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Guidance for identifying and designating peatlands, wet grasslands, mangroves and coral reefs as Wetlands of International Importance

Resolution VIII.11, 2002

Introduction

1. Action 6.3.1 of the Convention's Work Plan 2000-2002 requested the Scientific and Technical Review Panel (STRP) to prepare additional guidance for the identification and designation of peatland, wet grassland, mangrove, and coral reef wetland types as Wetlands of International Importance (Ramsar sites).

2. Peatlands, mangroves, and coral reefs were recognised by the *Global Review of Wetland Resources and Priorities for Wetland Inventory* report to COP7 as being amongst the wetland ecosystems that are most vulnerable and threatened by habitat loss and degradation, and thus in need of urgent priority action to ensure their conservation and wise use.

3. This additional guidance provides clarification of aspects of the application of the *Strategic Framework and guidelines for the future development of the List of Wetlands of International Importance* (Resolution VII.11) as they apply to peatlands, wet grasslands, mangroves, and coral reefs. In particular, it provides guidance to Contracting Parties on the identification and designation of representative wetlands of these habitat types in accordance with Ramsar Criterion 1 for the designation of Wetlands of International Importance.

4. The reasons for which such wetland types are as yet under-represented in the Ramsar List are various. They may include lack of recognition of the existence of particular wetland types within a particular territory; lack of recognition that coastal and marine wetland types such as mangroves and coral reefs fall within the Ramsar definition of wetlands and so are eligible for designation as Ramsar sites; difficulty in applying the guidance in completing the Ramsar Information Sheet (RIS) for Ramsar site designation, particularly in relation to the delimitation of appropriate boundaries, especially for coral reefs; uncertainty as to which particular features of these habitat types indicate the best representative examples of such wetlands under Ramsar Criterion 1; uncertainty, in the case of peatlands and wet grasslands, as to which wetland types in the Ramsar Classification System for Wetland Type apply, since these habitat types can occur in a number of different categories; and, for peatlands, a lack of recognition that a wetland is a peat-based system if wetlands are assessed only for their vegetational characteristics.

5. All Ramsar Criteria for the designation of Wetlands of International Importance can be applied to the identification and designation of peatland, wet grassland, mangrove and coral reef wetland types.

6. Since each of these wetland types has been identified as being particularly vulnerable and threatened by habitat loss and degradation, the identification and designation of threatened ecological communities, as well as threatened species, under Ramsar Criterion 2 will often be of particular importance.

Identification and designation of peatlands

7. Peatlands are ecosystems with a peat deposit that may currently support a vegetation that is peat-forming, may not, or may lack vegetation entirely. Peat is dead and partially decomposed plant remains that have accumulated *in situ* under waterlogged conditions. It is understood in this guidance that the term "peatland" is inclusive of active peatland ("mire"). An active peatland ("mire") is a peatland on which peat is currently forming and accumulating. All active peatlands ("mires") are peatlands, but peatlands that are no longer accumulating peat would not be considered as active peatlands ("mires"). The presence of peat or vegetation capable of forming peat is the key characteristic of peatlands.

8. Since peatlands are defined by the presence of a peat substrate, whilst the Ramsar Classification System is based on vegetation, peatlands occur in a number of categories in the Ramsar Classification System for Wetland Type:

   a) They may occur as a *Marine/coastal* wetland under categories I (intertidal forested wetlands) and E (sand, shingle or pebble shores, including dune systems), and perhaps marginal areas of K (coastal freshwater lagoons).

   b) They may occur as an *Inland wetland*, primarily under U (Non-forested peatlands) and Xp (Forested peatlands).

   c) Peat soils also may be present in all other *Inland wetland* categories except: M (Permanent rivers/streams/creeks), Tp (Permanent freshwater marshes/pools – inorganic soils), Ts (Seasonal/intermittent freshwater marshes/pools – inorganic soils), W (Shrub-dominated wetlands – inorganic soils), Zg (Geothermal wetlands), and Zk(b) (subterranean karst systems).

9. Peatlands contribute to biological diversity, global water issues, global carbon retention relevant to climate change, and wetland functions valuable to human communities.

10. Significant features of peatlands include:

   a) uniqueness of the peat-forming phenomenon and its ecological and natural resource functions;
   b) dependence of peatlands on their hydrology and hydrochemistry;
   c) interdependence between peatlands and their catchments and adjacent watersheds;
   d) uniqueness of their vegetation;
   e) provision of habitat for particular taxa of fauna and flora;
   f) water regulation and buffering functions;
   g) capacity to regulate local and regional climates;
   h) capacity to sequester carbon from the atmosphere and store it for long periods of time; and
   i) ability to serve as geochemical and palaeo archives.

11. In addition to their many natural values, peatlands have important socio-economic values which include, but are not limited to, the absorption and release of drinking water, natural resource provision to local communities and indigenous people, landscape stabilization, flood mitigation, removal of pollutants, tourism, and recreation.

12. Threats to peatlands can arise from both within and outside their area and include:

    a) direct threats, including drainage and land conversion, excavation, burning, over-grazing, agricultural abandonment, visitor pressure, non-sustainable commercial exploitation; and

    b) indirect threats, including pollution, excessive water abstraction, reduction in extent and quality of buffer zones, and climate change.

13. Some peatlands that have been modified but remain ecologically valuable are subject to similar threats. Opportunities exist for the restoration of such areas.

Applying the Ramsar Criteria to peatlands

14. Peatlands considered for designation under Criterion 1 should include pristine active peatlands, mature peatlands and peatlands that may be no longer forming peat, naturally degrading peatlands , human-modified and impacted peatlands, and restored or rehabilitated peatlands.

15. Special attention should be given to the designation of peatlands which have at least some of the following attributes:

    a) an intact hydrology;
    b) the presence of a peat-forming vegetation;
    c) the capacity to act as a reservoir of regional/global biodiversity;
    d) the capacity to act as a carbon store;
    e) the presence of a carbon sequestration function;
    f) the ability to maintain a geochemical and/or palaeo archive;
    g) hydrochemical diversity; and
    h) macro- and/or micro-morphological features.

16. Special attention should also be given to the designation of peatlands that have high vulnerability, such that minor impacts can lead to major degradation, and to those with potential for restoration after degradation.

17. Large areas of peatland are normally of higher importance than small areas for their hydrological, carbon storage and palaeoarchive values and because they incorporate macro-landscapes: these should be afforded high priority for designation. Consideration should also be given to the capacity of the peatland system to influence regional climate.

18. Where appropriate and desirable**,** peatlands designated as Ramsar sites should include entire catchments, so as to maintain the hydrological integrity of the peatland system.

19. Designation of both single peatlands and of complex systems that incorporate more than one type of peatland system is appropriate.

Identification and designation of wet grasslands

20. Wet grasslands are natural and near-natural ecosystems with a vegetation characterized and dominated by lower growing perennial grasses, sedges, reeds, rushes and/or herbs. They appear under periodically flooded or waterlogged conditions and are maintained through mowing, burning, natural or human-induced grazing, or a combination of these.

21. Wet grasslands include: floodplain grasslands, washlands, polders, water meadows, wet grasslands with (intensive) water level management, lakeside grasslands, vegetation dominated by relatively large, perennial, competitive herbs, and ground-water dependent dune slacks. These grasslands occur on different soils: heavy clay, loam, sand, gravel, peat, etc., and occur in freshwater, brackish and saline water systems.

22. Vegetation types that fall under this definition can appear in mosaic with one another or with other wetland types, such as peatlands, reedbeds, water-dependent shrubs, forests and others.

23. Wet grasslands are covered by the following wetland types of the Ramsar Classification System:

    a) They can occur as a *floodplain component*, under Ts (seasonal/intermittent freshwater marshes on inorganic soils, including seasonally flooded meadows and sedge marshes), and U (non-forested peatlands, including swamps and fens).

    b) They can occur as a *human-made* wetland type, under 3 (irrigated land, including irrigation channels and rice fields), and 4 (seasonally flooded agricultural land, including intensively managed or grazed wet meadow or pasture). Irrigation channels with natural vegetation cutting through wet meadows fulfil substantial ecological functions; they are therefore considered part of wet grasslands.

    c) *Wet grassland habitats* can also occur in other wetland types: E (sand, shingle or pebble shores including dune systems and humid dune slacks) and H (intertidal marshes, including salt meadows, raised salt marshes, tidal brackish and freshwater marshes). They can also occur on the edges of other wetland types, such as J (coastal brackish/saline lagoons), N (seasonal/intermittent/irregular rivers/streams/creeks), P (seasonal/intermittent floodplain lakes), R (seasonal/intermittent saline/brackish/alkaline lakes and flats), and Ss (seasonal/intermittent saline/brackish/alkaline marshes).

24. Wet grasslands support specific biodiversity, comprising rare and threatened plant and animal species and communities, including internationally important bird populations, a range of mammals, invertebrates, reptiles and amphibians.

25. In recent years there has been increasing awareness about the value of wet grasslands in performing hydrological and chemical functions, notably:

    a) flood alleviation - since wet grasslands can retain floodwater;

b) groundwater recharge - wet grasslands retain water within a watershed enabling groundwater to be replenished; and

c) water quality improvement - riparian wet grasslands retain nutrients, toxic substances and sediment, preventing them from entering watercourses.

26. Economic benefits accrue from these functions. When wet grasslands are destroyed, these functions are lost and have to be replaced at often enormous financial cost. These benefits include:

a) water supply – wet grasslands can influence both water quantity and quality;

b) health of freshwater fisheries – backwaters, ditches and other open water habitats within wet grassland areas are important for river fisheries;

c) agriculture – floodplains provide some of the most fertile agricultural land; and

d) recreation and sustainable tourism opportunities.

27. From an early stage in human history, floodplains have been subject to modifications. Since the industrial revolution, pressures on rivers and floodplains have increased significantly in many areas. As part of this process, wet grasslands have declined significantly in industrialized areas, but are also exposed to specific threats in other regions. This is being brought about by:

a) changes in agricultural practices – increased drainage and use of fertilizer, change from hay-making to silage, re-seeding, herbicide use, conversion to arable land, higher stocking densities, neglect or abandonment, use of aquatic herbicides;

b) land drainage – modification of natural hydrological regimes, isolation of floodplains from river flows, rapid evacuation of winter floods and early fall of spring water tables, maintenance of low water levels in drainage channels;

c) abstraction for drinking water and crop irrigation – leading to lowered river flows and in-channel water levels, lowered water tables, exacerbation of drought-related problems;

d) eutrophication – leading to changes in grassland plant communities and increased sward vigour;

e) threats to coastal wet grasslands from sea-level rise and construction of flood defences;

f) development and mineral extraction – leading to a decline of routinely flooded area and increased frequency of flooding of the remaining washland; and

g) site fragmentation – leading to isolation of sites, threatening species restricted to wet grassland and vulnerable to extinction, and to problems with water level control and agricultural management.

Applying the Ramsar Criteria to wet grasslands

28. A wet grassland should be considered for designation under Criterion 1 particularly if it performs specific hydrological functions.

29. Since wet grasslands are particularly dynamic ecosystems, special attention should be paid to the designation of those systems that, as part of river or coastal floodplains, are maintained by periodic floods or waterlogged conditions, either natural or human-induced, and demonstrate hydrological integrity.

30. Where wet grasslands are associated with agricultural or other management practices, special attention should be paid to the designation of systems whose ecological character is maintained through specific management measures or traditional forms of land and wetland resource uses (typically including induced grazing, mowing, or burning, or a combination of these), and whose continuation is critical to preventing gradual vegetation succession that may transform wet grasslands to tall reedbeds, peat bogs, or forested wetlands.

31. Many managed wet grasslands support important assemblages of breeding waterbirds and provide habitat for large populations of non-breeding waterbirds, and attention should be given to the designation under Criteria 4, 5 and 6 for these features.

Identification and designation of mangroves

32. Mangroves swamps are forested intertidal ecosystems that occupy sediment-rich sheltered tropical coastal environments, occurring from about 32º N (Bermuda Island) to almost 39º S (Victoria, Australia). Around two-thirds to three-quarters of tropical coastlines are mangrove-lined.

33. Mangrove swamps can form extensive and highly productive systems where there is adequate low-gradient topography, shelter, muddy substrates, and saline water with a large tidal amplitude.

34. Mangrove swamps are characterized by salt-tolerant woody plants with morphological, physiological, and reproductive adaptations that enable them to colonize littoral habitats. The term mangrove is used in at least two different ways:

    a) to refer to the ecosystem composed of these plants, associated flora, fauna and their physico-chemical environment; and

    b) to describe those plant species (of different families and genera) that have common adaptations which allow them to cope with salty and oxygen-depleted (anaerobic) substrates.

35. Mangroves occur under *Marine/Coastal Wetlands*: I (Intertidal forested wetlands) in the Ramsar Classification System for Wetland Type.

36. Mangroves carry out critical landscape-level functions related to the regulation of fresh water, nutrients, and sediment inputs into marine areas. By trapping and stabilizing fine sediments they control the quality of marine coastal waters. They are also exceptionally

important in maintaining coastal food webs and populations of animals that live as adults elsewhere and live within the mangrove at different stages of their life cycle, such as birds, fish, and crustaceans. Mangroves have an important role in pollution control through their absorptive capacity for organic pollutants and nutrients.

37. Mangroves are key ecosystems whose persistence is critical for the maintenance of landscape and seascape functions well beyond the boundaries of individual forests. Mangroves, coral reefs, and seagrass beds are among the best examples of integrated landscape-level ecosystems. When they occur together, they act as a unit, forming a complex mosaic of interrelated and integrated subsystems linked by physical and biological interactions. They play an important role in storm protection and coastal stabilization.

38. Worldwide, mangrove ecosystems support at least 50 species of mammals, over 600 species of birds, and close to 2,000 species of fish and shellfish, which include shrimps, crabs and oysters. Mangroves are also important for migratory birds and endangered species. A wide variety of species from other taxa make this a highly diverse community with a complex food web that is closely interlinked with adjacent ecosystems.

39. Mangroves are indispensable to the vitality and productivity of marine and estuarine finfish as well as shellfish fisheries. Globally, nearly two thirds of all fish harvested in the marine environment ultimately depend on the health of tropical coastal ecosystems, such as mangroves, seagrass beds, salt marshes and coral reefs, for maintenance of their stocks. The health and integrity of mangroves are critical to maintaining coastal zones and their cultural and heritage assets, and in buffering impacts due to climate change effects, including sea-level rise.

40. Mangroves have played an important role in the economies of tropical countries for thousands of years, and constitute an important reservoir and refuge for many plants and animals. In tropical countries, mangrove ecosystems support extremely valuable subsistence, commercial and recreational fisheries, while also providing numerous other direct and indirect goods and services to society.

41. Mangroves differ from other forested systems in that they receive large inputs of matter and energy from both land and sea, and more organic carbon is produced than is stored and degraded. They display a high degree of structural and functional diversity, placing mangroves among the most complex ecosystems. Because of the diversity of goods and services provided by mangroves, they should not be managed as a simple forest resource.

42. A large proportion of the world's mangrove resource has been degraded by:

    a) unsustainable exploitation practices, such as over-fishing, bark (tannin) extraction, charcoal and fuel wood production, and exploitation for timber and other products;

    b) habitat destruction: worldwide, mangroves are threatened by clearing for agriculture, urban, tourism, and industrial development, and particularly to make aquaculture ponds;

    c) changes in hydrology due to stream diversions for irrigation and dam construction, causing nutrient deprivation and hypersalinization; and

d) pollution, including industrial and sewage effluents and chronic or catastrophic oil spills.

43. Mangroves are particularly vulnerable to oil pollution and increased coastal erosion, sea-level rise, and natural events such as hurricanes, frosts, tsunamis, and human-induced climate change.

Applying the Ramsar Criteria to mangroves

44. In applying Ramsar Criterion 1 it should be recognized that mangroves occur in two broad biogeographic groups: an Indo-Pacific (Old World) group and a western African and American (New World) group, each with a characteristic but different species diversity.

45. Particular priority should be given to the designation of mangroves that form part of an intact and naturally functioning ecosystem which includes other wetland types, such as coral reefs, seagrass beds, tidal flats, coastal lagoons, salt flats, and/or estuarine complexes, since these are essential for maintaining the mangrove parts of the ecosystem. Under most circumstances, the mangrove, i.e. forested part of the site, should not be designated without inclusion of the other linked parts of the coastal ecosystem.

46. Networks of sites have more value than individual small areas of mangroves, since they contribute to the integrity of whole landscapes and seascapes. Designations that encompass whole landscapes and seascapes are valuable tools to safeguard critical coastal processes, and consideration should be given, where possible, to Ramsar site designations as part of a nested management framework for the coastal zone.

47. In determining the appropriate boundaries for site designation, consideration should be given to the following aspects:

a) inclusion of critical habitat patches, particular communities, or landforms to focus conservation and management actions;
b) provision for conservation actions within the human-dominated portion of the landscape, since a more benign human-dominated landscape can help alleviate negative edge effects;
c) provision for the conservation and wise use of large areas with relatively limited human access;
d) inclusion of whole landscape units (lagoon-estuarine complexes, salt flats, delta or mudflat/tidal flat systems);
e) the maintenance of hydrographical integrity and water quality, including in the context of catchment (river basin) management;
f) provision for the effects of sea-level rise and human-induced climate changes that may otherwise lead to loss of habitat and genetic processes; and
g) consideration of the possible landward migration of mangroves in response to sea-level rise.

48. In applying Criterion 1 to mangrove swamps, special attention should be given to the listing of areas which are in pristine condition or have biogeographic or scientific importance and protection needs.

49. Mangrove conservation should categorize units on the basis of the most appropriate use such as for protection; restoration; understanding and enjoyment of natural heritage, and conservation with emphasis on sustainable use. The minimum size of a site is that which contains the greatest diversity of habitat types, including habitats for endangered, threatened, rare, or sensitive species or biological assemblages. The "naturalness" should be considered when selecting candidate sites, i.e., the extent to which an area has been protected from or has not been subjected to human-induced change. The ecological, demographic and genetic processes should also be considered because these maintain the structural and functional integrity and self-sustaining capacity of the designated site.

50. When defining the site boundaries, it must be considered that the more complex a system, the larger the site must be in order to be effective for conservation purposes. However, boundary definition becomes more critical the smaller the unit. If in doubt, the site should be made larger rather than smaller.

51. For mangroves, particular attention should be paid to the application of Criteria 7 and 8 since mangrove systems are of critical importance as breeding and nursery areas for fish and shellfish, and Criterion 4 in recognition of the fact that because of their complex ecological, geomorphological and physical structure they can act as refuges, and are important for the persistence of populations of many migratory and non-migratory species. Designation of such areas should take into account that different habitats of coastal complexes of mangroves, seagrass beds, and coral reefs may be essential for different stages of a species' life-cycle.

Identification and designation of coral reefs

52. Coral reefs are massive carbonate structures built by the biological activity of the stony corals (true corals) and the associated complex assemblage of marine organisms that make up the coral reef ecosystem. They are found throughout the world's oceans on mud-free coastlines between latitudes 30°N and 30°S. Their estimated total area is 617,000 km^2, forming about 15% of the marine shallow shelves.

53. There are three general types of coral reefs: fringing reefs, barrier reefs, and atolls. Fringing reefs are found close against the coast; barrier reefs are separated from land by a lagoon; and atolls are ring-shaped coral reefs that enclose a lagoon and have been formed where an island (often volcanic in origin) has progressively sunk below the sea surface. However, coral reefs that develop on continental coastlines are often complex and contain features that are difficult to categorize.

54. Coral reef ecosystems may also occur as a veneer over non-reef substrata. Although geologically these are not "true" coral reefs, they have the same ecological attributes as other coral reefs, and are used by people in the same ways.

55. Coral reefs falls under *Marine/Coastal Wetlands*: C (Coral reefs) in the Ramsar Classification System for Wetland Type.

56. In many places coral reefs form part of an ecosystem that is functionally and intricately linked to other adjacent marine habitats in the Ramsar Classification System, notably A (Permanent shallow marine waters), B (Marine subtidal aquatic beds – especially seagrass

beds), E (Sand, shingle and pebble shores), H (Intertidal marshes), and J (Coastal brackish/saline lagoons).

57. In terms of sheer beauty of form, colours, and diversity of life, perhaps no other natural area of the world can compare with coral reefs. Coral reefs have the highest species diversity of all marine ecosystems and represent a significant contribution to global biodiversity. There are 4,000 known species of reef fish, and about 10% of these are restricted to island groups or a few hundred kilometres of shoreline. Despite forming a small fraction of marine systems of the world, nearly two thirds of all fish species harvested in the marine environment depend upon coral reefs and associated ecosystems, such as mangroves and seagrass beds.

58. Corals also provide a vital source of life-saving medicines, including anticoagulants and anticancer agents such as prostaglandins.

59. Coral reefs have been valuable to people for as long as communities have lived in coastal areas adjacent to warm seas. They have been exploited for food, building materials, medicines, and decorative objects, and continue to provide many of the basic needs of millions of people living in tropical coastal regions.

60. In tropical regions, coastal ecosystems and marine biodiversity contribute significantly to the economies of many countries. Coral reefs support tourism and recreation and subsistence, commercial and recreational fisheries. Some countries, including Barbados, the Maldives, and the Seychelles, rely on reef tourism for much of their foreign income. The Caribbean region alone receives over 100 million visitors per year, most of whom are destined for the beaches and reefs.

61. Coral reefs function as natural, self-repairing, and self-sustaining breakwaters, protecting the often low-lying land behind them from the effects of storms and rising sea levels. The health and integrity of coral reefs are critical to maintaining tropical coastal zones and their cultural and heritage assets.

62. Despite their ecological and economic importance, coral reefs are in serious decline worldwide. They are threatened by numerous human actions that contribute to coral reef degradation, such as sediment, sewage, agriculture run-off and other pollution sources, mining, dredging of coastal areas, and coastal development. A strong correlation has been found between risk of degradation and coastal population density. The severe anthropogenic stresses from growing populations and their activities on the coastal zone are now coupled with die-offs due to coral diseases and epidemics affecting reef species. Over-fishing, blast fishing, fishing with poisons, and souvenir collecting for national and international trade are major agents of reef destruction. Rising carbon dioxide may reduce the rate of calcification and reef formation.

63. A further and increasing impact on coral reefs is the effect of rising sea surface temperatures linked to global climate change. This causes the phenomenon of coral bleaching – expulsion of symbiotic algae, leading often to the death of the corals themselves with consequent loss of the diverse communities dependent upon them. Coral reefs that are already under stress from other human-induced pressures such as pollution and sediment deposition appear to be most vulnerable to bleaching. Predictions of future sea surface temperatures indicate that bleaching will become increasingly widespread and

frequent. Recent results suggest that bleaching of corals by increased UV-B radiation may be adding to the effects of temperature.

64. Once corals have died, reefs are more vulnerable to physical break-up during storms, thus threatening their function in protecting coastal lands and their people from impacts of rising sea levels and storms. The massive worldwide coral bleaching in 1997-98 suggests that coral reefs maybe signaling the first ecosystem-scale damage from human-induced global change. Recovery will depend upon reducing human pressures through sound management and upon whether bleaching events will recur with increased severity and frequency, reversing any coral reef regeneration.

65. As a result of these interacting problems, coral reefs have suffered a dramatic decline in recent years. About 11% of the world's reefs sites have been lost, 27% are under immediate threat, and another 31% are likely to decline in the next 10 - 30 years. At greatest risk are the reefs in the wider Indian Ocean; Southeast and East Asia; the Middle East, mainly in the Arabian-Persian Gulf; and the Caribbean-Atlantic region.

66. Coral reefs support multi-species fisheries. Protected areas are now often used as a tool in fisheries management. Some economically important species may spend part of their life cycle outside the boundaries of the designated area, which should be taken into account in management. On the other hand, fisheries management measures support not only sustainable fisheries but also biodiversity and other valuable characteristics of the site. Many reef fish species need regulatory frameworks beyond the Ramsar Convention to complement Ramsar site designation. These species need protection under complementary conservation frameworks and authorities.

67. In managing coral reefs, conservation needs must be considered along with the needs of local people who may depend on certain reefs for their livelihoods. Some areas are best managed using multiple-use and zoning approaches that can accommodate the needs of different stakeholders. Nested protection frameworks at coastal zone level are required, as opposed to using schemes based on the strict protection of just a few areas. Coastal coral reef areas are best managed within the context of Integrated Coastal Zone Management (ICZM) programmes.

Applying the Ramsar Criteria to coral reefs

68. Contracting Parties should consider, where appropriate, the listing of composite sites under Criterion 1 that include coral reefs and associated systems, in particular adjacent shallow reef flats, seagrass beds, and mangroves, which normally function as intricately linked ecosystems. The designated coral reef area should contain the greatest diversity of habitat types and successional stages possible, and also include the habitat types and successional stages of the associated systems.

69. Special attention should be given also to the listing of networks of sites rather than to individual reefs. Networks have more value than individual sites, contributing to the preservation of the integrity of whole seascapes.

70. Contracting Parties should pay special attention to the listing of coral reef areas that, because of their geographic location ("upstream-reefs"), are sources of pelagic larvae and ensure the seeding of large areas of reefs "downstream".

71. Reefs that buffer coastlines against storm damage, and so protect coastal populations and infrastructure, should also be considered for designation.

72. Consideration should be given to the listing of sites where there is a threat of degradation, and where listing can lead to comprehensive management actions that enhance maintenance of the ecological character of the coral reef.

73. An important consideration in the identification of coral reef sites for designation is the extent to which an area is unaffected by, and can be protected from, human-induced change that alters the quality of coastal waters, since the ecological character of the reefs will be maintained only if the water quality is preserved and coastal zones are appropriately managed.

74. In determining the boundaries of a coral reef site to be designated, Contracting Parties should take into account Article 2.1 of the Convention. Since the outer parts of many coral reef systems as defined in paragraph 53 and the middle of some lagoon systems extend to below six metres water depth, boundaries of coral reefs sites should include all such parts of the reef. Moreover, since coral reef ecosystems as defined in paragraph 53 extend beyond the boundaries of the reef structure, and activities in adjacent areas can harm them, adjacent waters should, as appropriate, be included in the site designation.

75. The size of a designated coral reef site should be appropriate to the geographic scale of the reef and the management approaches necessary to maintain its ecological character. Wherever possible, the area should be large enough to protect an integral, self-sustaining ecological entity. In the sea, habitats are rarely precisely restricted, and it should be noted that many marine species have large ranges and that ocean currents can carry genetic materials of sedentary species over great distances.

76. In addition, consideration should be given also to the listing of sites that:

    a) support unusual geologic/biologic formations, and/or species of fauna and flora of particular aesthetic, historic or scientific interest;

    b) have a history of documented long-term research and management by local and international institutions; and

    c) can be used for the establishment of long-term monitoring programmes for the assessment of environmental change.

77. The importance of coral reefs for fish species should be recognized through the application of Criteria 7 and 8. In applying Criterion 7 it should be noted that the fish species richness of reefs varies regionally, for example from more than 2,000 species in the Philippines to about 200 - 300 species in the Caribbean. Simple species counts (species inventories) are not sufficient to assess the importance of a particular area, and assessments must take into account the characteristics of the fish fauna in each region. Although endemism in coral reef fish is not common, some islands and shoals may be effectively isolated, with fish populations becoming genetically distinct. Such reef systems should be afforded a priority for listing.

78. Sites that support species of special conservation concern, unique biological assemblages, and flagship or keystone species (such as elkhorn coral forests, sponge and sea fan assemblages), and which are in pristine condition, should be a high priority for designation.