Report of the

Joint ECS-ASCOBANS-ACCOBAMS Workshop on

The challenge of spatially managing cetaceans – a highly mobile animal group

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INTRODUCTON During its history, the European Cetacean Society has held two workshops on Marine Protected Areas, the first entitled “Protected Areas for Cetaceans” was held in Valencia, Spain in April 1999, and the second “Selection Criteria for Protected Areas for Cetaceans” in San Sebastian, Spain in April 2007, in conjunction with the international conservation agreements, ASCOBANS and ACCOBAMS. These workshops introduced the concept of marine protected areas for cetaceans, the various functions they can serve, and recommended criteria for use in their selection.

The main piece of legislation catering for MPAs in Europe has been the EU Habitats Directive with the Natura 2000 network of Special Areas of Conservation for Annex I habitats and Annex II species. However, the Natura 2000 network has been of limited benefit for marine mammals in general. First, amongst cetaceans, only harbour porpoise and bottlenose dolphin are considered for SAC designation, and offshore foraging areas for seals have scarcely been considered. Second, many countries have been slow to propose cetacean SACs and where they have done, they often comprise only small areas covering a minor portion of the range of the population they were established to protect. Thirdly, even once an SAC has been designated for a marine mammal species, managing threats to that species remains a challenge.

The concept of marine spatial planning and the zoning of areas for different activities and with different levels of protection has become incorporated in the new EU Marine Strategy Framework Directive. Beyond the European Union, countries throughout Europe and adjacent seas are looking to ways to establish wider marine protected areas, although focus remains upon the coastal zone where potential conflict with human activities is greatest. This inevitably presents many challenges, particularly for highly mobile marine species such as cetaceans. In addition, the work undertaken through OSPAR and the Barcelona Convention on the identification of Ecologically or Biologically Significant Areas, and the development of representative networks of MPAs including not only national waters but also the high seas, is of particular relevance for cetacean conservation.

This workshop proposed to examine best ways to spatially manage threats to marine mammals in Europe and adjacent seas both within and beyond MPAs. Attention was focused upon the areas covered by the two Regional Agreements, including the area of overlap. The intention was to draw upon the direct experiences of policy makers, managers and scientists using case studies where appropriate from Europe and beyond; and to examine possible approaches to improve MPA management so that it can deal with the wide range of threats that impact marine mammal populations throughout their range. Emphasis was placed upon consideration of large zoned MPAs and the incorporation of multiple species across marine taxa as well as more general ecosystem considerations. ASCOBANS and ACCOBAMS Secretariats kindly provided financial support towards the organisation of this workshop and participation of invited speakers.

A total of around one hundred persons from at least 25 countries attended the workshop. Fourteen talks were presented covering three main themes: Regional Frameworks, Impacts on Cetaceans in a Spatial Context, and Case Studies. Each theme was followed by a general discussion, with concluding remarks at the end of the workshop. Annex I outlines the Agenda for the workshop and Annex II list those attendees that pre-registered.

Heidrun Frisch introduced the first theme of the workshop, Regional Frameworks, with a talk reviewing recent efforts by OSPAR, HELCOM, and the European Commission. She noted that the European Environment Agency had identified 22 environmental policy instruments (global and regional) relevant to the establishment of protected areas in Europe, of which the most important were EU Directives (Habitats Directive & Marine Strategy Framework Directive) and the Regional Seas Conventions (OSPAR, HELCOM, Barcelona Convention and Bucharest Convention). The latter can also designate protected areas on the High Seas. The EU Habitats Directive has as its overall objective to ensure that the listed species and habitat types are maintained at, or restored to, a "favourable conservation status". Two species (harbour porpoise and bottlenose dolphin) are listed on Annex II. For these species, Sites of Community Importance (SCIs) are first identified; these are then reviewed by the Commission, after which may follow designation of Special Areas of Conservation (SACs). 196 different sites are identified as having harbour porpoise and 274 sites having bottlenose dolphin, although in only a minority of cases are they classified as important areas (categories A & B) for the species. For species such as cetaceans or fish, which do not spend time on land, and for parts of the life cycle of those species that do, it is acknowledged that it can be difficult to identify areas of sea "essential to their life and reproduction". Defining boundaries for 'sites' in offshore waters which support a given percentage of the national population of some mobile species may be difficult due to the lack of obvious natural boundaries in the open sea. However, recent progress in the use of geo-statistical techniques to identify densities and distribution centres in space and time for mobile species such as cetaceans and birds can support the site selection process for mobile species.

All cetacean species, listed in Annex IV of the Habitats Directive, benefit from a strict protection regime under Community legislation in European waters. Therefore, the provisions of article 12 apply to the protection of cetaceans, including the obligation to avoid deliberate disturbance in all EU waters (inside and outside Natura 2000 sites). Article 6 on Natura 2000 sites requires the designation of protected areas for Annex II species, and the development of management plans. The EU Biodiversity Strategy sets 2015 as the deadline for their completion. However, this provision is not applicable for non-significant populations, which are therefore not qualifying features for the site. Since cetaceans appear in Annex II and IV, it is clear that the intention was to have two regimes complementing each other.

The EU Marine Strategy Framework Directive is an ecosystem-based approach to the management of human activities for sustainable use of marine goods and services. Its goal is to achieve "Good Environmental Status" (GES) by 2020 across Europe's marine environment. It requires member states to develop a marine strategy for their waters with regional coordination through Regional Seas Conventions. Eleven high-level descriptors of GES have been developed, but no specific programme of measures as yet, except for the establishment of MPAs.

OSPAR has two types of MPAs: 276 ones in territorial waters of contracting parties, which largely overlap with Natura 2000 sites, but can have broader ecological criteria for selection, with regional coordination in management; and six High Seas MPAs which account for 40% of the OSPAR Maritime Area beyond national jurisdiction. The goal of the latter is to build an

ecologically coherent network of MPAs. Selection has been largely based on permanent features such as seamounts, ridges, fracture zones – not specifically related to the importance of the area for cetaceans or other mobile species, even though they form part of the biodiversity criteria and objectives for each site. The conservation objectives are to be supported by management oriented, achievable, measurable and time bound targets. Relevant to cetaceans is the following specific objective: "2.3.1 Water Column. c. To protect, maintain and, where in the past impacts have occurred, restore where appropriate the epipelagic and bathypelagic ecosystems, including their functions for resident, visiting and migratory species, such as: cetaceans, and mesopelagic and bathypelagic fish populations. Special attention should be given to the area of the meandering sub-polar frontal ecosystem."

HELCOM, which is a regional seas convention applying specifically to the Baltic, has as its target that "by 2020, there should be an ecologically coherent and well-managed network of Baltic Sea Protected Areas (BSPAs), Natura 2000 areas and Emerald sites in the Baltic Sea." 89% of the 86 notified and designated BSPA sites are terrestrial or coastal within the territorial waters; 99%, of the officially designated BSPAs are also Natura 2000 sites.

Some common points of all these regimes were identified: 1) Most MPAs are relatively small, the exception being the OSPAR High Seas MPAs; 2) area selection is based primarily upon benthic or demersal sedentary species or habitats, partly because identifying critical habitat for mobile species is a challenge; 3) all frameworks strive to establish ecologically representative and coherent networks of MPAs; and 4) all frameworks require development of management plans and monitoring.

Heidrun Frisch concluded with four questions: 1) Do the existing MPAs/MPA networks adequately cater for mobile species? 2) Even if selected for other reasons (including biodiversity criteria), do they coincide with important areas for cetaceans? Why, or why not? 3) What protection/mitigation measures with spatial components are taken inside and outside the MPAs (e.g. fishery closures, marine spatial planning requirements)? and 4) From the cetaceans' viewpoint, do MPAs make a difference?

Giuseppe Notarbartolo di Sciara addressed the issue of place-based protection for cetaceans in the Mediterranean Sea. In collaboration with Erich Hoyt, he identified eight main areas where cetacean MPAs were proposed on the basis of these forming critical habitats for a range of species. Experts from different species groups were then invited to contribute their data for overlays of important areas for marine turtles, sharks & rays, bluefin tuna, marine birds and monk seals. Several of the areas proposed overlapped with those selected for cetaceans. The results (project name: Critical Habitat of Mediterranean Predators) were offered to CIESM (Commission Intérnationale pour l'Exploration Scientifique de la Méditerranée) at Venice in 2010, providing strong indications on the biological importance of these areas. Meanwhile, a number of Specially Protected Areas of Mediterranean Importance (referred to as SPAMI's) were established during the past decades within the framework of the Barcelona Convention. However, these formed an assemblage dictated by the availability of the single Mediterranean countries to propose them rather than a network, so that any representativeness and connectivity was more by

chance than by design. A recent effort spearheaded by UNEP MAP with the support of the EC addressed this problem by identifying Ecologically or Biologically Sensitive Areas (EBSAs) in open seas and deep seas of the Mediterranean, where SPAMI could be eventually be formally designated. This was accomplished through a rapid survey of experts of Mediterranean marine ecology, biodiversity, oceanography, and geomorphology, which produced 90 polygons in all eight sub-regions of the Mediterranean. These included 18 areas selected for bottom features (canyons, seamounts, etc.); 59 as known habitats of protected species (mammals, birds, turtles, sharks, large pelagics) as well as deep-sea coral beds; and 13 high primary productivity areas. Within these potential EBSAs, a first list of 12 areas were drafted and endorsed by Parties to the Barcelona Convention (Feb 2012) as "priority conservation areas" in the open seas, including the deep sea, likely to contain sites that could be SPAMI candidates. These include: Alborán Seamounts; Southern Balearic Islands; Gulf of Lions shelf and slope; Central Tyrrhenian Sea; Northern Strait of Sicily (including Adventure and nearby banks); Southern Strait of Sicily; Northern and Central Adriatic; Santa Maria di Leuca; North-eastern Ionian Sea; Thracian Sea; North-eastern Levantine Sea and Rhodes Gyre; and the Nile Delta Region.

The following main challenges were identified:

• How are these new large open seas MPAs going to be managed? Is it conceivable to establish MPAs without providing for a solid management mechanism, just like in the Pelagos case? Can a management mechanism of an MPA in ABNJ be created within the existing legislative framework, or do we need something new?

• How can we ensure that cetacean conservation within future MPAs is included in their management plans?

• Can corridors among MPAs be identified so that connectivity is addressed with specific conservation measures?

The third talk addressing the theme of Regional Frameworks, was given by **Jeff Ardron**. He examined the governance of areas beyond national jurisdiction, often referred to as "high seas" areas, at the global and regional level. He outlined the CBD (Convention on Biological Diversity) process on Ecologically or Biologically Significant Marine Areas (EBSAs). He highlighted the range of international institutions that manage human impacts on aspects of biodiversity, pointing out that no single body protects biodiversity as a whole. The sectoral bodies (e.g. fishing, shipping, and mining) use 'hard law' regulatory measures, whereas the conservation agreements (e.g. CBD, Convention on Migratory Species, etc.) rely on 'soft law' voluntary agreements.

Three premises were identified for pelagic MPAs: 1) Management of human activities that occur within fluid/dynamic features will entail either very large static zoning, or fluid/dynamic temporal-spatial management, or a combination of both (fluid measures in large areas); 2) Our understanding of pelagic features is at a coarse scale and requires validation and feedback; and 3) If dynamic management is undertaken, it will require near-real-time data flows and decision-making.

One illustration of dynamic management in practice is the deployment of “smart buoys” relaying acoustic information on right whale detections in the Stellwagen Bank National Marine Sanctuary that can then be used to modify the tracks of large vessels thus reducing the danger of ship strikes.

In the context of fisheries management, it was noted that 47 out of 68 actively managed fisheries have no regional observer coverage. Seven out of thirteen RFMOs (Regional Fisheries Management Organisations) have no observer data. Three lack observer programme data because Parties are not required to report, and four lack data sets because they do not have an observer programme. And only three of the 13 RFMOs have regional observer programme data sets of sufficient time-series length to support most rigorous research applications (Gilman *et al*., 2013: Performance of regional fisheries management organizations: ecosystem-based governance of bycatch and discards. *Fish and Fisheries*, doi: 10.1111/faf.12021.

Planning needs to account for variability and uncertainty. To do that, the following recommendations were made: 1) Recognize those places that are already known to be special; 2) Anchor spatial planning around more persistent features, whenever possible; 3) Choose scales that are stable to perturbations (e.g. functional communities vs individual species level); 4) Take a portfolio approach (distribute risk, etc.); 5) Keep it simple (do not over-fit); and 6) Plan in advance your management options to be open to adaptation and learning.

A final point made was that since there is uncertainty in what we do, actions should be reversible. If fisheries managers did not apply adaptive management (updating catch quotas), the result would be disastrous. At present, it is generally difficult to reverse MPAs. However, if MPAs were able to be reversed/revised, then they might be more accepted by industry, and lead to better experiments and utilisation as marine mammal management tools.

The second session addressed the theme of Impacts on Cetaceans in a Spatial Context, with each of the main conservation issues reviewed. **Christopher Clark** focused his talk on the human impacts upon ocean acoustic ecology. He presented three main messages: 1) Marine animals depend on sound and their acoustic environments for life (acoustic energy); 2) Human activities impose huge risks to those habitats over very large spatial and temporal scales (chronic noise from shipping and energy exploration); and 3) Knowledge can change the conceptual paradigm, our attitudes, and our behaviours (scientific activism), and we must act!

Different marine animals occupy different acoustic niches in terms of space, time, and sound frequency. Blue whale singers can be heard across an ocean, at frequencies similar to those produced by commercial shipping and seismic exploration. Beaked whales occupy shelf breaks and deepwater basins or canyons relying upon sonar in the ultrasonic frequency range (25-55 kHz).

Risks to wildlife and habitats can be expressed as either acute or chronic. Acute risk is the risk of an animal being struck, injured or killed; chronic risk is driven by cumulative risk. It

includes the direct and indirect costs of multiple anthropogenic stressors, where multiple stressors originate from physical and biological changes in their environment, which leads to reduced health, fecundity and survival.

Ninety-six percent of the world's commerce is conducted on the oceans, with some regions of the world receiving much higher levels of shipping than others. The means now exists to track much of this shipping in real-time. It is also possible to collect enormous amounts of acoustic data using a variety of autonomous units (e.g. auto-detection buoys, acoustic mouse traps, etc.), and even to map shipping noise at an ocean scale (see, for example, the work of the NOAA Sound Mapping Group). The results of this scientific monitoring may be used to determine risk, as for example has been done with northern right whales off Boston, Massachusetts. The consequences of shipping noise on right whale acoustic habitat can be expressed in terms of reduced foraging efficiency, decreased mating opportunities, lower survival, or population decline, with habitat loss being driven by high chronic background noise + discrete noise events.

Humans remain very much in denial of the scales at which seismic airgun surveys operate. These surveys produce very loud sounds over very large areas for very long times. Seismic airgun activities west of Portugal, for example, could be shown to ensonify an area of 100,000 square nautical miles. A similar large-scale impact was modelled for Virginia, USA using a Seismic Airgun Noise Footprint Model, which revealed noise levels of between 125 and 135 dB, 7.5 seconds after the impulse at ranges of 30-100 km.

If one superimposes the frequency-spatio-temporal spaces occupied by shipping, seismic airguns and mid-frequency active sonar upon those of the various cetacean taxa, it becomes clear how much the former impinge upon the latter. Of anthropogenic noise, shipping and seismic occupy by far the greatest niche space.

A pragmatic approach to environmental compliance is recommended in the form of a three-legged stool, implementing real-time open-access mechanisms to engage the public. The three legs between environmental compliance and communication are regulations, research and development, and monitoring & mitigation (as required). All three are necessary if society is to address the issue of noise.

Ana Tejedor Arceredillo followed on from Christopher Clark's talk by introducing the maritime traffic sector and its potential impact on cetaceans and biodiversity in general. Shipping is a global industry, being a relatively cheap way to conduct world trade. It has increased markedly over the last fifty years, particularly in the last ten years. Most shipping is either general cargo or tanker traffic. Most of the world fleet is owned by four nations: Greece, Japan, Germany and China, although many other countries participate in ownership. Impacts on biodiversity include accidental spills, operational discharges, ship-generated emissions, underwater noise, marine debris, ship strikes, damage from grounding and anchoring, and movement of alien species.

Several legislative agreements provide a regulatory framework for the shipping industry. In a number of cases these have been effective, for example in reducing major oil spills. There have been two IMO Resolutions (in 1999 and 2008) in relation to voyage planning, and a

guidance document for minimising the risk of ship strikes to cetaceans, whilst external initiatives include the establishment of High Seas Marine Protected Areas under OSPAR.

Within Spanish waters, a LIFE+ INDEMARES project involved a marine spatial planning analysis to mitigate the shipping impacts on cetaceans. This involved collecting data on distribution, movements, aggregation sites (e.g. bottlenecks), and habitat use of vulnerable species (e.g. sperm whale), and relating this to the distribution and behaviour of ships in the region (number and type of vessels, distribution and routes, vessel speeds). This then enables a risk analysis by identifying potential hotspots where both cetaceans and shipping overlap, so that mitigation measures can be applied along with monitoring of compliance with any measures adopted. Similar exercises can be conducted by mapping ship noise.

Thirteen areas may be identified where the impacts of ship strikes should be a matter of special concern: the Bering Sea, waters around Hawaii, coastal California, west coast of Chile, north-eastern United States, the Caribbean, coastal Argentina, the Canaries, Strait of Gibraltar, Gulf of Oman, coastal waters of Japan, Indonesia, and New Zealand. The characteristics of these identified hotspots are bottlenecks of maritime traffic, fast shipping lanes, areas with intensive cetacean based tourism, and research & monitoring whale hotspots. Other potential sites include locations where there is overlap of maritime traffic lanes with cetacean hotspots.

The implementation of mitigation measures (such as speed reductions) has not always been successful. In the case of Cabo de Gata, 100% compliance was achieved. In the case of the speed reduction recommendation, the suggested radio transmission of whale-ship strike risk to mariners in the first years was not implemented with any regularity, and was finally suspended by IMP given that it is not considered a message responding to safety at sea requirements.

Spatial management of recreational impacts on cetaceans was next considered by **Enrico Pirotta and David Lusseau**. In the last few decades, a considerable shift in the use of marine resources has taken place, from consumptive to non-consumptive uses. Marine tourism now generates more income than fisheries and aquaculture combined. Two types of recreational activities may impact upon cetaceans: whale and dolphin watching, and ecotourism in general (ranging from occasional to commercial, and to swim-with/feeding programmes). The growth of the industry, resulting from the change in attitude towards these species in western countries, is now expanding to developing countries, where it is actually much more difficult to manage. However, other recreational activities can also affect cetaceans, although these are often managed separately.

Short-term effects may derive from noise or physical harassment. These effects include stress, evasive tactics such as changes in travel direction and speed (horizontal changes, for example minke whales in iceland changing their movement path as the result of interactions with whalewatching boats, going from a sinous path associated with foraging to a more straight directional path associated with travel); and changes in dive times (vertical changes). These may lead to an alteration of the behavioural budget – disruption of resting or foraging, masking of echolocation and communication, and effects on prey (e.g. fish being scared away). At the extreme of acute effects is habitat displacement, which may have a

direct effect on vital rates. Acute responses or changes in behaviour are not necessarily biologically significant, however.

Non-lethal effects (on behaviour and physiology) can affect the ability of individuals to maintain a good energy balance (constraints on decisions about energy allocation to survival and reproduction), and therefore may translate into effects on vital rates and, ultimately, population dynamics. Examples include a change in habitat use for one bottlenose dolphin population, and a change in calving success (lower calf survival) for another whose range was entirely exposed to whale watching. As long-lived species, cetaceans can be expected to prioritise survival over reproduction.

Long-term effects will depend on the proportion of the population impacted, the exposure rate of single individuals, importance of an area/activity for the individuals, and key life stages, all of which will affect an individual's ability to compensate for disturbance.

The absence of short-term responses does not necessarily imply the absence of effects, however (tolerance is different from habituation). An individual might not leave an area because its activity is too critical (for example, if it is an important feeding area). There will always be a trade-off.

Since cetaceans are generally mobile species, they will be exposed to different threats in different parts of their range. Recreation is unlikely to be the only human activity in a given area. So one needs to consider additive/synergistic effects of different threats.

In terms of management, so far there is a lack of a unified robust scheme to manage these effects, probably because of the way that recreation has been viewed. Habitat modelling has been used to identify critical areas and plan the exclusion of touristic activities (whether at specific times or permanently). An example of the management of the whale watching industry is that of Hervey Bay, Queensland, Australia. Within two years of the start of the industry, in 1987 a spatially explicit management scheme was put in place, with defined management goals. Management started with a mathematical model for the number of licenses issued; a transferable scheme of licensing that included enforcement (individual transferable quotas, ITQs), and the capacity for industry consolidation over time. This seems to be having a positive effect.

Another example is in the Moray Firth, East Scotland, where by using a long-term data set, one can compare the density of bottlenose dolphin individuals across their range, overlaid with the distribution of disturbance (boats, in this case), in order to derive an exposure rate. The same approach can be adopted at the individual level. One can then combine these results with information on which areas are most relevant to the animals (e.g. for specific activities, such as foraging), then and use all this information to build an individual-based model that can predict the changes in the behavioural budget as a result of exposure, or the predicted changes in individual condition, which are then expected to reflect upon the individual's vital rates.

The management aim should be to determine the conservation status of the targeted population, managing non-lethal effects as takes, and managing these together with other

threats so as to form a unified evidence-based precautionary framework. It is important that management is predictive rather than reactive, which can be informed by individual-based models.

For management, cetaceans need to be viewed as a common-pool resource, because they are a source of income. Operators compete to extract benefits. If there is unlimited/open access for a few, then the others will be economically damaged. Quotas of carrying capacity/sustainable threshold may need to be imposed, as in fisheries. It is important, however, that there is dialogue with stakeholders.

There are a few instances where self-regulation has been assessed, generally with not good results. One of the problems is the international nature of this resource, so there is a need for inter-governmental bodies to manage it.

Since the use of space by animals is not uniform, and different areas will be relevant for different life stages at different periods for a different portion of the population, and there is also a non-uniform distribution of human activities, there should be an adaptive management scheme, with acute response measures such as time-area closures.

Susceptibility to disturbance varies with individuals (their sex, age, degree of tolerance, reproductive condition, etc) as well as a lot of confounding factors in the measurement of responses. The number of vessels, duration of encounters, and behaviour around animals may all have differential effects. It is important to consider management throughout the life of an individual. Different areas may have different threats, but there will also be cumulative effects. That is why management especially needs to be intergovernmental.

One final question is how to treat uncertainty in every step of the process (response, and effects of response). For this, it may be necessary to use appropriate modelling frameworks. However, there is a need for more data. The information needed includes 1) quantification of responses (and their characterisation – under which conditions are animals more likely to respond, and what happens if they do not move away, which factors of the interaction determine the onset of a response), in an ecological (e.g. natural predation) and antropic (other disturbances/threats) context; 2) individual usage of space (e.g. home ranges); and 3) models predicting recreational/boat usage. In general there is a need for longitudinal long-term data sets.

David Mattila's talk on the effects of fisheries upon cetaceans (with emphasis upon large whales), was presented on his behalf by Brad Barr as unfortunately he was unable to attend. The specific question posed was how big a problem is bycatch for cetaceans, and can marine mammal protected areas play a role in its solution? Reporting to the IWC of entanglements by country almost certainly represents a very small fraction of the actual number that take place. Scar studies are thought to represent a more accurate means to investigate interactions with ropes and nets. These show that between 20 and 70% of studied populations are scarred. In the Gulf of Maine, between 10 and 25% of whales acquire new wounds each year although less than 10% were reported to the local Response Network. Entanglement was thought to represent 2-4% of annual mortality in some humpback whale populations, and may be the primary human threat to most stocks, especially critically

endangered populations. In the North Pacific, no population of humpbacks had less than 20% entanglement scarring. Whales can get entangled in any type of passive gear. The recommendation of an IWC workshop in Hawaii in 2010 was for better data collection. Marine mammal protected areas could in particular help by conducting distribution, abundance and scarring studies, acting as a catalyst or hub for stranding responses, conduct fishermen interviews, and provide support for reporting and/or response programmes.

There are various ways in which impacts could be prevented or reduced: fisheries or areas could be closed; "whale safe" fishing gear could be designed; and recue networks could be developed. Protected areas could thus institute seasonal closures, provide a site and support for experimental fisheries (e.g. only fishers with new "whale safe" gear could fish in otherwise closed areas), and they could act as a catalyst or central focal point for rescue networks.

Time-area closures, however, can be difficult to manage since whales are mobile and may be exposed to fishing gear outside of the closed area. Furthermore, closed areas have to be publicised and then monitored. Seasonal and dynamic area closures require extensive enforcement; they can require extensive monitoring for whales; they may involve difficult communication to fisheries and it is important that actions required are feasible; and usually they displace rather than reduce fishing effort.

The second general type of prevention is that of designing "whale safe" fishing gear, or at least, less risky gear. Gill nets are generally considered (per unit effort) to be very high risk. In Sweden a type of fish trap that floats just off the bottom was developed to replace gill nets in order to reduce harbour porpoise and seal bycatch. In Argentina, some fishermen switched from gill nets to long lines, in order to reduce dolphin bycatch. Neither is completely "safe", however. It appears that any "passive" gear in the water with whales can entangle them, and in US waters the most prevalent gear falls into two types of gear: Pot fisheries (I.e. for lobster), which can entangle the whale in the buoy line, or the line between pots if it is floating line. This latter may pose a greater risk than originally thought. Divers and video of floating "ground lines" between strings of traps have shown that it floats up into the water much higher than the fishermen using it had thought. And so, sinking the ground line, as has now been done in New England (USA), may provide a significant risk reduction. A study of the strength of gill nets has suggested that whales might easily break through monofilament webbing, but the "float line" makes the whole net much stronger, and likely prevents the whale from breaking through. And so, for certain gill net fisheries in certain parts of the US, "weak links" in the float line are mandated. Also, in the belief that a whale might be more likely to "slip" out of an entanglement in a buoy line, "weak links" at the buoy were mandated in certain US fisheries in New England. Protected areas can be used to allow fishers into areas closed due to whale entanglement, if they can use gear that is clearly zero, or extremely low, risk (e.g. single traps with no buoy line). If successful, these can then be gradually mandated outside of the MPA.

Finally, reduction of the impact can occur by developing rescue networks. Such a scheme was introduced in the Hawaiian Islands Humpback Whale National Marine Sanctuary in 2002, for example. This entailed training teams and establishing "caches" of equipment on

key islands, usually stored using Sanctuary offices and staff. Rescue does not involve getting into the water nor is it assumed that the whale “knows” that it is being helped. These are two common misconceptions. If the whale does not drown immediately, there is usually time to respond. Another common misconception is that cutting some of the entanglement off is better than nothing, however this often leaves the "lethal wrap" on the whale and makes it harder for a trained team to fully release.

Before intervening, an assessment is made as to whether success is likely. These involve asking the following questions: Is entanglement potentially lethal? Are the environmental conditions appropriate? Does one have proper resources? What is the risk to whale and rescuers? Does one have authorisation to undertake a rescue? For all attempted rescues it is important that the species, individual ID (if possible), health assessment, gear, actions, and follow-up are all documented.

Freeing a whale usually involves the following steps: 1) Approach cautiously and habituate the whale, looking for signs of stress; 2) Assess the entanglement (e.g. mouth, flippers, body, tail?); 3) Use knives that cut by hooking and pulling away from the whale; 4) Generally cut from the most forward line to the aft, leaving the last cut to release the whale from its anchor.

With help from the IWC, capacity building for regional response programmes has been instigated, following a workshop in Provincetown in 2011, with general principles and guidelines agreed.

The remainder of the spatial management workshop was devoted to case studies, with seven presentations. **Michael Tetley** gave a talk on the principles of best practice in addressing ecological coherence in MPA networks and Marine Spatial Planning. Ecological coherence is a widely used term aimed at providing a frame of reference for conservation practitioners, and a set of guiding design principles for establishing Marine Protected Area (MPA) networks. These principles have been developed and applied to a range of spatial scales worldwide for a variety of MPA and marine spatial planning (MSP) initiatives. In the Northeast Atlantic, these are mainly related to the OSPAR MPA network and the EU Natura 2000 network.

The OSPAR network of MPAs has been established to support the sustainable use, protection, conservation of marine biological diversity and ecosystems in partnership with other measures. These will, both individually and collectively, aim to protect, conserve and restore species, habitats and ecological processes which are adversely affected as a result of human activities; prevent degradation of and damage to species, habitats and ecological processes, following the precautionary principle; and protect and conserve areas that best represent the range of species, habitats and ecological processes in the OSPAR area. The Convention defines ecological coherence as the relationships, interactions and connections between marine species and marine environment, resulting in further resilience to changing conditions. A network of MPAs designed as such is characterised by coherence in purpose, and by the connections between its constituent parts. Ultimately, the network’s constituent

parts should firstly be identified on the basis of criteria, which aim to support the purpose of the network.

The development of an ecologically coherent network of MPAs should take account of the relationships and interactions between marine species and their environment both in the establishment of its purpose and in the criteria by which the constituent elements are identified. A functioning ecologically coherent network of MPAs should interact with, and support, the wider environment as well as other MPAs although this is dependent on appropriate management to support good ecosystem health and function within and outside the MPAs. It is recommended that there should be a greater harmonisation between the different ecological networks in order to achieve maximum synergies.

Beyond those terms provided by OSPAR, the Natura 2000 Directive defines ecological coherence as a sufficient representation (patch quality, total patch area, patch configuration, landscape permeability) of habitats/species to ensure favourable conservation status of habitats and species across their whole natural range. Migration, dispersal and genetic exchange are essential key processes for species acknowledged in Article 10 of the Directive in order to obtain or maintain favourable conservation status.

Reflecting upon both of these policy frameworks, common elements of the guiding principles of ecological coherence become apparent. These include that throughout the network 1) features comprising habitats, species and ecological processes are incorporated; 2) they are proportional throughout the network; 3) they are representative biogeographically or by management units of species and habitats; 4) they can be connected either by exchange of larvae, recruits, juveniles, or adults and by linkages for the flow of non-living organic matter; 5) they are resilient and contain suitable replication of sites or areas with features with suitably sized sites or areas for management; 6) they are managed, ultimately meeting a standard whereby an effective programme of management covering the entire marine ecosystem and the land areas that affect it, recognising the mutually supportive role that both marine protected areas and wider ecosystem management have in protecting and conserving biodiversity and in supporting its sustainable use.

Brad Barr gave his experiences of spatial management with examples from the US National Marine Sanctuary system and beyond. His first example was of northern right whales in the Stellwagen Bank National Marine Sanctuary where the species faces threats from ship strike, fishing gear entanglement and noise disturbance. A number of challenges were outlined: entanglements and ship strikes are relatively rare events and therefore difficult to predict; noise impacts are not well understood; the efficacy of management responses is often difficult if not impossible to evaluate; few (if any) responses have been demonstrated as “successful”; most efforts are driven by precaution (and hope); and resources for research, monitoring, enforcement/compliance, and infrastructure are limited.

There are eleven national marine sanctuaries in the vicinity of continental US, with a further two in Hawaii and one in Samoa. Zoning is used as a spatial management tool. In the

national marine sanctuaries in eastern US, there is mandatory ship reporting to reduce the likelihood of vessel strikes, with seasonal management areas in some high-risk localities. This is aided by passive acoustic monitoring, as well as a "Whale Alert" software application. In the Channel Islands of southern California, a traffic separation scheme has been proposed to reduce the likelihood of vessels striking blue whales. And working with IMO, particularly sensitive sea areas (PSSAs) have been identified elsewhere in US waters, along with areas to be avoided (ATBAs) within the national marine sanctuaries. There are a number of issues here: 1) international shipping requires IMO endorsement and action, and one needs to address cases of "innocent passage"; 2) efficacy estimates are based on risk calculations but these are difficult to evaluate, and may create the perception of protection, limiting opportunities to try other ideas; 3) there is a need for identification of "globally-significant whale aggregation areas", and working with the marine transportation industry, these should be avoided, where possible, through route planning; and 4) resource requirements are significant if one is to reliably avoid whales, particularly since some may be present but not detected.

In the Stellwagen Bank NMS, some areas are closed to fishing. Dynamic management areas have operated for periods of time, triggered when right whale densities reach or exceed 0.04 whales per nautical mile^2. They can require removal of fixed gear, or use of gear modifications (e.g. sinking line, limited buoys, weak links, enhanced anchoring of sink gill nets). These are of limited duration (e.g. two weeks) and it is not known how effective they are.

Recreational fishing for bluefin tuna is a significant permitted activity within the Stellwagen Bank NMS. The tuna and whales feed on the same fish, and fishermen target areas where whales are feeding. Outreach education and enforcement are therefore essential.

There is significant under reporting of entanglements with the number of reports being well being the number of actual incidents occurring in the NMS. It is unclear whether spatial management measures in the protected area are effective.

Currently, there are no "whale watching zones" in the NMS system. Whale watching vessels are subject to voluntary guidelines, limited regulations, and ship management related to collisions with whales. It is perceived to be a "relatively benign" activity with opportunities for outreach and education, raising public awareness. There have been few demonstrated population-level impacts although some cases of harassment of individuals. There is a significant challenge, however, related to the many smaller private vessels engaged in whale watching. In Iceland, whaling is banned in the areas where whale watching takes place.

Other human activities that may impact upon cetaceans include oil & gas exploration and development, offshore mining, and alternative energy sources. Such developments are generally restricted within national marine sanctuaries but other unprotected areas where cetaceans may concentrate (e.g. the Chukchi Sea and areas off eastern Canada) are currently exposed to these developments.

One recent initiative to mention is the "Beyond Borders" project – an innovative management tool for the protection of a transboundary marine mammal species, the

humpback whale, involving collaboration between the Stellwagen NMS, Bermuda and Dominican Republic NMS, and the French Antilles Marine Mammal Sanctuary.

The following conclusions and observations were made:

• Many potential management tools have been conceived, developed and implemented (with and through partners) in the US NMS System; these can serve as models elsewhere.

• MMPAs can be a catalyst, driver and test-bed for creative spatial management ("in the box", regionally, and internationally).

• Most existing measures remain unproven, precaution driven, but are likely to prove effective to some degree, eventually. However, one needs to avoid the perception that "we've solved the problem".

• Public awareness and support, resources and political will are all required, yet all tend to be in short supply.

Nicholas Tregenza introduced one practical measure that contributes to the application of spatial management, that of static acoustic monitoring with particular reference to the C-POD. He introduced the advantages of the system: it is good for temporal patterns of usage of an area, for animals at very low densities, and it is a potentially cheap source for collection of large data volumes. However, it is weak on species identification (except for particular species like harbour porpoise), there are uncertainties around animals which are silent, and there can be problems with loss of gear at sea. Nevertheless, it has been used in a wide variety of conservation management contexts, such as assessing the effectiveness of pingers attached to fishing gear in deterring porpoises from coming close and thus avoiding entanglement. It has been used to monitor natural noise sources and tidal power, and to examine the effects of seal scarers and turbine construction on porpoises. Diel and seasonal patterns of activity can be monitored readily. And it can be used to identify the presence of endangered species where detections by other means would be very limited. Examples of such usage have been the Hector's dolphin in New Zealand, vaquita in the Gulf of California, and harbour porpoise in the Baltic. Most recently, it has been deployed to monitor river dolphins in localities that represent a very favourable acoustic environment. Future developments are focusing upon obtaining longer running times, an integral acoustic release with light moorings, and better species discrimination.

Peter Evans presented a talk giving evidence-based management recommendations for bottlenose dolphins in the Irish Sea. He introduced the EU Habitats Directive and the bottlenose dolphin as an Annex II species requiring a network of protected areas (Natura 2000 network of Special Areas of Conservation, SACs). There are currently 274 sites in ten member states that host bottlenose dolphin, but very few of these were selected with this species as a primary feature. In the UK, there are just main coastal populations of this species, in West Wales and East Scotland (there is also a significant offshore population along the shelf edge). Three SACs for the species have been established, two in Cardigan Bay, West Wales (proposed in 1996, designated in 2004). The selection criterion was those areas where sightings were concentrated based upon vessel surveys. However, these were

conducted within a fairly confined area and so did not provide a comprehensive survey of the region to identify important areas.

The SAC conservation objective is to maintain (or restore) the habitat and species features, as a whole, at (or to) Favourable Conservation Status within the site. For species like the bottlenose dolphin, this involves monitoring population dynamics, range, habitat and the management of activities and operations. Several monitoring methods were employed: line-transects (by vessel and plane), photo-ID, passive acoustics, and habitat modelling.

Bottlenose dolphins in Wales are locally distributed, mainly coastal particularly in summer where the main concentrations occur in Cardigan Bay. In winter they are more widely dispersed forming much larger groups, mainly in North Wales and elsewhere in the northern Irish Sea. In summer, several headlands form important foraging sites for the species in Cardigan Bay. The population inhabiting Cardigan Bay in summer each year has numbered between 150 and 300 animals.

Using photo-ID almost 400 individuals have been identified between 2001 and 2012. Some appear to be resident to relatively small areas (e.g. 15% have been recorded only within Cardigan Bay SAC), others are occasional visitors, and a smaller proportion are transients. Nevertheless, 78% of individuals that have been recorded in one or both of the SACs have also occurred in unprotected areas in North Wales. No confirmed matches, however, have been obtained with bottlenose dolphins outside the Irish Sea, suggesting that they form a discrete management unit.

Human activities in Cardigan Bay include marine recreation (water sports, sailing, and dolphin watching) and fishing (mainly potting, also some scallop dredging in winter). In North Wales, however, dolphins face some different pressures: offshore wind farm construction, tidal turbine development, shipping, and in the northeast around Liverpool Bay, pollution from various industries (where high levels of PCBs, mercury and lead have all been recorded). The seasonal movements of Cardigan Bay animals to this area, recently confirmed, may thus account for very high levels of PCBs recorded in a juvenile male and a calf in the late 1980s in southern Cardigan Bay (where no local source of PCB exists).

Bottlenose dolphin birth rates have varied a lot between years, being particularly low in 2008 and 2009. This coincided with a major move into Cardigan Bay (including the SAC) of fishing vessels engaged in scallop dredging during the winters of 2007 and 2008. Scallop dredging has now been banned from within the SAC and birth rates have increased. However, without further information on effects upon potential prey, it is not possible to say whether the two are linked.

Line-transect surveys indicate that within Cardigan Bay SAC, the population has been in decline since 2006. One possible reason for this is the sharp increase in recreational activity in the region since that year. Recreation takes the form of water sports, sailing and dolphin watching. The number of dolphin trip operators in Wales has increased from 3 (1998) to 17 (2008) and 26 (2011). However, probably the greatest pressure comes fro water sports. Several photo-identified animals have signs of vessel strike, and short-term responses to vessels have included avoidance, increased dive times, increased swim speeds, changes in

vocal behaviour, and changes in the cohesion of social groups. In those areas where vessel traffic is highest and has increased most, declines in encounter rates are greatest, and several individuals identified as once occupying the SAC on a regular basis have moved out permanently and are now seen elsewhere.

There is a recreational and commercial boating ode of conduct in Cardigan Bay SAC (with an 8-knot speed restriction zone in some areas), and compliance appears to be high, particularly amongst commercial vessels. However, a social network analysis shows that whether or not there is regulation appears to make no difference, and it is in all areas with high vessel traffic that a change in association patterns is observed, with apparent disruption of tightly knit social groups to form looser, larger groupings.

It is recommended that spatial management should extend beyond the two SACs, and particularly should encompass the area around NE Anglesey. The wider Irish Sea distribution of bottlenose dolphins needs further investigation; large group sizes in winter potentially make the species particularly vulnerable to negative impacts of human activities (such as noise disturbance). Those areas identified as important for bottlenose dolphins should not be exposed repeatedly to scallop dredging. The number of motorised small vessels in summer may need to be limited in certain areas to reduce activity levels; solely regulating vessel behaviour seems to be insufficient as a management measure.

Signe Sveegaard and Jonas Teilmann then presented their experiences of selection of areas for SAC designation for harbour porpoises in Danish waters, and how to go from research to management. The main steps for creating a management plan are usually: 1) assess species status on a local and global scale; 2) identify threats; 3) if necessary, implement conservation measures which may include MPAs; and 4) monitor the status of the species, including within the MPAs. In the context of marine protected areas, the first step should be to identify critical habitats. In Danish waters, this was conducted using a mixture of aerial and vessel surveys, acoustic surveys, passive acoustic monitoring, and satellite tracking of individual animals. Twelve years of tracking showed a significant correlation with one year of acoustic surveys, and indicated long-term stability and certainty of areas recommended as SACs. Twelve sites of community interest were proposed.

In assessing the status of the species in Danish waters, three management units were recognised: 1) an isolated Baltic Sea population considered to be critically endangered although its status and abundance is unknown; 2) a Western Baltic population exhibiting declining numbers from 1994 to 2005, with the only possible gene flow being within the Baltic; and 3) a North Sea population that has been stable from 1994 to 2005.

For monitoring the status of porpoises in Denmark, a national surveillance programme (NOVANA) has been initiated on a 6-year reporting cycle, but with annual reports to the EU. Through the Marine Strategy Framework Directive, an ecosystem approach is adopted, with synergy of efforts through the Habitats Directive, CFP Fishery regulations, etc. The plan is for an aerial survey to be conducted annually, and acoustic surveys and passive acoustic monitoring once every three years, with an abundance estimate derived every six years.

Four main threats facing Danish porpoises are identified: 1) Bycatch from fisheries which can be mitigated by no fishing, deployment of pingers or use of alternative gear; 2) prey depletion from fisheries which requires fishery management as a mitigation measure; 3) habitat destruction from fisheries and constructions which can be mitigated by avoidance of critical areas; and 4) pollution, both chemical and noise pollution from shipping, industry, or construction, mitigated by controlling chemical outputs or minimising noise.

For creating a management plan, the Ministry of Fisheries initiated a "Dialogue Forum" in 2010 involving fisheries, NGOs, managers and scientists with the primary aim of regulating fisheries within Natura 2000 sites. The outcome was a buffer zone being set around reefs, and a bycatch/pinger project. In tackling bycatch issues, the Ministry of Fisheries is collaborating with the Danish Nature Agency as well as Aarhus University and DTU Aqua.

DTU Aqua has introduced cameras on ten gillnet fishing vessels for a year to gather information on which gear types are causing bycatch, any seasonal changes observed, and to identify hotspots for bycatch.

Aarhus University has been examining whether deployment of pingers results in habitat exclusion, comparing porpoise densities and distribution (monitored by C-PODs) in areas where pingers are mandatory with those where they are not in use. This will help inform whether this mitigation measure is appropriate.

The following questions are posed for the future:

- Can the network of MPAs fulfil conservation objectives?
- Is the current Natura 2000 network sufficient?
- Can we obtain knowledge of the magnitude of threats (pollution, prey depletion, habitat destruction, bycatch)?
- Can we find appropriate methods for mitigation?
- How will we mitigate bycatch in MPAs?
- Will fisheries bycatch in areas outside MPAs be included in management plans?

The next talk by **Ricardo Sagarminaga** was delivered in his absence by **Tilen Genov**. It presented the case of the Albóran Sea, a European hotspot of marine biodiversity at the intersection of three biogeographic areas. It is an important foraging ground for eight species of odontocete. Using a 23-year database of cetacean monitoring gathered by Alnitak has provided a robust foundation for spatial management. This is especially critical given that the Albóran Sea is also a hotspot for the sectors of maritime transport, defence, tourism, energy and fishing. This relevance is not only at a regional level but also a global level given the relevance of this site as a migration corridor for over 25% of the world's maritime traffic, the loggerhead turtle and the bluefin tuna, and its strategic political position. In 2002, maps were produced for the design of different types of marine protected areas. Since then, these maps have been improved and criteria strengthened in the frameworks of the European Habitats Directive, the Barcelona Convention, ACCOBAMS, and other frameworks. Four SACs were proposed, one SPAMI, and one sectoral MPA within the defence sector.

The recent inclusion of an EBSA proposal for the entire Albóran Sea is currently seen by Alnitak as a very positive step, given that the current NATURA 2000 site list is still seen as very limited for the conservation of cetaceans as the sites are not adapted to the extraordinary spatial requirements of these species. An important lesson here is the need for continuous long-term monitoring: This example of the changes in usage by bottlenose dolphin of the Seco de los Olivos seamount clearly illustrates both the need for larger areas and the importance of long-term monitoring. Unfortunately, there remain many areas where management measures and marine protected area design are based on very limited data.

In 2009 and 2010, several research organisations and military authorities have worked with Alnitak in Albóran Sea. The active involvement of sectors such as that of defence, has provided an important source of data for the development of risk zoning maps that appear to be more operational than marine protected areas.

Frameworks such as ACCOBAMS have provided an important opportunity to develop these spatial management tools at a regional scale, through the cooperation of research groups

Within the fishing sector, collaboration has been very intense at different levels, with bycatch mitigation trials, acoustic deterrent device experiments, capacity building, and also by working together to develop bycatch risk zoning maps. One of the challenges is to make the fishermen understand that developing maps of this nature can take years, and their collaboration is necessary to provide the necessary data to complement survey information, satellite tracking and satellite images of sea surface features. A similar approach has been taken with other sectors, such as tourism and especially energy, given the increase in recent years of projects prospecting for oil extraction, wind energy, thermal power, and desalination plants.

Data from programmes such as that of ALNITAK have been extremely useful also for the Spanish Ministry of Agriculture, Food and Environment in the first phase of the EU Marine Strategy Framework Directive. One of the sectors that has been most positive in the framework of the INDEMARES actions of ALNITAK has been maritime transport. Relevant authorities, the industry and research institutions have worked alongside one another since 2009 to find solutions to risks such as ship strikes, acoustic pollution, and other threats like invasive species and oil spills.

The reconfiguration of the Traffic Separation Scheme of Cabo de Gata, and the introduction of speed reductions within the traffic separation scheme in the Strait of Gibraltar between 2006 and 2008 have been some of the most positive measures achieved. Furthermore, in the context of the EC LIFE+ Project INDEMARES, Alnitak has developed and tested diverse electronic monitoring systems as AIS and hydrophone ranges in order to tackle the logistical and economic challenges of offshore monitoring of marine protected sites. AIS data in particular, both from coastal receiving stations set up by Alnitak as from NOAA, have provided an invaluable source of information for the implementation of the first steps of the EU MSFD by the Spanish Ministry of Agriculture, Food and Environment.

The final talk in this session was by **Natacha Aguilar de Soto, Ana Cañadas, Alexandros Frantzis and Giuseppe Notarbartolo di Sciara** proposing a moratorium on naval sonar in areas of special concern for beaked whales in the Mediterranean, based on the success of applying spatial mitigation in the Canary Islands. Past experience shows that beaked whales are particularly sensitive to naval sonar with mass strandings in Greece, the Bahamas, Canary Islands as well as other parts of the world coinciding with such activities.

Following the mass stranding of Cuvier's, Gervais' and Blainville's beaked whales in September 2002, a Resolution was passed in 2004 on Active Sonar in the EU Parliament (B6#8209;0089/2004), supporting the "adoption of a moratorium and restriction measures in the use of active sonar in naval exercises and to develop alternative technologies". Also of relevance was the notice of 2005 OEIS/EIA Undersea warfare training range that "all predicted Level B harassment of beaked whales (= disruption of natural behavioural patterns) is counted as Level A harassment (impact)". The Canaries government imposed an official moratorium at the end of 2004 on the use of sonar within 50 nautical miles of the islands. Since then, there has been no mass strandings whereas between 1985 and 2004, an average of one mass stranding occurred every 2.5 years.

In the Mediterranean both beaked whales and naval maneouvres using active sonar occur, and there have also been mass strandings of beaked whales. The locations of strandings have been mapped along with buffer zones of 50 nautical miles around strandings of two or more. Areas believed to be important for beaked whales have then been determined by spatial modelling, and mapped using the same 50 nautical mile buffer zones around each.

In those areas identified as of special concern for beaked whales, it is proposed that the use of naval sonar is avoided, and other intense sound sources exceeding 220 dB re 1 µPa at 1 m peak to peak source level should also be avoided unless they can be fully justified. It is recommended that mitigation is applied before, during and after activities emitting intense noise sources in the Mediterranean, mainly in the areas identified as beaked whales suitable habitat Mitigation requirements should be included in national regulations and, when possible, take the form of sound and transparent planning, consultation and permitting processes with Environmental Impact Assessments (EIAs) whenever the use of these intense sound sources are planned in the Mediterranean.

Additional measures that are recommended include defining by national law the minimum contents to be included in mitigation protocols of activities exceeding 220 dB re 1 µPa at 1 m peak to peak source level. This should include at least the following specific measures: a) apply spatial mitigation (avoidance) in areas found to be of concentration of beaked whales or important for biodiversity; b) perform acoustic (24 h) and visual surveys before, during and after the activity; c) define safety zones and shut-down protocols; d) conduct independent and transparent monitoring whenever national security is not compromised, and internal reporting to the government authority; and e) ensure there is a transparent process of reporting. To become true, this needs the willing involvement of all parties.

Erich Hoyt delivered the concluding remarks to the workshop. He began by giving thanks to all the speakers for stimulating discussions and thoughts on the various issues relating to spatial management. He noted that Peter Evans and others had commented provocatively

on the title of the workshop, “The Challenge of Spatially Managing Cetaceans” because of course it is humans not cetaceans that one attempts to manage, and as Christopher Clark reminded us, we are not very good at managing humans either, or for that matter anything at all.

Jeff Ardron illustrated with a slide the distinction between “green” and “brown” agreements, conventions and agencies, the green ones being the ones that have teeth, and the brown ones those that do not. He emphasised the need to connect the dots: to get the different groups and agencies to talk to each other.

Case studies presented in the afternoon demonstrated research feeding into management in the UK, Denmark, Spain, and Canary Islands, as well as attempts to manage human behaviour and threats. We have a lot of tools at our disposal now for starting to understand these animals, the C-PODs, the D tags. Natacha Aguilar’s case study about making the Navy of a country participate in a solution to stop the stranding deaths of beaked whales, to create a 50 nautical mile “no sonar” area, is impressive. And the fact that it apparently works is encouraging: there have been no strandings since the moratorium. And now she is working with ACCOBAMS, and attempting to push this idea in the Mediterranean.

Jeff Ardron and Brad Barr told us that fisheries/bycatch is the dominant problem for highly mobile marine species; but Chris Clark sressed that marine animals *depend* on sound. The human activities of shipping, hydrocarbon exploration, and so forth, are reducing the ability of the animals to communicate, in effect shrinking their habitat. Clark suggested that science is 20% of the role in decision making; but we need more “scientific activism” to change the paradigm. This phrase “changing the paradigm” was used several times, so I guess this proves we researchers are at least talking to each other.

One theme of the day, is that, although yes we do need more data and we need good science, we need to realize, as Brad Barr says, what is science and what isn’t and be humble and open to changes.

We also need to work from the ground up, and some said flatly that we cannot rely on governments. “Governments don’t care,” we heard.

Chris Clark said that “We spend a lot of time going to meetings and workshops telling each other that what needs to be done is to engage the public. But it really comes down to ourselves, and changing our behaviour.

Giuseppe Notarbartolo di Sciara said that “We need to get to the hearts of people.”

And Chris Clark added: “What we need is to build a bottom up, popular uprising, an Arab spring for the ocean…”

Erich Hoyt wondered if marine mammal protected areas, spatial solutions with marine mammals, can also serve as tools to change human behaviour — If they could in effect sell us and the wider public on making the necessary personal changes? Maybe combined with the World Heritage areas at sea, they could serve as jewels in the crown to inspire change.

So, to push some of these ideas in terms of marine mammal protected areas, and using marine mammals as iconic animals to inspire change, in 2008, a group including Erich Hoyt set up the International Committee on Marine Mammal Protected Areas. They organised conferences on making marine mammal protected area networks in Hawaii in 2009, and then a conference subtitled "Endangered Species; Endangered Spaces" in Martinique in 2011. And they are envisioning an even bigger role for marine mammal protected areas.

In Hawaii and at the Martinique conference, this opportunity to develop and extend a sense of community was seen among the people working in marine mammal protected areas and on these issues.

This was started as a group somewhat heavily biased towards NOAA and the IWC Scientific Committee perhaps, and somewhat heavily researcher oriented (science rather than management), but with French MPA Agency and Australian MPA influences very strong, also some NGOs represented and independent types as well, it has become more well rounded and focused on management as well as science.

At the Martinique meeting, the idea of setting up an IUCN Task Force on MMPAs began to be discussed in earnest, one that would include the International Committee on Marine Mammal Protected Areas but extend to new people, experts covering different species groups and from wider geographic areas. So Erich Hoyt and Giuseppe Notarbartolo di Sciara would like to make this pre-announcement of the IUCN Marine Mammal Protected Area Task Force, which they will co-chair. The formal announcement will be in October at the IMPAC 3 conference.

This IUCN Task Force will be situated between the Cetacean Specialist Group of the Species Survival Commission and the World Commission on Protected Areas, and they will be careful to get buy-in from both of those Commissions.

The task force is seen as the research, technical, information side of MMPAs. And the committee, more on the side of being able to advocate, set up conferences, and so forth. Although there are overlapping aspects of course.

Now one of the tasks that the task force has taken on is to work on the criteria for Marine Mammal Critical Habitat or what is being called Important Marine Mammal Areas, and to integrate it with existing criteria such as the EBSA (Ecologically or Biologically Significant Areas) criteria of the Convention on Biological Diversity, and the KBA (Key Biodiversity Area) marine criteria, and to integrate this bottom up approach. This does not necessarily mean creating MPAs, but recommending areas of importance in which the various tools, including sometimes MPAs but also IMO solutions and solutions like Natacha Aguilar's with beaked whales in the Canarias, could be used, where it can be accepted that an important area exists and that low noise or other controls need to be adopted and followed. A criteria workshop is planned in France at IMPAC 3 for these Important Marine Mammal Areas.

Various other things are being planned and a large part of the goal is to popularize, to help make Marine Mammal Protected Areas more effective in serving and reaching into the hearts of people.

Annex 1: *AGENDA*

09:15-09:30	Registration	
09:30-0940	Peter Evans	Introductory Remarks
	Regional Frameworks – Chair Peter Evans	
09:40-10:00	Heidrun Frisch	Protecting Mobile Species: Reflections on recent efforts by OSPAR & the European Commission
10:00-10:20	Giuseppe Notarbartolo di Sciara	Protecting Mobile Species in the Mediterranean Sea
10:20-10:40	Jeff Ardron	CBD & other approaches
10:40-11:00	Discussion	
11:00-11:30	*Tea/Coffee Break*	
	Impacts on cetaceans in a spatial context – Chair Erich Hoyt	
11:30-11:50	Christopher Clark	Noise
11:50-12:10	Ana Tejedor	Shipping
12:10-12:30	Enrico Pirotta	Recreation
12:30-12:50	David Mattila (presented by Brad Barr)	Fisheries
13:00-14:00	*Lunch*	
14:00-14:30	Discussion	
	Case Studies – Chair Giuseppe Notarbartolo di Sciara	
14:30-14:50	Mike Tetley	Addressing ecological coherence in MPA networks and MSP: principles of best practice
14:50-15:10	Brad Barr	Management of large areas: experiences from Stellwagen Bank, USA
15:10-15:30	Nick Tregenza	Monirtoring changing distribution and population using acoustics to support management
15:30-15:50	Peter Evans	Evidence based management recommendations for bottlenose dolphins in the Irish Sea
16:00-16:30	*Tea/Coffee Break*	
16:30-16:50	Signe Sveegaard	From research to management: harbour porpoise conservation in Danish waters
16:50-17:10	Ricardo Sagarminaga	Managing activities in the Alboran Sea
17:10-17:30	Natacha Aguilar	A moratorium to naval sonar: from the Canary Islands success to the Mediterranean
17:30-18:00	Discussion	
18:00-18:15	Erich Hoyt	Concluding Remarks

Annex 2: *PRE-REGISTERED ATTENDEES*

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