

Research needs expressed in the Decisions of the Conference of the Parties to the Convention on Biological Diversity: Thematic Work Programme on Marine and Coastal Biodiversity

The oceans occupy more than 70% of the earth's surface and 95% of the biosphere (<http://www.cbd.int/marine/default.shtml>). Life in the sea is roughly 1000 times older than the genus Homo. There is broad recognition that the seas face unprecedented human-induced threats from industries such as fishing and transportation, the effects of waste disposal, excess nutrients from agricultural runoff, and the introduction of exotic species.

The cited Decisions that express research needs are VI/8, VII/5 (where the work programme is annexed), VIII/21, VIII/22, IX/20, X/29, XI/6, XI/17, XI/18, XII/22, XII/23, XIII/10, XIII/11 and XIV/10, also checked were Decisions VI/3, XIII/12 and XIV/9.

1 Direct research needs

Decision	Paragraph	Chapeau / Heading	Text	Source http://www.cbd.int/decisions/
VI/8	Annex I Part II Planned Activity 9	Marine and coastal biological diversity.	Two major elements of taxonomic work within marine and coastal ecosystems can be considered as high priority for achieving the Convention's objectives in marine and coastal systems, namely ballast water organisms, and key organisms for monitoring the health of mangrove systems through their invertebrate fauna . The ballast water organisms sub-element will require, <i>inter alia</i> , a focus on pelagic juvenile stages of benthic organisms . The second element focuses on mangroves, which are among the world's most rapidly changing systems. Within the marine and coastal biodiversity programme of work there is a need to develop taxonomic support for baseline monitoring of invertebrate fauna in mangrove systems .	cop-06.shtml?m=COP-06&id=7182
VII/5	Annex I Appendix 1 Para 1 a	Scientific work plan on coral bleaching.	Identification of coral-reef areas that exhibit resistance and/or resilience to raised sea temperatures. Identification, development, testing and refinement of management regimes to enhance reef resilience to and recovery from raised sea temperatures and/or coral bleaching , through the application of, <i>inter alia</i> , appropriate protective status, reduction of reef stressors, management of reef communities, etc. Investigation of factors that enable such resistance such as, <i>inter alia</i> cool currents, cold up-wellings, genetic tolerance in certain species and genotypes of corals to raised sea temperatures, presence and	cop-07.shtml?m=COP-07&id=7742

		<p>necessary abundance of reef associated biodiversity that imbues reef systems with resilience to raised sea temperatures and/or coral bleaching.</p> <p>Investigation of the role(s) of sea currents, local and larger scale, in the resistance and/or resilience of coral reefs to raised sea temperatures and/or coral bleaching.</p>	
VII/5	Annex I Appendix 1 Para 1 c	<p>Explore utility and feasibility of short-term management interventions to reduce severity of bleaching or to facilitate recovery after bleaching.</p>	
VII/5	Annex I Appendix 1 Para 1 e	<p>Assist reef managers to identify, implement and justify actions that can reduce localized stressors on reefs that will increase reef resilience to mass bleaching.</p>	
VII/5	Annex I Appendix 1 Para 2 a	<p>Implement and coordinate targeted research programmes, including predictive modelling, that increase understanding of:</p> <p>The mechanisms that cause mass coral bleaching, including:</p> <p>Mechanisms that lead to variation in bleaching symptoms;</p> <p>Bleaching thresholds for varying geographic locations and reef types for acute and chronic increases in sea temperature;</p> <p>Synergistic relationships between global stressors, such as warming, increased exposure to ultraviolet radiation and localized threats that already place reefs at risk, such as pollution and overfishing;</p> <p>The long-term consequences of mass coral bleaching under different warming scenarios, including:</p> <p>Understanding of acclimation and adaptation potential</p> <p>Prediction of the frequency and extent of mass bleaching;</p> <p>Predict the impacts of mass bleaching on ecological, social, and economic systems.</p> <p>The <i>management</i> of mass coral bleaching, including:</p> <p>Effectiveness of short-term management interventions in promoting reef resilience to bleaching and/or recovery after mass bleaching events.</p> <p>Understanding of strategies to support long-term resilience to bleaching, including connectivity, removal of localized stressors, etc.</p> <p>Document instances of mass bleaching, and the impacts of coral-bleaching and coral-mortality events on social and economic systems,</p>	

			and provide relevant information to the Secretariat through the Global Coral Reef Monitoring Network (GCRMN).	
VII/5	Annex I Appendix 1 Para 2 b		<p>Implement baseline assessments and long-term monitoring to measure the extent and severity of coral bleaching, mortality and recovery and identify reef areas that exhibit resistance and/or resilience to raised sea temperatures;</p> <p>Widen, as necessary, the research on socio-economic impacts of coral bleaching on communities dependent on coral reefs;</p> <p>Identify pilot projects that establish training programmes and survey protocols and enhance availability of expert advice at a range of scales, including classification of scale data.</p>	cop-07.shtml?m=COP-07&id=7742
VII/5	Annex I Appendix 1 Para 4 b	<p>Develop approaches for assessing the vulnerability of coral-reef species to global warming.</p>		
VII/5	Annex I Appendix 4 Priority 2.1	<p>Research priorities including research and monitoring projects associated with PE 3: Marine and coastal protected areas.</p>	<p>Undertake initiatives to map ecosystems and habitats within regions and biogeographic areas, and determine the minimum level of broad habitat categories required for assessing representativeness of marine and coastal protected areas networks. Use this as a basis for assessing representativeness of the existing marine and coastal protected areas network. This work should use a high-level framework that is compatible with the basis for global inventory work. One possible approach to this work is to hold regional workshops.</p> <p>Assess connectivity to determine bioregions, and apply this information for evaluation of the existing marine and coastal protected areas network, as well as for identifying priority areas for the future.</p> <p>Assess the effectiveness of the current marine and coastal protected areas network regionally and globally for the conservation and sustainable use of migratory species.</p>	cop-07.shtml?m=COP-07&id=7742
VII/5	Annex I Appendix 4 Priority 2.3		<p>Develop and test a suite of effective assessment measures, including indicators, on a number of existing sites (biological, socio-economic and governance-based indicators). Selected pilot sites must cover the range of cold, temperate and tropical regions.</p> <p>Develop methods for evaluating the effectiveness of entire networks of marine and coastal protected areas.</p>	

			Develop methods for adapting marine and coastal protected areas management in response to possible changing species and habitat distribution patterns, which may result from climate change.	
VII/5	Annex I Appendix 4 Priority 3.1		Evaluate the long-term benefits (for example species changes, habitat changes and ecosystem changes) of protecting large-enough/significant-enough critical habitats and ecosystems, by developing case-studies.	
VII/5	Annex I Appendix 4 Priority 3.6		Develop methods for estimating the percentage of non-extractive protection required , in conjunction with national monitoring programmes, depending on the size and dynamics of local populations.	
VII/5	Annex I Appendix 5 Para a	Research priorities including research and monitoring projects associated with PE 4: Mariculture	<p>Development of research programmes to support establishment of efficient monitoring programmes to monitor impacts of mariculture on marine and coastal biological diversity;</p> <p>Development of criteria for judging the seriousness of biodiversity effects of mariculture;</p> <p>Subsequent establishment of monitoring programmes to detect effects of mariculture biodiversity;</p> <p>Research on the impact of escaped mariculture species on biodiversity;</p> <p>Development of criteria for when environmental impact assessments are required, and for the application of environmental impact assessments at all levels of biodiversity (genes, species, ecosystems), in the context of the guidelines endorsed by the Conference of the Parties in decision VI/7 A and the recommendations endorsed in decision VI/10, annex II;</p> <p>Noting that the FAO glossary of terms is skewed towards marine capture fisheries, expansion of this glossary with regard to its terminology related to aquaculture;</p> <p>Reinforcement of global assessments of marine and coastal biological diversity.</p>	cop-07.shtml?m=COP-07&id=7742
VII/5	Annex I Appendix 5 Para b		<p>Development of genetic resource management plans for broodstock;</p> <p>Research aimed at understanding genetic effects of biotechnology developments in aquaculture;</p> <p>Research aimed at understanding genetic structure of both the</p>	

		<p>farmed and wild populations, including: Effects of genetic pollution from farmed populations on wild populations; Maintenance of genetic viability of farmed populations; Studies of (genetics of) wild populations as potential new candidates for mariculture.</p>	
VII/5	Annex I Appendix 5 Para c	<p>Support for basic global-scale taxonomic studies, possibly in conjunction with the Global Taxonomy Initiative (GTI); Support for studies aimed at development of responsible aquaculture using native species, including through consideration of traditional knowledge; Development of methods and techniques for limiting by-catch of seed collection.</p>	
VII/5	Annex I Appendix 5 Para d	<p>Research on carrying capacity and carrying capacity models for planning aquaculture, especially stocking rates; Comprehensive studies to quantitatively and qualitatively assess effects of mariculture on biodiversity for various aquatic ecosystems, selected by their sensitiveness degree; Research on the competitive nature imposed on marine fisheries by capture and culture fisheries; Studies aimed at improved understanding of the effects of inputs, such as chemicals, hormones, antibiotics and feeds on biodiversity; Research on the impact of diseases in cultured and wild species on biodiversity;</p>	
VII/5	Annex I Appendix 5 Para e	<p>Comparative studies on legislation, economic and financial mechanisms for regulating mariculture activity; Development of quantitative and qualitative criteria to assess mariculture impacts on the environment, including cultural and social impacts, as outlined in the recommendations contained in decision VI/10, annex II;</p>	
VII/5	Annex I Appendix 5 Para f	<p>Support for mariculture-related disease monitoring programmes at the global level; Support for the transfer of biotechnological diagnostic tools for wide use; Update of taxonomic database including genetic diversity at the intra-</p>	

			specific level.	
VII/5	Annex III Para 2	Improvement of available data for assessment of progress towards the global goal.	<p>Global data on marine and coastal protected areas should be improved and/or gathered in the following critical categories:</p> <p>Location (physical coordinates and country or political unit, including the names of neighbouring country/countries where the marine and coastal protected areas is transboundary);</p> <p>Total size of the protected area, the relative size of the marine and coastal component and, where transboundary, the total area under country jurisdiction;</p> <p>Temporal aspects e.g. permanency or seasonality of protection or management;</p> <p>Type of protection and management proposed or being implemented, using a simple three-tier system;</p> <p>Representative highly-protected areas where extractive uses are excluded;</p> <p>Additional marine and coastal protected areas;</p> <p>Sustainable-management practice in the wider coastal and marine environment;</p> <p>Effectiveness of protection and management gauged against the regime being proposed or being implemented, using a simple three-tier system:</p> <p>Currently fully effective – no significant problems known;</p> <p>Currently partially effective – some deficiencies;</p> <p>Currently ineffective – significant implementation problems;</p> <p>Nationally-designated names for type of protection and management e.g. marine park, marine and coastal nature reserve, etc.</p> <p>Habitats protected and managed (3D not just benthic);</p> <p>Species protected and managed (3D not just benthic);</p> <p>Habitats and species specifically excluded from protection/management within the marine and coastal protected area (i.e. that have no legal protection);</p> <p>Nature of threats to habitats/species</p> <p>Name and contact details of person(s) providing the above information and date on which this was done.</p>	<p>cop-07.shtml?m=COP-07&id=7742</p>
VIII/21	Para 2	The Conference	<i>Recognizes that given the vulnerability and general lack of scientific</i>	COP-08&id=11035

		of the Parties	knowledge of deep seabed biodiversity, there is an urgent need to enhance scientific research and cooperation and to provide for the conservation and sustainable use of these genetic resources in the context of the precautionary approach;	
IX/20	Para 8	The Conference of the Parties	<i>Invites</i> to cooperate in further developing scientific and technical guidance for the implementation of environmental impact assessments and strategic environmental assessments for activities and processes under their jurisdiction and control which may have significant adverse impacts on marine biodiversity beyond national jurisdiction,	cop/?id=11663
IX/20	Para 23	The Conference of the Parties	<i>Urges</i> Parties, other Governments and relevant organizations to undertake further research to improve understanding of marine biodiversity, especially in selected seabed habitats and marine areas in need of protection , including, in particular, elaboration of inventories and baselines to be used for, <i>inter alia</i> , assisting in the assessment of the status and trends of marine biodiversity and habitats, paying special attention to those ecosystems and critical habitats that are relatively unknown;	cop/?id=11663
X/29	Para 8	The Conference of the Parties	<i>invites</i> Parties, other Governments, relevant organizations, and indigenous and local communities, to address climate-change adaptation and mitigation issues by: Extending their efforts in identifying current scientific and policy gaps in order to promote sustainable management, conservation and enhancement of natural carbon sequestration services of marine and coastal biodiversity; Identifying and addressing the underlying drivers of marine and coastal ecosystem loss and destruction , and improving the sustainable management of coastal and marine areas;	cop/?id=12295
X/29	Para 10	The Conference of the Parties	<i>encourages</i> Parties, other Governments and organizations to further enhance globally networked scientific efforts [...] and further assess and map the distribution and abundance of species in the sea , and <i>encourages</i> Parties and other Governments to foster further research activities [...] to explore marine communities where the current level of knowledge is scarce or inexistent ;	cop/?id=12295
X/29	Para 61	The Conference	<i>Notes</i> that in order to provide reliable predictions on the potential	cop/?id=12295

		of the Parties	adverse impacts on marine biodiversity of activities involving ocean fertilization, further work to enhance our knowledge and modelling of ocean biogeochemical processes is required;	
X/29	Para 62	The Conference of the Parties	<i>Notes</i> also that there is a pressing need for research to advance our understanding of marine ecosystem dynamics and the role of the ocean in the global carbon cycle;	cop/?id=12295
X/29	Para 68	The Conference of the Parties	<i>Further notes</i> an urgent need to further assess and monitor the impacts and risks of human activities on marine and coastal biodiversity , building upon the existing knowledge;	cop/?id=12295
X/29	Annex		To further research and investigate the role of the ocean and its ecosystems in the carbon cycle;	cop/?id=12295
XI/6	Para 34	The Conference of the Parties	Encourages the development of further Arctic ecosystem resilience assessments and reports;	cop/default.shtml?id=13167
XI/17	Para 7	The Conference of the Parties	<i>Takes note</i> of the need to promote additional research and monitoring [...] to improve the ecological or biological information in each region with a view to facilitating the further description of the areas already described, the future description of other areas meeting the scientific criteria for ecologically or biologically significant marine areas as well as other relevant compatible and complementary nationally and intergovernmentally agreed scientific criteria;	cop/default.shtml?id=13178
XI/18	Section A, Para 18	The Conference of the Parties	<i>Encourages</i> Parties, other Governments and relevant organizations, according to their priorities, to: a) Promote research with a view to further improving understanding of the issue [anthropogenic underwater noise]; d) Develop indicators and explore frameworks for monitoring underwater noise for the conservation and sustainable use of marine biodiversity	cop/default.shtml?id=13179
XI/18	Section A, Para 27	The Conference of the Parties	<i>requests</i> the Executive Secretary [...] to discuss ways to prevent and reduce the impact of marine debris on biodiversity and strengthen research on the reduction and management of marine debris , with a focus on addressing sources;	cop/default.shtml?id=13179
XI/18	Section B, Para 5	The Conference of the Parties	<i>Invites</i> Parties, other Governments and relevant organizations, in accordance with international law, including the United Nations Convention on the Law of the Sea, to facilitate further research to fill gaps in knowledge , as highlighted in the voluntary guidelines on	cop/default.shtml?id=13179

			marine and coastal areas, in particular in areas beyond national jurisdiction ;	
XII/22	Para 11	The Conference of the Parties	<i>Invites</i> Parties and other Governments [...] to undertake scientific and technical analysis of the status of marine and coastal biodiversity in areas [...] described as meeting the EBSA criteria and contained in the EBSA repository;	doc/?meeting=cop-12
XII/22	Para 13	The Conference of the Parties	<i>Encourages</i> Parties and <i>invites</i> other Governments to collaborate with relevant international scientific bodies [...] to address knowledge gaps and lack of scientific information regarding the description of areas meeting the EBSA criteria ;	doc/?meeting=cop-12
XII/23	Para 2	The Conference of the Parties	<i>Notes</i> that there has been a significant amount of research into the impacts of underwater noise on aquatic life over the past few decades, but that there remain significant questions that require further study, with the largest gaps in knowledge relating to fishes, invertebrates, turtles and birds, and additional knowledge gaps on characteristics of major sound sources, trends in the prevalence and magnitude, as well as the intensity and spatial distribution, of underwater noise and on the potential impacts of underwater noise on ecosystems and animal populations , including implications of cumulative and synergistic impacts of multiple sources of noise and other stressors;	doc/?meeting=cop-12
XII/23	Para 3	The Conference of the Parties	<i>Encourages</i> [...] relevant stakeholders, to take appropriate measures such as: a) Defining and differentiating types or intensities of underwater noise where there are adverse impacts, and characterizing noise by source; b) Conducting further research on the remaining significant knowledge gaps noted in paragraph 2 above ; d) Including areas that are affected at different levels of sound when mapping the spatial and temporal distribution of sound ; e) Combining acoustic mapping with habitat mapping of sound-sensitive species with regard to spatial risk assessments in order to identify areas where those species may be exposed to noise impacts;	doc/?meeting=cop-12
XII/23	Para 16	The Conference of the Parties	<i>recognizing</i> the need for further work to identify the location and condition of deep-water corals and to understand the impacts of	doc/?meeting=cop-12

			human activities on these corals.....;	
XII/23	Para 18	The Conference of the Parties	<i>invites</i> relevant organizations to advance their work on enhancing methods and tools, including monitoring measures, for marine spatial planning;	doc/?meeting=cop-12
XII/23	Annex, Para 8.2	Parties are encouraged to undertake the following actions:	a) Identify all sources of significant land-based and sea-based pollutants affecting coral reefs and set up comprehensive national/local water quality monitoring programmes;	doc/?meeting=cop-12
XII/23	Annex, Para 11.3	Parties are encouraged to undertake the following actions:	<p>a) Research on multiple stressor interactions and effects on coral reefs at the species, population and ecosystem level to identify the most damaging local stressors affecting coral reefs ecosystems at the site-based level;</p> <p>b) Research to support a resilience-based approach to coral reef management that is embedded within an integrated ecosystem-based management framework;</p> <p>c) Develop and implement early warning systems for major reef health incidents such as bleaching or disease events, tropical storms and flood plumes;</p> <p>d) Develop water chemistry monitoring programmes for coastal and inshore waters to determine the natural spatial and temporal variability of ocean carbon chemistry, and detect trends;</p> <p>e) Research on the sensitivity of species, habitats and communities within coral reefs to changes in ocean carbon chemistry and whether there is a potential for adaptation to ocean acidification in reef organisms;</p> <p>g) Further develop ecological and socio-economic criteria and variables for use in vulnerability assessments in coral reef regions;</p> <p>h) Develop mapping tools that combine data on the current status of coral reefs, management efforts and their effectiveness with predictive modelling of stressor effects to generate future scenarios of reef condition and ecosystem service provision;</p>	doc/?meeting=cop-12
XIII/10	Annex Para 8		For land-based sources of marine debris, the following actions are suggested:	

		<p>a) Identify baseline data on the main land-based sources, quantities and impacts of marine debris;</p> <p>c) Support research aimed at developing, and encourage the transfer of, technology to better understand and reduce the environmental impacts of plastics on the marine environment, to design new or improved biodegradable products and to assess cost-effective production on a commercial scale;</p> <p>d) (i) Supporting the design of products that are long-lasting and reusable, repairable, re-manufacturable and recyclable with the most effective use of resources;</p>	<p>decisions/cop/?m=cop-13</p>
XIII/10	Annex Para 12	<p>For addressing knowledge gaps and research needs, the following actions are suggested:</p> <p>a) Support and promote, as appropriate, harmonized approaches to monitoring, analysis and reporting based on standardized methodologies, taking into account existing monitoring guidance for marine litter, such as the European Union Monitoring Guidance for Marine Litter in European Seas;</p> <p>c) Develop and promote means to identify sources, pathways and distribution of marine debris to understand individual and population-level effects of marine debris on marine species;</p> <p>d) Investigate and promote the best available techniques as well as research and develop additional techniques in wastewater treatment plants to prevent microparticles entering the marine environment;</p> <p>e) Promote research on the potential trophic transfer of marine microdebris in food webs to determine whether there is a bioaccumulation effect for plastics and harmful chemicals;</p> <p>g) Undertake socioeconomic research to better understand the social factors which may contribute to the production of marine debris, the impacts of marine debris on various coastal and maritime sectors and communities, and consumer preferences, perceptions and attitudes that can help to inform targeted outreach programmes designed according to local/cultural context;</p> <p>h) Develop a risk assessment of impact and implement a management plan for debris on marine and coastal species and ecosystems, and identify hotspots of gear loss and their associated biodiversity impacts;</p>	<p>decisions/cop/?m=cop-13</p>

			<p>i) Develop monitoring and follow-up strategies, taking account the following needs: i) To evaluate population-level impacts that consider, in a coordinated way, the migration routes and the distribution of species and populations; ii) To include species' life stages and their specific vulnerability to marine debris (for example, monitoring of juveniles to quantify the burden on adults); iii) To address sublethal effects while taking into account that a broad range of interacting natural and human factors determines the survival and reproductive success of individual animals; iv) To take into account that, in the case of highly endangered species, direct harm caused by marine debris on one individual can easily have an effect on the entire population;</p> <p>j) Apply modelling as a useful tool for marine debris management and mitigation, which can be used with spatial mapping to estimate debris distribution, encounter rates between debris and species and support the production of global risk assessments, especially for threatened species.</p>	
XIII/11	Para 4d	The Conference of the Parties	<p><i>Encourages</i> Parties to enhance understanding of ecosystems in cold-water areas, including by improving the ability to predict the occurrence of species and habitats and to understand their vulnerability to different types of stressors, as well as to the combined and cumulative effects of multiple stressors;</p>	decisions/cop/?m=cop-13
XIII/11	Annex I, Para 16		<p>Greater understanding of the interactions between species within trophic webs is needed. Whether an impact of climate change on one organism will impact the survival of other organisms is poorly understood at present. Mesocosm experiments, where communities are subjected to projected future conditions, can help to address this.</p>	decisions/cop/?m=cop-13
XIII/11	Annex I, Para 17		<p>Impacts of ocean acidification on different life stages of cold-water organisms need to be studied. Early life stages of a number of organisms may be at particular risk from ocean acidification, with impacts including decreased larval size, reduced morphological complexity and decreased calcification. Further work needs to be done on different life stages of many cold-water organisms.</p>	decisions/cop/?m=cop-13
XIII/11	Annex I, Para 18		<p>Existing variability in organism response to ocean acidification needs to be investigated further, to assess the potential for evolutionary adaptation.</p>	decisions/cop/?m=cop-13

XIII/11	Annex I, Para 23		Our understanding of the impacts of individual stressors is often limited, but we have even less understanding of the impacts that a combination of these stressors will have on cold-water marine organisms and ecosystems and the goods and services they provide. There is a pressing need to understand these interactions and the potentially combined and cumulative effects of multiple stressors.	decisions/cop/?m=cop-13
XIII/11	Annex II, Para 5.4	Parties are encouraged to take the following actions	Expand and improve monitoring and research on biodiversity in cold-water areas to improve fundamental knowledge of how, and over what time scales, climate change and other human-induced stressors will impact the long-term viability of, and ecosystem services provided by, cold-water biodiversity, habitats and ecosystems, including through activities outlined in annex III, with a focus on activities that: a) Improve knowledge of biodiversity in cold-water areas, including species identification, species distribution, community composition and taxonomic standardization, to provide baseline information for assessing the effects of climate change and other human-induced stressors; b) Assess the socioeconomic implications of the ongoing and predicted future pressures on cold-water biodiversity; c) Improve understanding of how climate change, acidification and other human-induced stressors will impact the physiology, health and long-term viability of cold-water organisms, habitats and ecosystems; d) Improve monitoring of environmental conditions in cold-water habitats to understand variability in carbonate chemistry; e) Develop or expand upon predictive model research to determine how projected climate change will impact cold-water biodiversity over different time scales.	decisions/cop/?m=cop-13
XIII/11	Annex III, Para 1	<i>Invites..</i> research... organizations to promote... activities to address research and monitoring needs identified	Improve knowledge of biodiversity in cold-water areas to provide baseline information used for assessing the effects of climate change and other human-induced stressors: 1. Support research on biodiversity in cold-water areas to fill in gaps in fundamental knowledge of species identification, species distribution, and community composition, including taxonomic standardization; 2. Identify key habitat providers and their functional role within ecosystems to understand which organisms may be a priority in conservation and management;	decisions/cop/?m=cop-13

		in annex III	<p>3. Understand the biodiversity that key cold-water habitats support globally, and assess the gaps in current knowledge;</p> <p>4. Map biodiversity and coral viability along natural gradients of carbonate saturation in order to identify the main predictors of coral biodiversity and health, assess changes related to carbonate saturation state, locate hotspots of biodiversity and endemism and help validate predictive models and improve understanding of how acidification affects ecosystem function and viability.</p>	
XIII/11	Annex III, Para 2	<i>Invites.. research... organizations to promote... activities to address research and monitoring needs identified in annex III</i>	<p>Assess the socioeconomic implications of current and predicted future pressures on cold-water biodiversity:</p> <ol style="list-style-type: none"> 1. Enhance understanding of the ecosystem goods and services of cold-water areas; 2. Investigate connectivity (genetic and transfer of mobile species) between cold-water areas at multiple scales; 3. Investigate flow-on effects to ecosystems and ecosystem services that have significant environmental, social, cultural and economic impacts. 	decisions/cop/?m=cop-13
XIII/11	Annex III, Para 3	<i>Invites.. research... organizations to promote... activities to address research and monitoring needs identified in annex III</i>	<p>Conduct research to assess how climate change and other human-induced stressors will impact the physiology, health and long-term viability of cold-water organisms, habitats and ecosystems:</p> <ol style="list-style-type: none"> 1. Carry out controlled laboratory experimentation, where feasible, on key individual species (ecosystem engineers, keystone species) to understand their metabolic, physiological and behavioural responses, and their tolerance limits/thresholds, to ocean acidification, potential interactive effects of warming and deoxygenation and human-induced stressors; 2. Implement experiments using mesocosms in the field to understand fundamental ecological responses to ocean acidification, including how acidification may alter plankton productivity, larval ecology, food webs and the competitive interactive strength of taxa; 3. Assess experimental designs for ocean acidification biodiversity research at the individual, population and ecosystem level to identify best practices; 4. Identify the adaptive (or evolutionary) capacity of species with regard 	decisions/cop/?m=cop-13

			<p>to single and multiple stressors, to assess the long-term resilience of key ecosystems and their continued provisioning of goods and services;</p> <p>5. Conduct long-term experiments to assess whether organism survival comes with hidden energetic, structural or reproductive costs over a longer period;</p> <p>6. Conduct experiments to assess whether larval stages are more susceptible to potential impacts at different life stages of organisms, and whether this impacts the long-term fitness of key species;</p> <p>7. Incorporate broader assessments of ecological, physiological and microbiological impacts of acidification into research to consider wider impacts on individuals, species and ecological interactions.</p>	
XIII/11	Annex III, Para 4	<i>Invites.. research... organizations to promote... activities to address research and monitoring needs identified in annex III</i>	<p>Improve monitoring of environmental conditions in cold-water habitats to understand variability in carbonate chemistry:</p> <ol style="list-style-type: none"> 1. Develop or expand upon existing physicochemical water chemistry monitoring programmes in cold-water areas to better understand the natural spatial and temporal variability of ocean carbon chemistry; 2. Integrate physicochemical water chemistry monitoring within national jurisdictions into international programmes, such as the Global Ocean Acidification Observation Network and initiatives such as the Global Ocean Observing System; 3. Support the development of technology for the rapid and economical assessment of seawater carbonate chemistry; 4. Integrate carbonate chemistry sampling into marine monitoring programmes, where possible. 	decisions/cop/?m=cop-13
XIII/11	Annex III, Para 5	<i>Invites.. research... organizations to promote... activities to address research and monitoring needs identified in annex III</i>	<p>Develop or expand upon predictive model research to determine how projected climate change will impact cold-water biodiversity over different time scales:</p> <ol style="list-style-type: none"> 1. Improve ocean carbonate models to understand the temporal and three-dimensional spatial changes in carbonate saturation state and its main drivers, including changing atmospheric CO₂ conditions and ocean currents; 2. Document existing gaps in knowledge on global, regional and national scales that limit the predictive power of models; 3. Couple ocean carbonate chemistry mapping and oceanographic models to biophysical and ecological information to predict the temporal 	decisions/cop/?m=cop-13

			and spatial variability of acidification impacts in order to help identify areas under the greatest threat as well as possible refugia; 4. Optimize habitat modelling to predict key habitats and biodiversity occurrence from seawater carbonate chemistry, oceanographic and water mass modelling and larval dispersal.	
XIV/10	Para 4	The Conference of the Parties	<i>Recognizes</i> the need for further research on the impacts of marine debris, including plastics and microplastics, on marine and coastal biodiversity and habitats	decisions/cop/?m=cop-14

2 Indirect research needs

Decision	Paragraph	Chapeau / Heading	Text	Source http://www.cbd.int/decisions/
VII/5	Annex I Appendix 1 Para 1 c	Scientific work plan on coral bleaching.	Instigate and support initiatives for marine protected areas managers where resilience principles are being actively applied and tested.	cop-07.shtml?m=COP-07&id=7742
VII/5	Annex I Appendix 4 Priority 1.1	Research priorities including research and monitoring projects associated with PE 3: Marine and coastal protected areas.	Draft action-oriented strategies for establishing marine and coastal protected areas networks , and implement those strategies in line with regional initiatives, for example by holding regional workshops.	cop-07.shtml?m=COP-07&id=7742
VII/5	Annex I Appendix 4 Priority 2.2		Develop the high-level framework for the global inventory (see annex IV below), and related advice to national managers on national inventories. Develop national databases for assessment of selected existing national/regional networks, selecting examples from the range of political, economic and biogeographic situations. Undertake a global review of the current state of knowledge of marine and coastal protected areas by region. Provide output in a format understandable for managers and policy makers. Compiling information that illustrates the values, benefits and unique contributions of marine and coastal biodiversity , <i>inter alia</i> , breeding, migration patterns of marine species, and spawning sites.	
VII/5	Annex I Appendix 4 Priority 3.2		Provide a conceptual model and best practice examples of criteria for selecting marine and coastal protected areas, by undertaking linked work in a small number of selected countries.	
VII/5	Annex I Appendix 4		Development of culturally sensitive marine and coastal protected areas development/management approaches to achieve effective	

	Priority 3.3		<p>participation, as appropriate, of indigenous and local communities and relevant stakeholders.</p> <p>Develop adaptive approaches to marine and coastal protected areas establishment and management. This could be done by collection and dissemination of case studies of both best and worst-case examples of the degree to which an understanding of how target communities operate (socially/culturally) and “do business” can affect the success of the establishment and management of marine and coastal protected areas.</p>	
VIII/21	Para 1	The Conference of the Parties	<p><i>Notes that deep seabed ecosystems beyond the limits of national jurisdiction, including hydrothermal vent, cold seep, seamount, coldwater coral and sponge reef ecosystems, contain genetic resources of great interest for their biodiversity value and for scientific research as well as for present and future sustainable development and commercial applications;</i></p>	COP-08&id=11035
VIII/21	Para 7		<p><i>Requests the Executive Secretary, in collaboration with the United Nations Division for Ocean Affairs and the Law of the Sea, and other relevant international organizations, to further analyse and explore options for preventing and mitigating the impacts of some activities to selected seabed habitats and report the findings to future meetings of the Subsidiary Body on Scientific, Technical and Technological Advice;</i></p>	
VIII/21	Para 9		<p><i>Emphasizes the urgent need, especially in developing countries, to build capacities relating to deep seabed biodiversity, including taxonomic capacity; to promote scientific and technical cooperation and technology transfer; and to exchange information regarding activities undertaken within the deep seabed beyond the limits of national jurisdiction.</i></p>	
VIII/22	Para 7	The Conference of the Parties	<p><i>Requests the Executive Secretary, in collaboration with Parties, relevant organizations and indigenous and local communities, to compile and analyse case-studies on successful and unsuccessful implementation of integrated marine and coastal area management.</i></p>	COP-08&id=11036
IX/20	Annex III		<p><i>Scientific identification of an initial set of ecologically or biologically significant areas. The criteria in annex I to decision IX/20</i></p>	cop/?id=11663

			<p>should be used, considering the best scientific information available, and applying the precautionary approach. This identification should focus on developing an initial set of sites already recognized for their ecological values, with the understanding that other sites could be added as more information becomes available.</p> <p>Develop/choose a biogeographic, habitat, and/or community classification system. This system should reflect the scale of the application and address the key ecological features within the area. This step will entail a separation of at least two realms—pelagic and benthic.</p> <p><i>Drawing upon steps 1 and 2 above, iteratively use qualitative and/or quantitative techniques to identify sites to include in a network.</i> Their selection for consideration of enhanced management should reflect their recognised ecological importance or vulnerability, and address the requirements of ecological coherence through representativity, connectivity, and replication.</p> <p>Assess the adequacy and viability of the selected sites. Consideration should be given to their size, shape, boundaries, buffering, and appropriateness of the site-management regime.</p>	
X/29	Para 24	The Conference of the Parties	<p><i>Recognizes</i> that the Convention on Biological Diversity has a key role in supporting the work of the General Assembly with regard to marine protected areas beyond national jurisdiction, by focusing on provision of scientific and, as appropriate, technical information and advice relating to marine biological diversity, the application of the ecosystem approach and the precautionary approach;</p>	cop/?id=12295
X/29	Para 48	The Conference of the Parties	<p><i>Invites</i> Parties and other Governments to foster research and monitoring activities, in accordance with international law, including the United Nations Convention on the Law of the Sea, to improve information on key processes and influences on the marine and coastal ecosystems which are critical for structure, function and productivity of biological diversity in areas where knowledge is scarce and to facilitate the systematic collection of relevant information in order to continue proper monitoring of these areas;</p>	cop/?id=12295
XI/17	Para 8	The Conference of the Parties	<p><i>Reaffirms</i> the need to facilitate the participation of developing countries [...] in targeted marine scientific research [...] including in oceanographic</p>	cop/default.shtml?id=13178

			cruises;	
XI/17	Para 9	The Conference of the Parties	<i>Affirms</i> that scientific description of areas meeting scientific criteria for EBAs and other relevant criteria is an open and evolving process that should be continued to allow ongoing improvement and updating as improved scientific and technical information becomes available in each region;	cop/default.shtml?id=13178
XI/17	Para 25	The Conference of the Parties	<i>Notes</i> that socially and culturally significant marine areas may require enhanced conservation and management measures, and that criteria for the identification of areas relevant to the conservation and sustainable use of biodiversity in need of such enhanced measures due to their social, cultural and other significance may need to be developed, with appropriate scientific and technical rationales ;	cop/default.shtml?id=13178
XII/23	Para 3	The Conference of the Parties	<i>Encourages</i> [...] relevant stakeholders, to take appropriate measures such as: f) Mitigating and managing anthropogenic underwater noise through the use of spatio-temporal management of activities, relying on sufficiently detailed temporal and spatial knowledge of species or population distribution patterns combined with the ability to avoid generating noise in the area at those times; g) Conducting impact assessments, where appropriate, for activities that may have significant adverse impacts on noise-sensitive species, and carrying out monitoring ; i) Considering thresholds as a tool to protect sound-sensitive species , taking into account their locations during critical life cycle stages as well as relevant results of research and additional information; j) Standardizing metrics and sound measurements so that there are similar measures and approaches for all sounds and in all places;	doc/?meeting=cop-12
XII/23	Para 8	The Conference of the Parties	<i>Urges Parties and invites</i> [...] relevant scientific groups [...] to further enhance their international collaboration to improve the monitoring of ocean acidification , closely linked to other global ocean observing systems, noting that a well-integrated global monitoring network for ocean acidification is crucial to improve understanding of current variability and to develop models that provide projections of future conditions ;	doc/?meeting=cop-12
XIII/10	Annex, Para		The considerable gaps in knowledge of the sources, distribution	decisions/cop/?m=cop-13

	6		and quantity of marine debris items, and their impacts on marine and coastal biodiversity and habitats, is limiting the ability to address the problem effectively. There is a lack of information on the amount of debris entering the marine environment and degradation or fragmentation rates for debris under a range of conditions. There is limited information available for the physical and chemical consequences of debris on marine species through ingestion/uptake.	
XIII/11	Annex I, Para 14		Global monitoring of ocean acidification is increasing, while there is a need for further development of predictive models. A well-integrated global monitoring network for ocean acidification is crucial to improve knowledge of current variability and to develop models that provide projections of future conditions..... There is a need for greater cross-sectoral partnership between government, industry and academia to facilitate establishing globally integrated monitoring system.	decisions/cop/?m=cop-13
XIII/11	Annex I, Para 14		Seawater pH shows substantial natural temporal and spatial variability. The acidity of seawater varies naturally on a diurnal and seasonal basis, on local and regional scales, and as a function of water depth and temperature. Only by quantifying these changes is it possible to understand the conditions to which marine ecosystems are subjected currently. This will, in turn, increase understanding of how marine ecosystems will change in a future climate.	decisions/cop/?m=cop-13
XIV/10	Para 1	The Conference of the Parties	<i>Urges</i> Parties to increase their efforts with regard to: a) Avoiding, minimizing and mitigating the impacts of marine debris, in particular plastic pollution, on marine and coastal biodiversity and habitats; b) Addressing the potential impacts of deep-seabed mining on marine biodiversity;	decisions/cop/?m=cop-14
XIV/10	Para 4	The Conference of the Parties	<i>Emphasizes</i> the need for the clean-up and removal of marine debris, where appropriate and practical, and that such efforts are particularly urgent where marine debris poses a threat to sensitive marine and coastal biodiversity and habitats;	decisions/cop/?m=cop-14