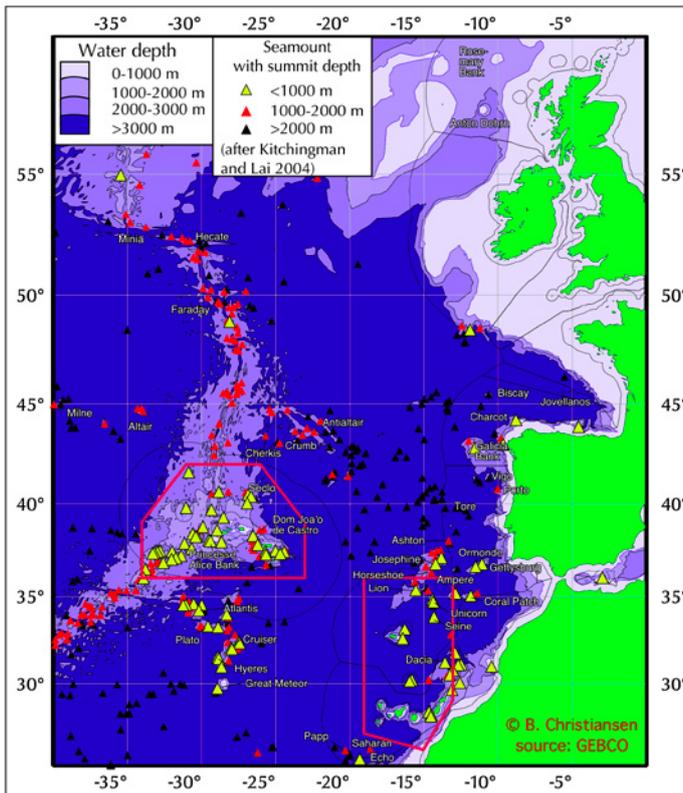


Figure 16: Areas for which a permanent ban on bottom trawling, gill nets and trammel netting were confirmed by the European Commission in September 2005.

The Council Regulation 27/2005 also defines the TAC's for the highly migratory fish species as the Swordfish and Tunas for a wide area including the Azores region. These management measures are adopted in the framework of international fisheries organizations such as the ICCAT (International Commission for the Conservation of Atlantic Tunas). The same regulation also defines a TAC of 3200 tonnes for the Horse mackerel (*Trachurus spp.*) for the Azores waters.

Until recently, the right to fish with the EEZ of the Azores was restricted to Portuguese (Azores) registered vessels or other fishing boats authorised by the RGA. In some years several Portuguese mainland fishing vessels have also been allowed to fish around the Azores under restricted conditions and targeting specific fish species. This was set out in EC Regulation 2847/93 which established exclusive fishing zones extending 200nm offshore around the Azores, Madeira and the Canary Island. This Regulation was reviewed in 2002 and since August 2004 the zone between 100 and 200 nm of the Azores EEZ has been open to fishing vessels from any EU Member State (EC Regulation 1954/2003). There was also a temporary ban on bottom trawling (since October 2004) around the Azores which was due to expire at the end of 2005. In September 2005 the EU Fisheries Ministers agreed to make this a permanent ban covering most of the Azores (Portugal) waters as well as waters around the Canarian Archipelago and Madeira. The use of bottom gill nets and trammel nets in this zone was also banned under this new Regulation (Figure 16).

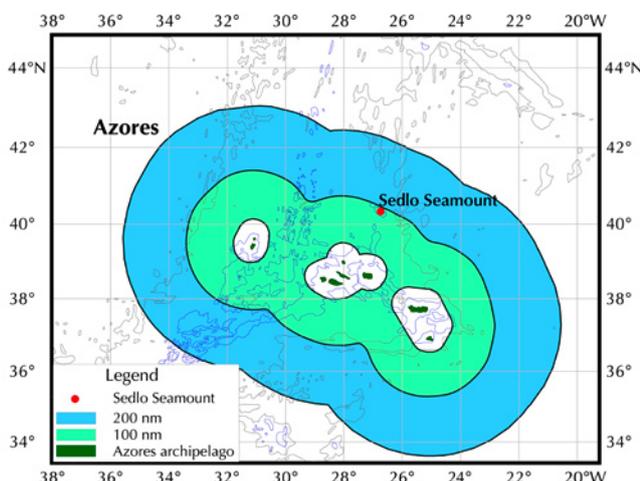


Figure 17: Location of Sedlo in relation to fisheries management 100 nm zone

Sedlo lies inside the 100 nm zone (Figure 17) and therefore commercial fisheries are limited to vessels from the Azores and their regulation and management lies within the competence of Fisheries Directorate of the Regional Government of the Azores.

4.2.6 Existing & potential threats and implications for management

Given the very low level of human activity around Sedlo there are few existing threats to the biodiversity interest of the area. The exception is the possible bycatch of sharks and turtles from occasional pelagic longlining in the area (Figure 18).

The most likely potential threat is from commercial fisheries, especially if an orange roughy fishery develops, if the current trawling ban within the Azores EEZ is rescinded and/or if longlining becomes more frequent in the area. Seamount fishes, and especially those that aggregate around seamounts are highly vulnerable to exploitation. The implications for management are to ensure that the possibility of any fishing activity around Sedlo is thoroughly investigated and decisions based on scientific knowledge. This approach is necessary even before any exploratory fishing takes place, and subsequent decisions should be precautionary, given the known high risk of collapse to certain stocks such as orange roughy which is known to be present at Sedlo.

Existing & potential threats and implications for management

<i>Prionace glauca</i>	Blue shark	2040
<i>Xiphias gladius</i>	Swordfish	96
<i>Isurus oxyrinchus</i>	Mako shark	30
<i>Thunnus abalunga</i>	Albacore	5
<i>Alepisaurus spp.</i>	Lancetfish	4
<i>Alopias superciliosus</i>	Bigeye thresher shark	3
<i>Isurus paucus</i>	Longfin mako	1
<i>Coryphaena hippurus</i>	Common dolphinfish	1
<i>Thunnus albacares</i>	Yellowfin tuna	1
<i>Lepidocybium flavobrunneum</i>	Escolar	1
<i>Tetrapturus pfluegeri</i>	Longbill spearfish	1
<i>Taractes rubescens ct.</i>		1
<i>Masturus lanceolatus</i>	Sharp-tailed sunfish	1
<i>Lagocephalus lagocephalus</i>	Pufferfish	1
<i>Caretta caretta</i>	Logger head turtle	4
<i>Dermochelys choriacea</i>	Leatherback turtle	1
Total		2191

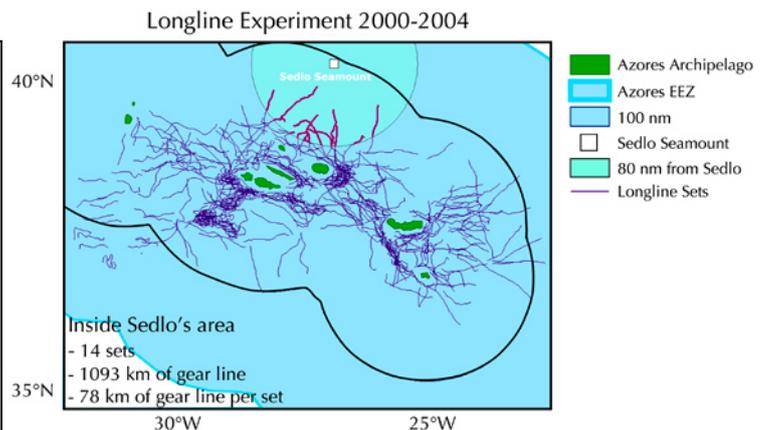


Figure 18: Location of long line sets and bycatch data from an experiment conducted between 2000-2004. The data in the table represent bycatch within 80 nm around Sedlo. (NOAA-NMFS and IMAR & DRP, following the design proposed by Bolten et al. (Eds) 2000)

4.2.7 Existing gaps of knowledge

Very few seamounts in the NEA have been studied systematically. The current research at Sedlo is starting to build a picture of the characteristics of this seamount from work at a number of sampling stations. There remain gaps in knowledge about the Sedlo, not only in terms of what is present but also on the interactions that make it function as an ecosystem. There is also very limited information on far field affects in terms of how Sedlo is influenced by and influences the characteristics of surrounding area.

Existing gaps of knowledge

4.3 Management Plan

4.3.1 Goals & objectives

Overall Goals:

To manage human activities around Sedlo in a way that protects its ecosystem function, biodiversity and significance as an unexploited example of a seamount within a network of marine protected areas in the Azores EEZ.

Objectives:

- To safeguard the biodiversity interest of Sedlo and its surrounding waters for resident and visiting species as well as the marine communities associated with the seamount
- To avoid unsustainable exploitation of species and disruption of the natural processes which support the structure and function of the Sedlo ecosystem.
- To safeguard the potential for species using Sedlo as a spawning, nursery or feeding ground to enhance the biodiversity of surrounding areas.
- To increase scientific understanding of processes governing seamount ecosystems in the absence of human impacts
- To increase local, national and international public interest for and understanding of the conservation of offshore areas in the Azores

4.3.2 Management tactics

Designation, review and reporting of MPAs in the Azores EEZ falls within the remit of the Environment Directorate however, given that successful management of activities within the MPA cannot be achieved by a single sector, a multi-agency group should be set up to be the overseeing management committee for the MPA. The chair and secretariat should be within a government agency but membership of the group should be open to other stakeholder groups who can demonstrate a legitimate interest in the management of the area. Examples would be fishermen's associations, research institutes and nature conservation groups. The management committee will need to be supported by formal interagency agreements to give it a legal basis and clear commitment for the participation all relevant groups.

Boundaries & zoning

Sedlo seamount is a large topographic feature with an influence that extends beyond the immediate area of the seamount. Deciding on the most suitable boundary for a MPA at the site will depend on many factors including the aims of protection, the presence of key features and the zone of influence. Practical considerations are also important since users and regula-

Goals & objectives

Management tactics

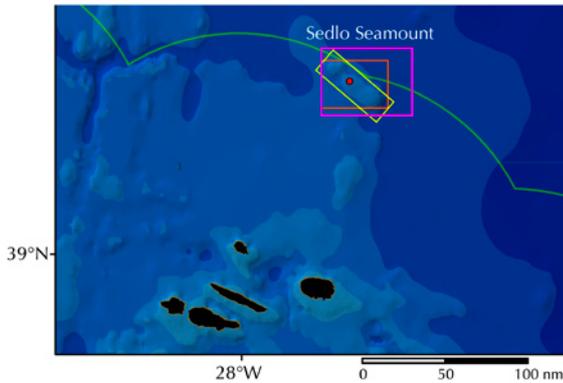


Figure 19: Three boundary options for a Marine Protected Area at Sedlo Seamount.

tors need to identify the boundary when *in-situ*.

Five options were presented to the stakeholder workshops for discussion (Figure 19). In each case the proposed MPA includes the seabed, as well as the overlying water column.

Option 1. Straight line boundaries enclosing main zone of influence as indicated by modelling of currents (purple). This would be a useful approach where, for example, an ecosystem approach to management was favoured.

Option 2. Straight line boundaries enclosing the main topographic feature (orange). This would be a useful approach where, for example, the conservation of demersal species, was an objective, as they are closely associated with the seabed feature of the seamount.

Option 3. Straight line boundaries enclosing the main topographic feature (more tightly drawn) (yellow). This would be a useful approach where, for example, the intention was to include the smallest possible area Option 4. Option 2 but with eastern boundary along outer limit of 100 nm fisheries zone (not illustrated)

Option 5. Option 3 but with eastern boundary along outer limit of 100 nm fisheries zone (not illustrated)

Options 4 and 5 may be favoured if, for example, there were administrative issues which made it difficult to include the management of fisheries outside the 100 nm fisheries zone.

Having discussed these options at the stakeholder workshops it became apparent that there was most support for an option which included the physical feature of Sedlo as well as the principal area of influence as suggested by modelling of water currents, although recognising that it is not possible to be precise about the full extend of this influence at the present time. (One study of Azorean seamounts suggests that for many migratory species the area of influence may be at least 60 km around the feature). Straight line boundaries were preferred for the sake of simplicity and because they were considered to be more practical from a fisheries and enforcement perspective. There was no demand for keeping the area as small as possible and no concern about extending beyond the 100 nm fisheries zone. A large area would also act as a buffer zone.

Having taken account of these points, the boundary proposed for a potential Marine Protected Area around Sedlo lies within the following limits;

40°40'N, 25°15'W; 40°40'N, 26°29'W; 40°6'N, 27°15'W; 40°6'N 26°29'W

This encloses an area of around 7,040ha (approximately 17,399 acres) and extends across the 100 nm zone where the Regional Government of the Azores has exclusive competence for management of fisheries (Figure 20). The area is entirely within the zone which the European Commission have agreed is to exclude any bottom trawling, gill netting and/or trammel netting.

The management and regulation of activities within the proposed MPA must be designed to deliver the overall goal and objectives of designation. Much of the discussion of management options during the stakeholder workshops focused on the extent to which commercial fisheries should be restricted at Sedlo. Views ranged from a desire for the entire area to become a “no-take reserve”, to a situation where pole and line fishing for tuna and longlining for swordfish would be permitted but other fishing activity banned. There was no support for a multiple use area open to all activities.

Given that there is so little (if any) commercial fishing around Sedlo at the present time and the fact that the seamount also falls within a zone where the European Commission have banned bottom trawling, gill netting and trammel netting, the site is almost a *de facto* no fishing zone. This might not remain the case however, for example if more accessible seamounts are depleted of valuable fish stocks or if technical advances make fishing more economic in the area.

Sedlo is not being proposed as a fisheries MPA but rather as an MPA for the conservation of marine biodiversity. The role of the MPA in the enhancement of fish stocks maybe therefore be limited. For example there may be little enhancement of surrounding fish stocks by a “spill over” effect, given that Sedlo is a relatively isolated seamount. On the other hand, as it has not been possible to differentiate genetically distinct orange roughy stocks across the region and because this species uses Sedlo as a spawning ground, the possibility that fish spawning around Sedlo support a widely dispersed stock cannot be discounted.

Given the current situation, establishing a strictly protected area around Sedlo would have virtually no effect on current activities. Instead, it could be a model of precautionary management as well as a safeguard against the uncertainty of the area being targeted for commercial fishing in the future. Enforcement would also be more clear-cut and easier to apply where there is a total prohibition on fishing within the reserve.

Potential limits on scientific research were also discussed at the stakeholder meetings. Research was considered to be essential for reporting on the effects of the MPA and on the success or otherwise of the management measures. Scientific activity was therefore considered acceptable but with an emphasis on non-invasive techniques. Invasive techniques may be needed on occasions and should be controlled by being subject to a permit/licence. The Regional Government will need to set out clear criteria for issuing such permits in the run up to establishing the MPA.

Proposals for the management of activities with the Sedlo MPA were made in light of discussions at the stakeholder

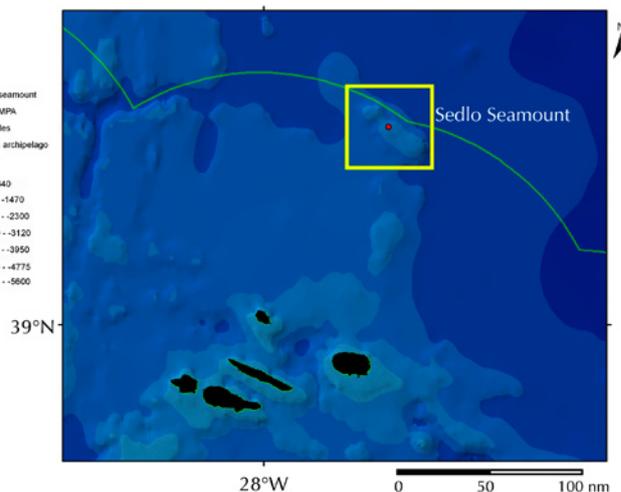


Figure 20: Proposed boundary for a Marine Protected Area around Sedlo Seamount

workshops and are summarised in Table 4. The table also includes comments on the necessity for regulation to support the management proposals. While the majority require the introduction of some regulations these requirements could be brought together into a few key statutes as part of the designation of the MPA. Regulation of fishing activity beyond the 100 nm zone will require separate provisions from the European Commission and possibly ICAAT.

Table 4: Proposed management of activities within a Sedlo MPA

Activity	Status in MPA	Regulatory requirements	Comment
NAVIGATION			
Shipping	YES	No change	Not on shipping route. May be some occasional vessel traffic
RECREATION			
Boating	YES	No change	Low activity level due to distance from nearest land.
Sports fishing	NO	Regional Government will need to introduce regulation	None at present
STRUCTURES			
Cables	Presumption against	Regional Government Policy needs to be agreed	Terrain unsuitable and not on any likely routeing for cables or pipelines
Pipelines	Presumption against	Regional Government Policy needs to be agreed	
WASTE DISPOSAL			
Garbage	NO	No change	Prohibition on the dumping of wastes and presumption against ballast water exchange under MARPOL.
Ballast water	NO	No change	
Other	Presumption against	Regional Government Policy needs to be agreed	
MINERAL EXTRACTION			
Oil & gas	Presumption against	Regional Government Policy needs to be agreed	No known mineral resources, no current extraction activities, and no proposed mineral extraction in the area
Surface deposits	NO	Regional Government will need to introduce regulation	
Aggregate	NO	Regional Government will need to introduce regulation	
FISHERIES			
Hand lines	NO	Regional Government will need to introduce regulation	Most handlining close to coasts and less than 600m depth; bottom longliners could operate in the area but generally work between 200-800m. Some pelagic longlining for swordfish (& tuna) No pelagic trawling. Bottom trawling is already prohibited As is deep-water gillnetting (and trammel netting).
Bottom longlines	NO	Regional Government will need to introduce regulation . EC regulation outside the 100nm zone	
Pole & line	NO	Regional Government will need to introduce regulation	
Surface longlines	NO	Regional Government will need to introduce regulation . EC regulation outside the 100nm zone. ICCATT agreement?	
Mid-water trawling	NO	Regional Government Policy needs to be agreed. EC regulation outside the 100nm zone	
Bottom trawling deep-water gill nets trammel netts	NO	Permanent ban already agreed by European Commission	
Traps	NO	Regional Government will need to introduce regulation	Trap fisheries not known to operate in the area at present
RESEARCH			
Observational (non-invasive)	YES	Regional Government will need to introduce regulation	Small number of research cruises conducted as part of OASIS project and demersal cruise by DOP/UAç - Observational and sampling, no seismic studies.
Sampling (invasive)	Under license	Regional Government will need to specify license conditions	
Seismic	NO	Regional Government will need to introduce regulation	

Regulations

The boundaries and management provisions for the Sedlo MPA must be enshrined in statute. This should ideally be specified within the regulation designating the MPA but could also be within other sectoral regulations such as fisheries ordinance. Some policy development will also be needed to guide certain activities in the area (eg. Placing of structure , mineral extraction). There may also be benefit in establishing a Memorandum of Understanding between the agencies responsible for implementing the regulations which sets out how they will work together.

The regulation of fisheries will fall within the Common Fisheries Policy. Within 100 nm the Regional Government of the Azores can regulate fishing but beyond this zone application for regulations will need to be made to the European Commission. Where fisheries regulations are needed to support nature conservation objectives it is likely that the site will need to be a protected area, such as a proposed *Natura 2000* site, before the EC will introduce supportive fisheries regulations.

Any regulation of tuna fisheries within the proposed MPA will need to be agreed by ICCAT.

Education and public awareness

Providing information and raising awareness about Sedlo will be essential to its successful management. This is the key to gaining support for the MPA from users and the local population and is important even though the islands of the Azores are some distance from the site. A range of materials can be produced about Sedlo to be distributed and promoted at public events (such as Fisheries week), to schools and in the local press. The Interpretation Centre on the Ecosystems of the Azores Triple Junction which is being built in Porto Pim could be the focal point for distribution of this information as well as hosting a permanent display about the management of seamounts including Sedlo. Presentations should also be made to special interest groups such as fishermen's organisations as part of an ongoing programme of education and public awareness. This should build on existing experience of promoting MPAs within the Azores.

4.3.3 Administration

Overall responsibility for the Sedlo MPA will lie with the Regional Government of the Azores. Detailed proposals for staffing, training and the required facilities and equipment will need to be developed. The entire proposal should also be supported by a budget and business plan, which specifies actual and anticipated annual investments and costs.

Administration

4.3.4 Surveillance & enforcement

Surveillance and enforcement of the proposed management measures for Sedlo are essential if the goals and objectives of the MPA are to be met. A good surveillance and enforcement

Surveillance e3 enforcement

programme will also show commitment to success of the MPA and be vital for the credibility of the management arrangements

The distance of Sedlo from the island archipelago of the Azores means that surveillance and enforcement will need to be based on satellite tracking technology. All EU Fishing vessels over 15 m are required to fit transponders as part of a satellite based Vessel Monitoring System. Positional information is then transmitted to the Fisheries Monitoring Centre of the flag state which retransmits it to the relevant coastal state for activities within their waters. In the case of the Azores this is undertaken by the Regional Fisheries Inspection known as MONICAP (Sistema de **M**onitorização **C**ontínua das **A**ctividades de **P**esca), the system is installed on more than 500 Portuguese fishing vessels, and is a requirement under Portuguese law for all national vessels over 15 m length with on deck cabin structures.

MONICAP will be able to record presence of larger fishing vessels within the MPA and data on vessel routes and time spent in the area can be used to determine the probability that fishing activity is taking place. This is a “real time” operation but will need to be backed up with prosecutions for any infringements of the proposed no-take zone on Sedlo if it is to act as sufficient deterrent. Data from MONICAP will also need to be combined with those from other Member States whose vessels may be fishing in the area, in order to get a complete picture of fishing activity in the region.

MONICAP and other national satellite tracking systems will need to be backed up by enforcement patrols in the area to observe any vessel activities at first hand.

An essential part of the enforcement programme is a public awareness and education campaign. This should explain the reasons behind the regulations and encourage self policing which is the most effective approach in the long run. The recently established federation of professional fishing organisations of the Azores should be a key player in any campaign of this type.

4.3.5 Monitoring & evaluation of plan effectiveness

Monitoring & evaluation of plan effectiveness

Regular monitoring and evaluation of the plan is important as it not only helps to determine whether the site management objectives are being met, but also demonstrates what is being achieved, identifies shortcomings, and provides lessons for improving management in the future. A continuing programme of research at Sedlo will therefore be an essential element of future management of activities taking place in the area, as well as improving understanding of seamount ecosystems in general.

A realistic timetable for review of the Sedlo management plan is considered to be 5 years.

4.3.6 Timetable for implementation

The timetable for establishing a MPA at Sedlo and instituting the required management provisions needs to be realistic and linked into existing relevant targets. OSPAR has set a target for the establishment of a network of MPAs in the OSPAR Maritime Area (North-East Atlantic) by 2010. Designation of SACs under the EU Habitats & Species Directive needs to be completed by 2008, although it is acknowledged that more time may be needed to complete the network for offshore site. There is also the likelihood that the list of marine habitats and species targeted for protected area status will be expanded in the future. If this happens, a timetable for designation of additional marine SACs is likely to be agreed at the same time. A potential timetable is shown in Table 5.

Timetable for implementation

Table 5: Illustration of possible timetable for establishment and management of Sedlo MPA

Action	Lead Agency & Partners	2005	2006	2007	2008	2009	2010
Consultation on draft proposals for Sedlo MPA							
Establishment of Sedlo MPA Management/ stakeholder committee							
Agreement on first management plan							
Drafting and agreement national regulations to establish MPA							
Drafting and agreement of national sector specific (eg.fisheries) supporting regulations							
Drafting and agreement of European fisheries supporting regulations							
Drafting and agreement of any supporting international measures (eg. through ICCATT)							
Nomination of Sedlo MPA as Natura 2000 site (pSCI)							
Establishment of education/public awareness programme							
Establishment of surveillance & enforcement programme							
Establishment of research and monitoring programme							
Submission of Sedlo MPA to OSPAR							
Stakeholder events							

- Initial establishment
- Ongoing work
- Review
- Events

5. *Concluding comments*

This report sets out some initial proposals for the conservation and management of Sedlo as a Marine Protected Area. They have been developed with reference to the work undertaken as part of the OASIS project and with initial comments from some stakeholders. The ideas presented need to be viewed as the start of a process rather than a comprehensive and complete scheme of management for Sedlo. The draft proposals need to be examined, refined, and agreed by the Regional Government of the Azores and necessary supporting work undertaken, such as the drafting of legislation and other measures for implementation. Action will also be needed at a European level where the European Commission will need to examine and agree proposals for the management of fisheries under the jurisdiction. The option for Sedlo to have international recognition as part of the *Natura 2000* protected area network or OSPAR MPA network should also be considered.

Stakeholder participation is essential at all stages of the MPA process from site selection through to day to day management of activities within and around any MPA. Some initial work has been done with stakeholders as part of this project, bringing the issue of a potential MPA at Sedlo to the attention of regional stakeholders and starting discussion of the detail of possible management measures. It is important to build on these initial contacts and discussions, reaching out to a wider audience and establishing a pattern of dissemination of information, collaboration and feedback. A clear message from the initial steps of consultation is that there is not only support for the principle of Marine Protected Areas in the Azores, but also for this type of management measure to be taken forward at Sedlo. Equally important is the view that the MPA proposals should not be viewed in isolation but rather that they would benefit from being set into the context of a fisheries strategy as well as a biodiversity conservation strategy for the Azores EEZ.

Bibliography

- Auster, P.J., Moore, J., Heinonen, K.B. & Watling, L. 2005. A habitat classification scheme for seamount landscapes: assessing the functional role of deep-water corals as fish habitat. In: Freiwald, A. & Roberts, J.M. (eds). *Cold-water Corals and Ecosystems*. Springer-Verlag, Berlin Heidelberg.
- Barcelos, L.M.D. 2004. Ecologia alimentar do PEIXE-RELÓGIO, *Hoplostethus atlanticus* Collett, 18889 no Arquipélago dos Açores. Relatório de Estágio do Curso de Licenciatura em Biologia Marinha.
- Bolten, A.B., H.R. Martins, and K.A. Bjorndal (editors). 2000. Workshop to design an experiment to determine the effects of longline gear modification on sea turtle bycatch rates, 2-4 September 1998, Horta, Azores, Portugal. NOAA Technical Memorandum NMFS-OPR-19, 50 pp.
- Collie, J.S., Escanero, G.A. and Valentine, P.C. 2000. Photographic evaluation of the impacts of bottom fishing on benthic epifauna. *ICES Journal of Marine Science* 57: 987-1001.
- European Commission 2004. Council Regulation No. 1811/2004 of 11 October 2004 amending Regulation (EC) No 2287/2003 as concerns the number of days at sea for vessels fishing for haddock in the North Sea and the use of bottom trawls in waters around the Azores, the Canary Islands and Madeira. OJ L319/1, 20.10.2004.
- Gjerde, K.M. and Breide, C. 2003. Towards a Strategy for High Seas Marine Protected Areas: Proceedings of the IUCN, WCPA and WWF Experts Workshop on High Seas Marine Protected Areas, 15-17 January 2003, Malaga, Spain. IUCN, Gland, Switzerland.
- Gubbay, S. 2003. Seamounts of the North-East Atlantic. Published by OASIS, Hamburg & WWF Germany, Frankfurt am Main, November 2003.
- Koslow, J.A., Boehlert, G.W., Gordon, J.D.M., Hae-drich, R.L., Lorange, P. and Parin, N. 2000. Continental slope and deep-sea fisheries: implications for a fragile ecosystem. *ICES Journal of Marine Science* 57: 548-557.
- Kiriakoulakis, K. & Wolff, G. (2005) Organic Biogeochemistry of seamounts: a review. OASIS report.
- Machín, F., A. Hernández-Guerra, and J.L. Pelegrí, 2006. Mass and nutrient fluxes in the Canary Basin. *Progress in Oceanography*, in press.
- Machín, F., J.L. Pelegrí, I. Láiz, I., A. Marrero-Díaz, and A.W. Ratsimandresy, 2006. Near-surface circulation in the southern Gulf of Cádiz. *Deep-Sea Research II*, in press.
- Machin, F., Pelegri, J.L., Emelianov, M., White, M., & Bashmachnikov, I. 2005. Inverse modelling the circulation over Sedlo Seamount (Eastern North Atlantic). Poster presentation. ASLO Summer Meeting 2005, Santiago de Compostela.
- Mar-Eco 2005. Patterns and processes of the ecosystems of the northern mid-Atlantic (MAR-ECO). Field Phase workshop and steering group meeting. IPI-MAR, Lisbon, Portugal 2-5 June, 2005. Program and Abstracts. 40pp.
- Marrero-Diaz, A., A. Rodríguez-Santana, F. Machín, and J.L. Pelegrí, 2006. Analytic salinity-temperature relations for the upper-thermocline waters of the eastern North Atlantic subtropical gyre. *Scientia Marina*, in press.
- Melo, O. & Menezes, G. 2002. Exploratory fishing of the orange roughy (*Hoplostethus atlanticus*) in some seamounts of the Azores archipelago. ICES CM 2002/M:26. ICES Working Group on the Biology and Assessment of Deep-Sea Fisheries Resources.
- Morato, T. 2005. Testing a seamount effect on primary production and on aggregating visitors. Poster presentation. ASLO Summer Meeting 2005, Santiago de Compostela.
- OASIS 2005. Oceanic Seamounts: an integrated study. Scientific & Technical Report for the period 1.12.2003 –30.11.2004. Prepared January 2004.
- OSPAR 2003. Guidelines for the Management of Marine Protected Areas in the OSPAR Maritime Area. Reference 2003-18.
- OSPAR 2004. Initial OSPAR List of Threatened and/or Declining Species and Habitats (Reference Number: 2004-06). OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic.

- Pelegrí, J.L., A. Marrero-Díaz, and A.W. Ratsimandrasy, 2006. Nutrient irrigation of the North Atlantic. *Progress in Oceanography*, in press.
- Santos, R. S., Hawkins, S.J., Monteiro, L. R., Alves, M. and Isidro, E. I. 1995. Marine research, resources and conservation in the Azores. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 5 (4): 311-354.
- Santos, R.S., Porteiro, F.M. & Barreiros, J.P. 1997. Marine Fishes of the Azores. Annotated Checklist and Bibliography. A Catalogue of the Azorean Marine Ichthyodiversity. Arquipelago – Life and Marine Sciences. Bulletin of the University of the Azores. Supplement 1.
- Schmidt, S. & Christiansen, S. 2004. The Offshore MPA Toolbox. Published by OASIS, Hamburg & WWF Germany, Frankfurt am Main, September 2004.
- Watson, R. and Morato, T. 2004. Exploitation patterns in seamount fisheries: a preliminary analysis. In: T. Morato and D. Pauly (eds), *Seamounts: Biodiversity and Fisheries*. Fisheries Centre Research Reports 12 (5): 61-65. Fisheries Centre, University of British Columbia, Canada.
- White, M. & Mohn, C. (2005). Seamounts: a review of physical processes and their influence on the seamount ecosystem. OASIS report.
- White, M., Mohn, C., Basmachnikov, I. & Jose, F. 2005. Seamount dynamics at an elongated, multi-peaked, seamount in the NE Atlantic. Poster presentation for ASLO.

Appendix 1

Participants Attending OASIS Project Workshop, 12-13th October, 2005, Horta

Name	Organization
Javier Aristegui	ULPGC
Tim Beck	FAU
Dave Billett	NOC
Marco Büntzow	DZMB
Bernd Christiansen	UHH
Sabine Christiansen	WWF
Susan Gubbay	Consultant
Stefanie Hirsch	UHH
Kostas Kyriakoulakis	ULIV
Bettina Martin	UHH
Ana Martins	IMAR/DOP
Ana Mendonça	IMAR/DOP
Gui Menezes	IMAR/DOP
Telmo Morato	IMAR/DOP
Christian Neumann	WWF
Mário Rui Pinho	IMAR/DOP
Ricardo Santos	IMAR/DOP
Barbara Springer	URO
Sergio Stefanni	IMAR/DOP
Robert Turnewitsch	NOC
Juan Carlos Vilas Espanol	ULPGC
Stephan Werk	URO
Martin White	NUIG
George Wolff	ULIV

UHH	Universität Hamburg
ULPGC	Universidad de Las Palmas de Gran Canaria
FAU	Friedrich-Alexander-Universität Erlangen
NOC	National Oceanography Centre Southampton
DZMB	Deutsches Zentrum für Marine Biodiversität
WWF	World Wide Fund for Nature
IMAR	Centre of IMAR (Institute of Marine Research) at the University of the Azores
DOP	Department of Oceanography and Fisheries, University of Azores
URO	Universität Rostock
NUIG	National University of Ireland, Galway
ULIV	University of Liverpool

Appendix 2

Participants Attending General Stakeholder Workshop, 14th October, 2005, Horta.

Name	Organization	
Marcelo Pamplona	Direcção Regional das Pescas Sub-Secretário	Directorat of Fisheries of the Azores Sub-secretary
Luís Fernandes	Direcção Regional das Pescas Director	Directorat of Fisheries of the Azores Director
Rogério Feio	Inspector Regional das Pescas	Fisheries Inspection of the Azores
Carla Dâmaso	CEPROPESCA –Certificação e Promoção de Pescarias e Produtos da Pesca Açorianos Executive assistant	CEPROPESCA - Certification and promotion of fisheries products of the Azores Executive assistant
Miguel Machete	POPA Coordinator	POPA - Fisheries observer program Coordinator
Luís Rodrigues	Associação Marítima Açoriana	Maritime association of the Azores
Jorge Gonçalves	Associação de armadores da pesca demersal	Bottom longline shipowners Association
Octávio Melo	IMAR - Instituto do Mar	IMAR - Institute of Marine Research
Gui Menezes	OASIS/DOP	OASIS/DOP
Bernd Christiansen	OASIS/UHH	OASIS/UHH
Sabine Christiansen	OASIS/WWF	OASIS/WWF
Telmo Morato	OASIS/DOP	OASIS/DOP
Susan Gubbay	Consultant	Consultant
Christian Neumann	OASIS/WWF	OASIS/WWF
Maria José Pitta Gros	Direcção Regional do Ambiente, Açores	Environment Regional Directorat, Azores
Ana Martins	OASIS/DOP	OASIS/DOP
Mário Rui Pinho	OASIS/DOP	OASIS/DOP
João Delgado	Direcção Regional das Pescas, Madeira	Fisheries Regional Directorat, Madeira
Fernandes	Associação de Pescadores do Pico	Pico's Fishermen Association
Francisco Liberato Fernandes	Cooperativa Porto de Abrigo; Federação de Pescas dos Açores Presidente	Cooperativa Porto de Abrigo (Fishermen Association from Sao Miguel) and Regional Council of the South Western Waters; Fisheries Federation of the Azores President.
Ricardo S. Santos	OASIS/DOP Chair of POPA, director at IMAR and DOP	OASIS/DOP Chair of POPA, director at IMAR and DOP
Isauro	Pescador	Artisanal fisherman
Pedro Afonso	DOP	DOP
Marco Santos	DOP	DOP
Alexandra Rosa	DOP	DOP
Jorge Fontes	DOP	DOP

*Appendix 3*Stakeholder consultations on the draft management plan:
2nd OASIS/DOP/WWF stakeholder workshop13 and 14 October 2004
Horta, Azores

Introduction

The main subject for discussion at the second OASIS stakeholder workshop was a draft management plan for a proposed marine protected area around the Sedlo seamount, one of the OASIS study sites. The event took place 13 and 14 October 2005 in Horta, Faial, Azores, and consisted of two separate discussion rounds. The first (13 October) was a consultation with the OASIS project team, as science stakeholders. The second (14 October) was targeted at local stakeholders from regional government and the fisheries sector, and was held in Portuguese. Participants gave their views and suggestions on the draft management plan, and these comments were used to revise the draft proposals before submitting them as an OASIS report. Further discussions and revisions will be needed to ensure that stakeholder views are fully integrated into any final scheme of management for the site..

Discussion with OASIS scientists

1. Discussing the boundary options – what is the “sphere of influence” and should it be considered for choosing the boundaries?

From the oceanographic investigations it appears that the current flow around Sedlo is highly variable in time and vertically, although the principal current direction is from SE into Sedlo and out principally out to NE, at the surface however more from SW to NE. Despite its deep summit, Sedlo may have an impact on the surface current patterns.

Remote sensing pictures of surface chlorophyll distribution show that the “footprint” of Sedlo is far larger than the topographic structure itself, therefore only a large protected area could comprise the entire seamount-associated ecosystem. A review of the distribution patterns of seamount associated species, including visiting (migratory) species except sea turtles, suggests that an area within at least a 60 km radius around the seamount would be an appropriate “sphere of influence”.

If, on the other hand, the boundaries for a protected area are proposed with the management of relevant human activities in mind, a small area, more focused on the seamount itself, might be more useful. The question was raised whether MPAs were an appropriate tool to man-

age large scale activities, e.g. in the vicinity of seamounts. Whatever the approach, it was agreed that any boundaries should be as simple as possible and have a square or rectangle shape for easy compliance.

The 100 nm boundary for implementing regional/EU fisheries management measures was not considered to be a useful option for determining the geographic MPA boundaries.

In the vertical, a stratified approach to the implementation of management measures could be an option depending on the objectives of the MPA

2. Discussing aspects of the ecological importance of Sedlo

The physical structure of Sedlo is unusual for the Azorean region. It is one of the two known areas where orange roughly spawning aggregations were found during experimental trawl surveys carried out in 2001/2002 (Melo & Menezes 2002). Studies from the Mid Atlantic Ridge (MarEco cruise 2004) revealed that young and old occur in the same trawl catches – therefore probability for Sedlo to be a nursery area for this species. Sedlo is also spawning area for blackscabbard fish and alfoncino, both commercially used and due to their life history, vulnerable to overexploitation.

3. Discussing the MPA objectives – the role of research

Concern was raised on the potential impact of MPA establishment on research. The proposals in the draft report were not intended to impede gaining a better understanding of the seamount system. On the contrary, ongoing research and monitoring was seen as a prerequisite to understanding whether the objectives of any MPA were being achieved. However, it was proposed to regulate research through a licensing system coupled to the usual application procedure for foreign research vessels. This would be especially important in the case of invasive techniques.

There was some support for establishing Sedlo as an MPA of special scientific interest – in order to promote long term observation and to prevent interference with

non-scientific users. This approach may however encourage other users to seek the limitation of scientific research within the boundaries of such MPAs.

Discussion with the Regional government and fisheries stakeholders

4. Why Sedlo? Presently, Sedlo is too far out for the fleet of small fishing boats from the Azores islands, the exploitable area is small and there are no other seamounts in the vicinity. Also catches are relatively low and as the market for exploitable deep water species is not developed. These factors mean that artisanal fisheries, as currently conducted in the Azores, are likely to be unprofitable in Sedlo. Consequently the fishing activity and other human impact near the seamount is extremely low. Why should we worry about this area? Do you have concerns for the future?

The Regional Fisheries Inspector confirmed that presently, there was indeed no fishing effort for deep sea species and reduced fishing effort by surface longliners around Sedlo. Eventually the surface longlines might pose a threat for the integrity of this area. Also, the exploitation of new resources in this area was considered possible in the future (e.g. for black scabbard fish). For the fishing sector, for the time being, Sedlo is not interesting, as other places closer to port are much easier to explore and exploit. However, due to the opening of the EEZ, it was considered necessary to find alternative fishing grounds, the larger longliners retreating into the 100 nm zone and competing with the smaller vessels. A closed area at Sedlo would be another limitation on the fishery and therefore the consequences need to be evaluated.

In general the representatives of the fishing sector welcomed the development of an MPA like Sedlo and considered it a pilot exercise. Some thought it was positive that there was no interference with ongoing fisheries. Others would prefer an experiment set up closer to port and closer to other (exploited) seamounts in order to profit of the likely export production from e.g. alfonsino spawning. Also the recovery effect to an exploited seamount was seen as a valuable study.

5. Discussing the boundaries - What criteria were used to establish the boundaries? Is there a wider influence of the seamount?

The draft management plan indicates several boundary proposals based on different criteria. As regards the larger options derived from oceanographic data indicating a "sphere of influence" to the northeast of the topographic structure, apparently, in pelagic domain the greatest in-

fluence of the seamount is seen 30 miles away from the top of the seamount. A buffer zone could be created for species and larvae migrating northwards. Sets of bottom longlines made on several distances away from the seamount don't show relevant differences as we go far away from it.

However, this wider area is unlikely to be negatively affected by human activities targeting demersal species as these are highly associated to the structure of the seamount.

6. Can territorial or political issues affect the boundaries identified by science? What is the weight of political issues on the delimitation of this MPA?

Neither the regional government nor the representatives of the fishing sector saw any need to restrict the potential boundaries for a Sedlo MPA to the 100nm zone around the Azores islands which is subject to regional fisheries management. It was felt that boundaries decisions should be made based on scientific criteria.

The Sub-Secretary of Fisheries emphasized that the delimitation of the area as proposed in the draft management plan was made in light of current activities in the vicinity. Once scientists and the fishery sector had agreed on boundaries, the government would in all likelihood support the proposals. Both the principle of free access and the precautionary approach should be the basis for formulating the management regulations. From his perspective, a compromise between boundary proposals 1 and 3, a rectangle shape protected area equally inside and outside the Azorean 100 nm zone would be the preferred option. Such an area would function as buffer zone and be easier to enforce.

He also emphasized that this MPA could not be implemented without the agreement of the European Commission as it ultimately means the closure of an area to EU fleets. Therefore on a European level the implementation of management measures for such an MPA will always be a political issue. A good justification was needed to have a strong mandate to negotiate with the European Commission. As a matter of political decision, it was requested to counterbalance different interests, i.e. conservation and fisheries. Science and OASIS had the task to raise public awareness for the importance of marine conservation also in remote areas like Sedlo.

From a scientific perspective, boundary option 1, the largest options was preferable, as it was assumed that the opening of the Azorean waters beyond 100 miles from baseline to European fisheries (Western Waters Regulation), given the now permanent prohibition for bottom trawling and gill netting, will have a greater impact on pelagic species, like the swordfish, blue shark and sea tur-

ties, than on demersal species. So far, the Azorean EEZ would act as a big buffer area in the middle of the Atlantic due to the reduced fishing effort exercised.

7. Discussing management measures: Which types of fishing are likely to be restricted in the potential Sedlo MPA?

It is proposed to establish a nature reserve with all human activities that could significantly interfere with the ecosystem being prohibited. This would cover all fishing gears in each category with the possible exception of tuna pole and line fishery, on the condition of the presence of observers and with the “blue box” transmitting.

The regional government was in favour of a total closure to all fisheries. From the fisheries sector it was commented that surface longlines should not be prohibited because there are very strong currents that prevent exact positioning of the gear. Pole and line should also be allowed.

8. Will the management regulations of the MPA aim only the protection of the environment? Would fishing limitations be imposed by regional regulations? Would they be enacted immediately or only as a response to a developing activity? And would they be definitive or temporary?

The general objectives of management plan aims at balancing environmental but also political issues. Opinions from all concerned stakeholders will be collected to ensure that the proposal will be approved by Environmental and Fisheries authorities. As a first step, regional legislation for establishing the MPA is required, however, more general measures are preferred by EC. According to EC, the maintenance of MPA's is too expensive. Therefore, OASIS will have to explain to society why we prefer the implementation of site-specific regulations and the report must explain why a local MPA approach is preferred to a large scale sustainable use approach. A public discussion is fundamental for the understanding of MPA's and management systems by stakeholders. An effort is being made to implement discussions about these issues.

This kind of MPA must be notified to EU and any changes to be done will not be of exclusive competence of the regional government. Measures must therefore be projected to last for 20 or 30 years, as during this period it will not be possible to change them.

9. Is it planned to monitor the success of the MPA, and if yes, how will this be done and are funds available? This appears particularly relevant with respect to a possible reorientation of the Azorean fisheries. Monitoring could thus tell about the effects of a complete fish-

ery closure and indicate a long-term potential for new resources.

In particular the representatives from the fishing sector requested to link the establishment of an MPA at Sedlo with the installation of a long-term site-specific monitoring programme to evaluate the success of the management measures. Both monitoring and financing the MPA should be part of the management plan. The results would also be important for fishermen to know whether fishery closures are a useful tool for sustainable management of fish stocks in Azorean waters.

At a regional scale, the fisheries monitoring programme MONICAP will monitor the presence and movement patterns of vessels larger than 15 m which are required to carry “blue boxes” – this would likely be virtually all fishing boats operating near Sedlo seamount. National authorities are in charge of vessels of their flag. In case of suspected illegal activity, it is possible to communicate to the respective authorities. Currently the monitoring of vessels in regional MPA's was considered insufficient and unreliable.

The regional fisheries director proposed scientific monitoring by observers onboard commercial platforms in order to supplement results obtained with scientific methods. Due to the distance, fishing vessels would have to be paid for doing this work. However some funds for scientific monitoring may become available based on the consideration of seamounts as a priority habitat under European legislation and on the OSPAR list of priority species and habitats.

10. OASIS aims at developing more general management recommendations: Does this seamount have such characteristics that it can be used as a model for other seamounts, maybe also shallower ones?

OASIS is now in the final phase of results analyses. The two seamounts investigated are different in many aspects which will make it very difficult to apply the same measures on several seamounts. But, despite of the differences, from the oceanographic perspective, a lot of similarities were found to occur at Sedlo and Seine seamount: similar water masses, including traces of Mediterranean water, phytoplankton distribution, the formation of a Taylor cap.

The fish biodiversity found in Sedlo is the same as found in other places in the archipelago. However, it was a surprise to find that this seamount is a spawning area for some species, like alfonsino and orange roughy. The latter is caught only with bottom trawl, prohibited in this area, and is endangered in the north east Atlantic. The catches of alfonsino (*Beryx* sp.) and bulls-eye (*Epigonus telescopus*) are decreasing in the mid Atlantic ridge re-

gion, but at Sedlo maturing and very large individuals were captured, indicating potential resident spawning populations. However, a commercial longliner fishing there soon afterwards did not catch those large individuals. The reasons for this could be the depth stratified effect of the current systems which can affect the behaviour of the gear used in the catch of black scabbard fish, as well as the depth of capture.

In terms of results from the scientific longlining, abundances at Sedlo are much higher compared to Seine which is located in an area of lower surface productivity further south. However, Seine has a higher diversity of fish species as it reaches from more than 3000 m depth to 180 m below the surface. Obviously, it will be necessary to conduct further studies before any measures can be applied at another seamount.

A representative of the fisheries sector requested the development of a long-term regional (Azores) strategy for fisheries and environment. In order to give an opinion on the establishment of an MPA at Sedlo it would be most important to be able to put the measures proposed in relation to a long-term strategic framework. In particular it would be interesting to think about a possible future shift towards developing further deep water fisheries in the Azores.

The representative of the Azorean Fisheries Federation) emphasized that this type of meeting provided practical benefits to the sector (partnership between scientists, fishermen and politicians). It was important to involve stakeholders at an early stage in the process to adjust to different needs and to create a better understanding. Fishermen are interested in the long-term sustainability of their activities. Consultations like this will facilitate the implementation of measures.

Final words

OASIS is interested to hear the opinions of all stakeholders in order to include them in developing the management plan proposal and to ensure that no measures are proposed that are not understood by the stakeholders.

This discussion was focused on fisheries stakeholders. There were no clear conclusions, but the issues discussed will be taken into account on the elaboration of the proposal, that will be presented to the regional government. All proposals for MPA's management have a period of six months for public discussion.

Rapporteur: Carla Dâmaso
Workshop report by Sabine Christiansen