Report on a mission to Ichkeul National Park, Tunisia
28 February – 4 March 2000

Lotfi Baccar, Mike Smart, Anada Tiega & Patrick Triplet

Objectives

1. The authors of the present report were requested by the World Heritage Centre (UNESCO), by IUCN, and by the Bureau of the Ramsar Convention to study the situation at Ichkeul National Park in order to:

   - evaluate the present conservation status of Ichkeul National Park, which is included (with the agreement of the Tunisian authorities) on the World Heritage in Danger List and on the Ramsar Convention's Montreux Record;
   - evaluate both the programmes to monitor the Park's ecosystems, which the Tunisian authorities are currently carrying out, and the management of the Park;
   - provide advice to the Tunisian authorities, to UNESCO, to IUCN, and to the Ramsar Bureau on the scientific parameters to be included in the programme of monitoring, study and restoration of the site;
   - make recommendations to the Tunisian authorities, to UNESCO, to IUCN and to the Ramsar Bureau on any other measures likely to improve the conservation of the site.

Programme

2. The mission's programme was as follows:

Sunday 27 February 2000:	Arrival in Tunisia of Mr Smart
Monday 28 February 2000:	Visit by Mr Smart to the General Department of Forestry (Ministry of Agriculture) and to the Ministry of the Environment. Visit by Mr Baccar to the National Agency for Environmental Protection (ANPE). Arrival of Mr Tiega and Mr Triplet; contacts with ANPE and the other members of the mission.
Tuesday 29 February 2000:	Meeting at ANPE.
Wednesday 1 March 2000:	Visit to Ichkeul National Park and discussions with staff of the Park.
Thursday 2 March 2000:	Visit to the fishery station at Tinja and to the Sejenane dam. Meeting with Mr Mansour Taieb, Regional Commissioner for Agricultural Development, Bizerta and his colleagues.
Friday 3 March 2000:	Meeting with Mr Ali El Hili, President of the Tunisian MAB Committee. Final meeting at ANPE to decide on the main points and conclusions of the report. Meeting with Mr Bechir Ben Mansour, Managing Director of ANPE.
Saturday 4 March 2000:	Visit by Mr Baccar, Mr Tiega and Mr Triplet to the General Department of Forests.

Brief description of Ichkeul National Park

3. Ichkeul National Park is made up of the three major landscape units, as follows:

   - A shallow lake (about one metre deep on average) with an area of 89 km^2. This lake is characterized by seasonal variations in water depth and salinity; the latter ranges from 5 gms/litre in winter to more than 30 gms/litre in summer. This alternation is influenced by inflow of fresh water from the catchment in winter, and in summer by reverse flow of sea water via the Lake of Bizerta through the Tinja canal. The low salinity in winter promotes the development of aquatic plants (and in particular of *Potamogeton pectinatus*) which at its greatest extent covers an area of up to 35 km^2. This vegetation is the principal food of some 200,000 wintering migrant water birds.
   - Temporarily flooded marshes covering 30 km^2. These marshes are characterized by extensive stands of rushes S*cirpus lacustris* and *S. maritimus*, which are the main food of Greylag Geese

Anser anser and of the roughly 2,000 cattle belonging to people living in the Park. These plants require a period of flooding with water of low salinity for several months.

- A jebel (mountain), which constitutes an isolated outcrop on the southern shore of the lake and makes a major contribution to the natural beauty of the site.

History of the conservation of Ichkeul

4. The Ichkeul lake and marshes have long been recognized (together with Doñana in Spain, the Camargue in France and the El Kala region in Algeria) as one of the four major wetland areas in the western basin of the Mediterranean. Ichkeul National Park (covering an area of some 12,000 hectares) is one of the few sites listed under three international agreements: (a) Biosphere Reserve (1977); (b) World Heritage Convention (1979); and (c) Ramsar Convention (1980). The documents presented at the time of Ichkeul's inclusion in these international lists noted that construction of dams on the rivers which provide water for the lake and marshes, as planned in the Master Plan for the Waters of Northern Tunisia, was likely to have an impact on the ecological character of the site.

5. During the 1980s, a research programme was carried out under the auspices of the Ministry of Agriculture, in collaboration with University College London, CNRS (France) and Sogreah, a Grenoble firm of consulting engineers. The programme was financed by DG XII of the European Commission, with the aim of evaluating the impact of the dams on Ichkeul. The Master Plan, in its original version, contemplated the building of six dams on rivers flowing into Ichkeul, the largest of which were the Joumine and Sejenane dams. The Joumine dam (with a catchment of 418 km^2 and a capacity of 100 million m^3 of water) became operational in 1983, the Ghezala dam (with a catchment area of 48 km^2 and a capacity of 15 million m^3) in 1984, and the Sejenane (with a catchment area of 307 km^2 and a capacity of 140 million m^3) in 1994.

6. The Tunisian authorities, aware of the impact of these dams on the natural environment at Ichkeul, organized an international seminar on Ichkeul in 1990. The principal result of this seminar was a decision to carry out a multidisciplinary study, more thoroughgoing than previous work, of all aspects, both biotic and non-biotic, of the National Park. This study, carried out between 1993 and 1995 under the auspices of the National Agency for Environmental Protection (ANPE), provides a very full documentation of the situation and in no way hides the threats, represented by the decrease in water inflow, to the integrity of the wetland ecosystems. The study, entitled "Etude pour la Sauvegarde du Parc National d'Ichkeul" and financed by a grant from KfW (Kreditanstalt für Wiederaufbau), Germany, was carried out by a multidisciplinary and multinational team of experts, with the following objective:

    - identification of the ecological and biological characteristics of Ichkeul National Park, and of the evolution of its ecosystems and the factors threatening their equilibrium, with a view to devising an optimal ecological management programme which takes account of the requirements of social and economic development in the region.

    The technical approach followed in the study comprised the following stages:

    - Bibliographical synthesis of all previous studies.
    - Critical analysis and diagnosis of the development activities carried out, under way or planned in the National Park and its area of influence, in order to define their impact on the environment.
    - Extensive programme of simultaneous measurements of biotic and abiotic parameters in the lake and marsh ecosystems, in order to understand their functioning and to establish tolerance limits.
    - Modelling of the various physical and biological phenomena which govern the behaviour of the lake and marshes, adjusted on the basis of observed data, in order to draw up an integrated management plan for the lake-marsh system and a predictive forecasting model for short term management of the lake.
    - Drawing up of a programme for social and economic development of the region, setting forth a series of priority actions related to the demands of the National Park's ecosystems.

- Definition of an optimal system of ecological management for the National Park, providing a scenario for socio-economic and ecological development of the region in a sustainable manner, and development of a Management Plan for the area of the Park with:
  - operating instructions for the sluice at Tinja;
  - a management plan for the sluice; and
  - a supporting programme of socio-economic measures.

Since the publication of this report, ANPE has continued to measure certain parameters in the lake, in particular water salinity and levels, and the status of submerged flora.

7. The Tinja sluice, built in the late 1980s on the Tinja canal to control water exchanges between Lake Ichkeul and the Lake of Bizerta, only began operating in 1996, on the basis of data collected by ANPE. The principle of its operation (opening – closing) is based on the recommendations of the Study, which aim to meet the ecological tolerance levels of the site, mainly as regards water salinity and level.

8. Given the risk of change in ecological character, Ichkeul was included in 1990 in the Ramsar Convention's Montreux Record ("Record of Ramsar sites where changes in ecological character have occurred, are occurring, or are likely to occur"), and in 1996 on the World Heritage in Danger List. At its annual meetings, the World Heritage Committee reviews the status of sites in danger and it requested a mission to present a report on the status of Ichkeul in 1999. The Ramsar Convention undertook a mission to Ichkeul in January 1997.

9. The present mission was informed of numerous other measures adopted by the Tunisian authorities, since the Study was completed, in order to promote the conservation of Ichkeul, in the light of the growing recognition in Tunisia of the importance of conserving natural habitats in general and of Ichkeul in particular. This recognition is shown by:

   - the decision to cancel the construction of the other dams originally planned on three rivers (the Douimis, Mellah and Tine) flowing into Ichkeul.
   - the construction and operation of the Tinja sluice.
   - the classification of Ichkeul, in the planning of water resources by the General Department of Hydraulic Studies and Works in the Ministry of Agriculture, as a water consumer and the decision to grant Ichkeul an annual water quota.
   - the decision to supply Ichkeul with water from the Sidi El Barrak dam (situated in a neighbouring catchment) once this dam becomes operational, probably in spring 2001.
   - the closure of the marble quarries on the mountain at Ichkeul.
   - the decision to route the future Tunis-Bizerta motorway well away from Ichkeul.
   - the measurements to monitor the status of Ichkeul carried out by ANPE since the end of the Study.
   - the construction of waste water treatment plants at Mateur and Menzel Bourguiba, which will make it possible to improve the quality of the water reaching Ichkeul.

Criteria for including Ichkeul in the World Heritage and Ramsar Lists

10. A document issued by the World Heritage Centre ("Brief Description of Sites Inscribed on the World Heritage List" WHC 99/15) notes that the lake and marshes at Ichkeul provide habitat for hundreds of thousands of migratory birds (in particular ducks, geese, storks and flamingos), and that it is the last remaining site of a chain of freshwater lakes which once extended right across North Africa. This document shows that Criterion (iv) - biological value - was the basis of Ichkeul's inclusion in the World Heritage List. It should be noted that, while Ichkeul was predominantly a freshwater lake before the construction in 1881 of the canal linking Bizerta to the sea, the lake has been characterized over the last hundred years by the alternation of fresh water in winter and brackish water in summer.

11. In the same way, the biological value of the site was what motivated its inclusion on the Ramsar Convention's List of wetlands of international importance. The occurrence of large numbers of migratory birds, which occupy the top position on the food chain, is a sign of the high carrying capacity of the site and of the abundance of available food, particularly plants and insects. The

lake and marshes are also a representative example of a type of wetland important at regional level, and meet Ramsar's criteria 1,3,5 and 6 for identifying wetlands of international importance.

12. Biosphere Reserves call for a mosaic of habitats, some of which are free of human use, whilst others support human activities, including scientific research. There are in fact important fisheries on the lake and some grazing in the marshes.

13. The mission considers that the combination of the three ecosystems - lake, marsh and mountain - combine to create a site of exceptional natural beauty: it is indeed rare to find a rocky mountain outcrop rising from the middle of a wetland. This feature is entirely consistent with Criterion (iii) for identifying sites for the World Heritage List.

Current conservation status

14. Despite all the conservation measures taken by the Tunisian authorities, it must be emphasized that the lake and marshes have undergone a very serious loss of biological diversity following the change of hydrological regime in the wetland. The fundamental question is whether it is possible to restore, at least in part, the previous richness.

15. As forecast in the Study, the decrease in inflow of fresh water caused by the filling of the dams has led to salinization of the lake and marshes, changes in the flora, and to a decrease in numbers of water birds, especially of wintering birds.

16. Water quantity and quality. The inflow of water to the lake has decreased, particularly during the filling of the dams, and especially the Sejenane dam. This shortfall was exacerbated by a number of years with low rainfall. As a result, natural evaporation in summer has increased and sea water has entered through the Tinja canal, leading to high salinity of the waters. Under these conditions, operation of the Tinja sluice is a very delicate matter; it calls for the application of the operating instructions which are triggered by the water salinity and levels observed, in order to predict the optimum opening time and period, and thus to satisfy the ecological tolerance levels of the lake/marsh ecosystems. Since it was first operated in 1996, the sluice has been closed in summers 1996, 1998 and 1999 (years of good or average rainfall) but remained open in summer 1997 after a winter of poor rainfall. The effect of this management, based on the recommendations of the Study, in decreasing the salinity of the water has been palpable. However, it must not be forgotten that the period until the Sidi El Barrak dam comes into operation is a transitory period, given that the managed Ichkeul catchment is not yet functional.

17. The mission noted that winter 1999/2000, up to the beginning of March, has been relatively dry. As a result – unless the spring brings an appreciable increase in rainfall – the sluice is likely to remain open in summer 2000, which would lead to a renewed upsurge in salinity, and hence a loss of the benefits laboriously obtained during previous summers.

18. Submerged flora of the lake. The increase in salinity of the lake has led to a change in the submerged flora. The beds of *Potamogeton pectinatus*, the principal food of wintering ducks and coots, have been replaced by beds of *Ruppia* which can tolerate a higher level of salinity but seem less palatable to water birds.

19. Flora of the marshes. The flora of the marshes (and particularly of the marshes at the mouth of the Joumine and Sejenane rivers) has suffered even more greatly. This is due, on one hand, to the very high level of salinity in the waters of the lake and, on the other, to the lack of leeching of salt from the marsh. Formerly the salt deposited in the marshes in summer was leeched by the autumn floods of the rivers. At present the flow of the rivers is very low and, in the case of the Joumine, the water course now flows through a drainage canal beginning in the agricultural land in the Mateur Plain and continuing through the marsh inside the National Park.

20. This increase in salinity in the marshes has led to a general change in the flora, which is at present dominated by plants which tolerate a high level of salinity and are of little interest either to water birds or to cattle. Two plants in particular have suffered from this increase in salinity: rushes *Scirpus* spp. and reed *Phragmites australis*. The latter formerly formed a belt all around the water

area, which provided shelter and nesting sites for a whole series of birds, as well as habitat for mammals (including otter *Lutra lutra*) and insects.

21. Birds. The increase in salinity and the changes to the flora have naturally had a considerable impact on populations of birds, which are at the top of the food chain and which led to Ichkeul's inclusion in the lists of international conventions.

22. The available ornithological data are unfortunately incomplete, and not always reliable. It is nevertheless certain that the numbers of wintering ducks and coots have decreased from an average of 200,000 individuals to a level situated around 50,000. The wintering geese feed on bulbs of rushes; their numbers, which in the 1980s sometimes exceeded 20,000 individuals, do not at present reach a thousand. Species which nest in the reed belt (such as herons and egrets, but also the globally threatened Marbled Teal *Anas angustirostris* and Purple Gallinule *Porphyrio porphyrio*) have disappeared as breeding birds, and there have been no observations for a long time of White-headed Duck *Oxyura leucocephala* (also globally threatened), even though it is featured in the Ecomuseum as a characteristic species of the site. The role of birds as bio-indicators should be emphasized: good numbers of birds normally occur where ecological conditions are excellent.

23. The mountain. The flora, the birds and the mammals of the mountain are of course little affected by variations in the salinity of the wetland, although birds of prey depend on the marshes for their prey. The Study refers to a risk of overgrazing by cattle from the villages. The decrease in the number of people living at the foot of the mountain could lead to a decrease in grazing pressure, though the cattle do not necessarily belong to people living in the Park.

Monitoring of biotic and abiotic factors

24. ANPE has established an on-site technical team, whose role includes carrying out a programme of measurements and studies suggested by the Study. This permanent team, based in the Reception Centre on the mountain, has since 1997 been monitoring a number of different parameters, both abiotic and biotic. The mission emphasizes the importance of this work, congratulates the researchers, and expresses the hope that this work may continue.

25. The abiotic factors monitored are the quantity and quality of waters of the lake (monthly transects, records of salinity, lake levels, rainfall). The biotic factors studied are essentially submerged flora (transects, identification of species, records of biomass). Non-systematic observations relate to marsh flora (above all of rushes) and bird censuses.

26. The mission considers that it is absolutely essential, as a basis for the restoration of the biological diversity of the site, to maintain this monitoring programme, and indeed to extend it. In response to a request from the Tunisian authorities, the mission proposes the monitoring programme set out in paragraphs 27 to 33 below.

27. Water quality and quantity. Maintain the existing programme.

28. Bathymetry. Monitor the evolution of the bed of the lake, where sedimentation patterns may have been changed through the operation of the Tinja sluice, particularly around the sluice itself.

29. Submerged flora of the lake. Maintain the current programme, and strengthen it by associating expert botanists (either from Tunisian universities or from specialized institutions within the administration). An annual visit during the period of maximum extent should be enough to measure the tendencies.

30. Flora of the marshes. Establish seasonal monitoring of the state of the marshes through transects, especially of the reeds and rushes.

31. Birds. This is the most difficult problem, and it is fundamentally a problem of institutions. Identification and censusing of birds at Ichkeul is not easy. Many observations and censuses of birds have been made at Ichkeul over the last forty years by a variety of observers, some more reliable than others. These observations have never been collected in a single place, nor checked

for reliability. It is therefore necessary to create the institutional conditions for carrying out this task, and to train qualified personnel needed to:

- collect, store, analyse and above all check the accuracy of the historical data;
- carry out censuses of birds, preferably on a monthly but at least on a bimonthly basis, from October to March, and on a bimonthly basis from April to September;
- analyse the evolution of bird numbers in the lake and marshes, considering them as indicators of the general health of the ecosystems.

32. While the drop in bird numbers at Ichkeul is certainly due to the degradation of the natural environment there, external factors (such as a possible general decrease in the numbers of certain species, poor conditions on the breeding grounds, or loss of migratory stopover points in other countries) may have an impact on migratory bird populations. This ornithological work at Ichkeul should therefore be placed in its international context.

33. The mountain. Monitor the status of fauna and flora (paying particular attention to overgrazing). Annual monitoring using a series of transects, with additional checks from time to time, should be sufficient.

34. The mission is well aware that a programme of monitoring of this scope requires considerable efforts in the field of administration (establishment of new institutions or strengthening of existing ones), of staff training and of field work. The mission considers that Tunisia can legitimately seek scientific and technical support from international organizations and financial input from funding bodies for the execution of this monitoring programme.

Proposals on the long term management of Ichkeul

35. The mission took note of the many policy decisions taken by the Tunisian authorities to promote the conservation of the natural environment in general and of biological diversity of Ichkeul in particular (see paragraph 9). The mission also noted a number of practical and positive measures currently being carried out (operation of the sluice, setting up of exclosure plots in certain sensitive areas of the marshes, visitor reception measures). The mission noted that - thanks to the Study for the Safeguard of the Ichkeul National Park - Ichkeul has the good fortune to have at its disposal a collection of basic data of great scientific value, which are often lacking at other sites of comparable importance. The mission considers that a summary of the Study should be published in an international scientific journal, so that the international scientific community can also take advantage of Tunisia's experiences.

36. If the biological diversity of Ichkeul National Park is to be restored to the maximum extent possible, two things will be required: an integrated management plan and an institution capable of implementing this plan.

37. Integrated management plan. Any internationally important protected area should - according to international conventions - have a management plan. The Ramsar Convention has officially adopted Guidelines on management planning for Ramsar sites, which comprise three stages: description of the site; definition of short-, medium- and long-term objectives, derived from the description; and execution of measures to attain these objectives. The Guidelines add an important proviso: management planning is a constantly evolving process, since the measures taken will change the description, which will in turn change the objectives, which will once again affect the measures to be taken. The Ramsar Convention has also provided its Contracting Parties with guidelines for encouraging and strengthening the participation of local communities and native populations in the management of wetlands.

38. As mentioned above, the Study for the Safeguard of the Ichkeul National Park drew up an integrated management plan for the Park. However, the mission recommends strongly that this plan should be updated and implemented, with the involvement of all concerned interest groups. The mission considers that the objectives of the plan should take account not only of the flora and fauna of the Park, but also of the human users: fishermen and graziers, visitors and tourists. The plan should look into the possibility of enhancing the value of the Park, for example through instituting payment for entrance, expanding the visitor reception facilities and activities, marking

the boundaries of the Park (particularly in the southern sector) and ensuring the return of benefits from the Park to the inhabitants of the region, perhaps by establishing a quality label with the name Ichkeul attached to it (as has been done at Doñana). The Study envisaged that Ichkeul should be set in its regional economic context. Guidance in this field might be found in the "Strategic Plan for the sustainable development of the area around Doñana" drawn up by the Andalucian authorities around the Doñana National Park.

39. Institutional framework. The implementation of an integrated management plan of this kind makes it necessary to set up an appropriate management body, with the necessary powers of decision. At present Ichkeul National Park undergoes a large number of different impacts which may sometimes come into conflict: conservation, fishery, agriculture, dams, tourism.

40. The Park is currently managed by the General Department of Forests of the Ministry of Agriculture, but the conservator has neither his own budget, nor a specific administrative structure for the Park. Other departments of the same Ministry of Agriculture have other responsibilities for other matters which have important impacts on the natural environment: the General Department for Hydraulic Studies and Works for dams; the General Department of Rural Engineering for the management of the immediately adjoining agricultural areas (there is no buffer zone); the General Department of Fisheries and Aquaculture for fishery management and negotiations with the private fishery licence holder. The Ministry for the Environment and Land Planning plays an important role in co-ordination of the activities of other ministries relating to the environment (and in particular in environmental impact studies), and represents Tunisia at many international events. The ANPE (which comes under the authority of the Ministry of the Environment) is responsible for the management of the Visitor Centre and for collecting data on the natural environment of the Park.

41. There is, thus, in the present management of the Ichkeul National Park, a sharing of powers and responsibilities between different administrations. Sectorial management of this kind is a classic source of management problems in natural environments. It is indeed astonishing that things have gone so well until now, and tribute must be paid to the spirit of co-operation between the various services and persons concerned. But it is clear that the management of a site so important at both national and international levels - and, above all, of a site facing a delicate and difficult restoration programme - requires the establishment of a suitable management structure with the material facilities and human resources necessary. The Interministerial Monitoring Committee which has functioned until now has been a forum for discussion of the problems that arise, but does not have the powers required for the implementation of an integrated management plan.

42. The mission therefore strongly recommends the establishment of an institutional structure, endowed with the means and powers necessary to implement the integrated management plan.

Urgent matters

43. The mission wishes to draw the attention of the Tunisian authorities to a number of very urgent matters, already mentioned in the above paragraphs, which need immediate action. These are:

    - restoration of the Joumine marsh (investigation and application of a system for flooding the marsh with run-off waters, even at a low flow);
    - siltation of the lake (through a new bathymetric study which, when compared with the one carried out under the Study for the Safeguard of Ichkeul National Park, could identify possible problem zones);
    - possibility of releasing water in the immediate future, and forecasting of the results, using the management model.

44. Restoration of the Joumine marsh. As noted in paragraph 19, salt from the Joumine marsh is no longer leeched out by river floods. A canal in the marsh carries run-off waters from agricultural land in the Mateur Plain towards the lake. The soils of the marsh have as a result become harder and saltier, and the flora has become more salt-loving and less attractive for herbivorous birds. This situation could rapidly be remedied, and part of the site's biological diversity could be restored, by reflooding parts of the marsh with water from the drainage canal. It would be enough to carry out a topographical study in the marsh and to divert the water into the appropriate sectors.

The mission strongly recommends that this work, which furthermore appears to be relatively low in cost, be carried out.

45. Siltation of the lake. The closing of the Tinja sluice in the summers of 1996, 1998 and 1999 may have had an impact on sedimentation patterns in the lake (see paragraph 28). Sediments, which would formerly have been carried away through the Tinja canal to the Lake of Bizerta and the sea, may have been held back in Ichkeul lake by the sluice. It may be therefore that the depth of the lake is decreasing more rapidly, which might provoke changes in the water regime or flooding. The mission therefore recommends that a bathymetric study, which would not be very expensive, be carried out to resolve this question.

46. Releases of water. Winter 1999/2000 has produced relatively little rainfall. There is a high probability that the salinity and water levels required to trigger the closing of the sluice (19 gms/litre at 1.00 metres NGT) will not be reached, as in 1997. This would lead to another sharp rise in salinity in the course of summer 2000, and the reductions in salinity levels achieved in 1998 and 1999 would be wiped out. The only possible solutions are: either heavy rainfall in the course of March/April 2000, which is highly desirable; or releases of water from the Sejenane or Joumine dams. The mission visited the Sejenane dam and saw that the dam had not this year reached the overflow level which would automatically supply the lake at Ichkeul. The mission realizes that it is difficult to release water from the dam when farmers themselves are short of water, but it requests the Tunisian authorities to consider this possibility, given the urgency of the situation at Ichkeul and the international values concerned.

Recommendations to IUCN and UNESCO

47. Distribution of the present report. The mission requests IUCN and UNESCO to make a copy of the present report available to the Tunisian authorities as soon as possible, so that they are aware of its content.

48. Maintaining Ichkeul on the World Heritage in Danger List. The text of the Convention provides that a site may be removed from the World Heritage List, if the values which originally motivated its inclusion on the List are lost. Recognizing the impact of the dams on these values, the World Heritage Committee included Ichkeul on the World Heritage in Danger List in 1996.

49. Germination tests have been carried out on seeds of *Potamogeton* collected in the sediments of the zone occupied by beds of this plant before 1996 (western part of the lake). These laboratory tests, carried out under optimal salinity conditions for germination, were successful and proved that the lake still maintains its potential to reconstitute the beds of *Potamogeton* which have currently been replaced by beds of *Ruppia*. The same is true for the restoration of rushes over large areas of marsh several years after the disappearance of the plants; they reappear when marshes are flooded during the right period for germination and also in pools of rainwater in little depressions.

50. This being the case, the answer to the question "For how long will the environment remain capable of retaining potential for restoration?" remains an enigma. It is clear that the current restoration process will last for several years. The mission recommends that Ichkeul should remain on the World Heritage in Danger List and on the Ramsar Convention's Montreux Record for some time (probably several years), until the outcome of the restoration programme is known. The Committee could consider the possibility of removing Ichkeul from the World Heritage List if it should prove that the restoration programme has not succeeded. If the programme is successful , the Tunisian authorities should be congratulated.

Annex: Summary of recommendations

(a) Monitoring

1. Maintain the current ANPE programme of monitoring water quality and quantity (paragraph 27).
2. Monitor the development of bathymetry of the lake (paragraph 28).
3. Maintain the current ANPE programme of monitoring the submerged flora, and extend it further by strengthening the team through the appointment of specialized multidisciplinary staff (paragraph 29).
4. Begin a monitoring programme for the flora of the marshes (paragraph 30).
5. Improve the monitoring of bird populations (paragraph 31).
6. Set up an institution with the ability to collect, store, analyse and check the ornithological data, and train the necessary staff (paragraph 31).
7. Monitor the fauna and flora of the mountain (paragraph 32)

(b) Management of the Ichkeul National Park

8. Update and implement the integrated management plan for the Park and its surrounding area, using the Ramsar Guidelines on management planning for wetlands (paragraph 37-38).
9. Establish an institutional structure with the means and powers necessary for the implementation of this management plan (paragraph 39-41).

(c) Urgent matters

10. Restore the Joumine marsh (paragraph 44).
11. Study the siltation of the lake (paragraph 45).
12. Consider water releases from the dams in spring 2000 (paragraph 46).

(d) Administrative measures

13. Make the present report available to the Tunisian authorities (paragraph 47).
14. Maintain Ichkeul on the World Heritage in Danger List and on the Montreux Record until the results of the restoration plan are known (paragraph 48).
15. Consider removing Ichkeul from the World Heritage List if the restoration plan is not successful (paragraph 50).
16. If the restoration plan is successful, remove Ichkeul from the World Heritage in Danger List and from the Montreux Record, and congratulate the Tunisian government on its efforts to conserve Ichkeul, which will have led to the site being maintained as a World Heritage site and as a Wetland of international importance (paragraph 50).

(e) Scientific publication

17. Publish in an international scientific journal a summary of the Study for the Safeguard of Ichkeul National Park (paragraph 35).