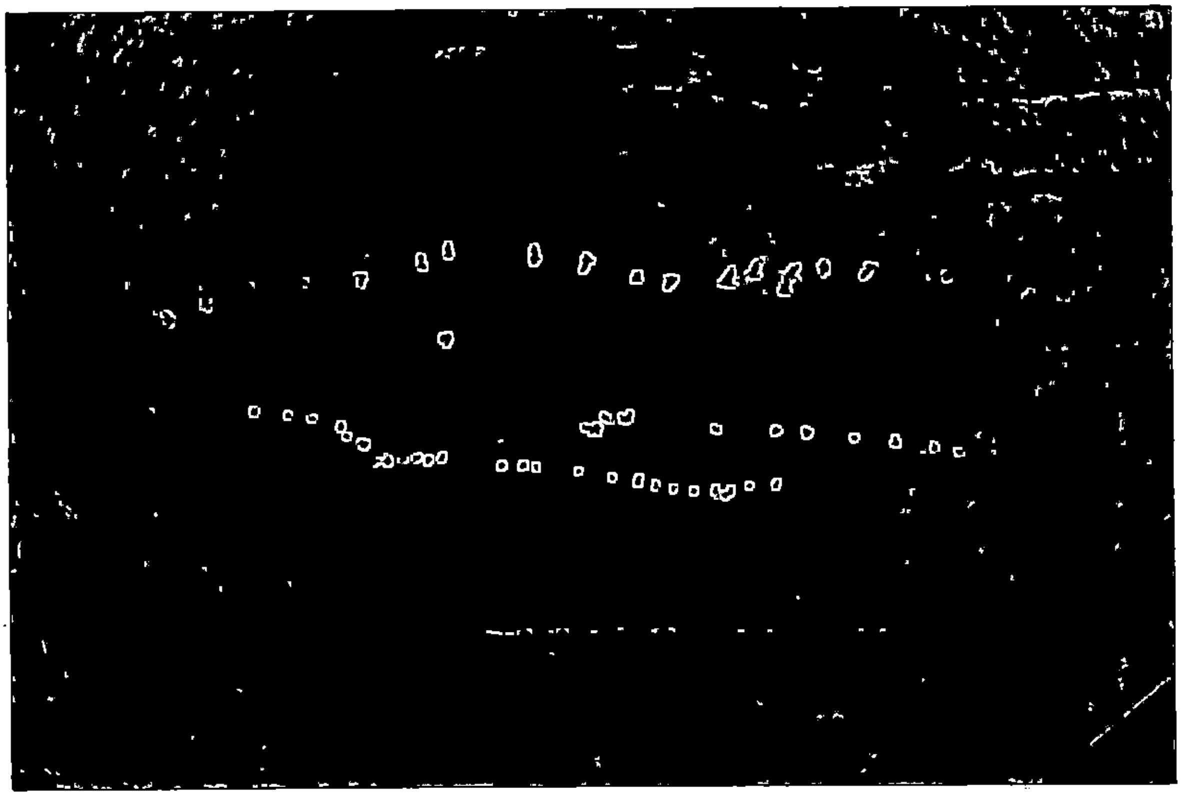
Conservation status of the greater and the lesser flamingo, an inventory.



Camargue, July 1998 (wg)

A working document for the second International Flamingo Symposium in Miami, October 1998.

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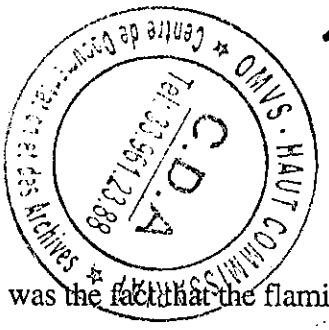

Acknowledgements

One of the first things that amazed me about flamingos was the fact that the flamingo family uses the same filtering system as the baleen whales. Two odd looking creatures of which we have no idea what coordinates their movements over long distances. Thank you Cathy King for giving me the challenge to try to understand the habits and movements of flamingos, and the threats these birds are facing today. I want to thank Alan Johnson at Tour du Valat Station Biologique for the generous way he shared his (unpublished!) literature with me, and for the hospitality during my stay in France. Closer by was Wetlands International, where I was supplied with lots of interesting literature as well. The following persons completed the "Flamingo Conservation Action Plan Questionnaire": A.W. Adil, J. Arinaitwe, A. Atzeni, N. Baccetti, B. Behrouzi-Rad, W. Borello, Y. Dellelegn Abebe, R. Dowsett, J. Githaiga Maina, G. Handrinos, K. Hyland, A. Johnson, Kalpavriksh Environmental Action Group of New Dehli, P. Kessler, B. Lamarche, M.A. Mohamed, P.J. Mundy, B.C. Mwasaga, O. Nasirwa, V. Parker, R.E. Simmons, R. Tomno, R. Yosef, A.Z-U. Zhatkaubayer and C. Zucca, thank you all for your participation!

Note: The citation sources in the text are not noted as usual (first author plus the year of publication) but are noted by a specific code. Generally, this code starts with two letters, indicating the first writer(s), followed by the year of publication.

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1 Introduction

Flamingos form one of the most ancient bird families of the world, as fossils have been found of present genera from 30 million years ago. These oddly shaped pink waterbirds with their fragile looking long neck and legs were models for drawings by our ancestors who communicated through their paintings in caves. Six flamingo taxa are still surviving: The largest of all is the greater flamingo (*Phoenicopterus ruber roseus*) and its conspecific the Carribean flamingo (*Phoenicopterus ruber ruber*); the two most endangered and least known species are the Andean and James' flamingo (*Phoenicoparrus andinus* and *Phoenicoparrus jamesi*, respectively); the Chilean flamingo (*Phoenicopterus chilensis*), is the most abundant flamingo of the New World; and the smallest in size but most numerous of all is the lesser flamingo (*Phoeniconaias minor*).

Flamingos forage and breed in inhospitable habitats. They occupy large shallow lakes or lagoons, which may be alkaline, with pH value as much as 10.5, or saline, sometimes with more than twice the salinity of sea water (*DE92*).The available breeding and feeding sites for flamingos around the world are decreasing in size, due to many factors, e.g. salt industry, erosion, weather instability, and (in-) direct disturbance by humans in general. Although none of the flamingos are endangered throughout their range, the wetlands they inhabit should be protected by means of conservation actions before these unique habitats become too small and fragmented to maintain their characteristic flora and fauna, including flamingos.

As this study is concentrated on the Old World, *Phoenicopterus ruber roseus* and *Phoeniconaias minor* are the two flamingo species of interest. They both occur in several sites of Asia Minor, western, southern, eastern Africa, and the greater flamingo is also found throughout the entire Mediterranean region. Greater flamingo is the largest flamingo species with a mean height of 120-145 cm whereas the lesser flamingo is the smallest with a mean height of 80-90 cm (*DE92*). Another easy morphological difference between the two flamingo species is the colour of the bill as the lesser flamingo has a much darker coloured bill.

1.1 Food preferences

Both species occupy shallow, saline and alkaline inland lakes and coastal lagoons where they forage in dense flocks of thousands or tens of thousands. The birds filter

food particles from water using their specialised bills and tongue with the head in the "up-side-down" position.

The greater flamingo has a relatively varied diet; animal foods ingested are aquatic invertebrates, e.g. copepods (*Gammarus),* molluscs, crabs, insects, including Diptera larvae or chrysalids; plant matter consumed consists of algae, diatoms, and some marsh grasses. *Phoeniconaias minor* tolerates even more alkaline water than *P. ruber roseus* where it finds the blue-green algae (*Spirulina, Oscillatoria, Lyngbya*) and diatoms (*Navicula*, Bacillophyceae), although some small invertebrates are also eaten (*DE92*). The two flamingo species do not compete for food this way. The pink colour in the flamingo feathers is due to pigments (carotenoids) derived from the algae (Howard in *IUCN97*).

1.2 Reproduction

Flamingos living in areas with clearly defined seasons usually breed in spring (France, Spain) or during/after the rainy season (Etosha Pan (Namibia):*SIM96*; Sambhar Lake (India): *FN8*), whereas flamingo groups living in areas with constant weather conditions initiate breeding attempts throughout the year. It seems that lesser flamingos breed irregularly or that only a proportion of the population breeds every year (Howard in *IUCN97*). Irregularity in breeding frequency may be due to irregularity in rainfall. Flamingos become reproductively active as a result of an increase in rainfall which changes food quality and induces or increases flooding of the areas around breeding islands. The flamingos then begin to perform their famous displays which presumably serve to synchronise the reproductive condition of males and females, so that a large number are in the right physiological state to nest together at the same time. Pre-nesting activities may last for days or weeks at the feeding lakes before the flamingos move to the breeding sites (Howard in *IUCN97*). Flamingos generally lay one chalky white egg, which is incubated for 27-31 days by both sexes in shifts of up to 24 hours if feeding grounds are far away (*DE92*). After hatching the chick stays at or around the nest for the first three weeks. It then joins colony creche until it fledges three months after hatching (*CE95*). Creches with hundreds or thousands of chicks guarded by only a small group of adults nonetheless decrease predation as the first three months are the most dangerous ones in a flamingo's life. Ringing for monitoring purposes is mostly done in the creche just before the chicks fledge (*JO97*).

1.3 Movements

Movements of flamingos cannot be classified as migration as their movements are not regular and not predictable. Flamingo movements are a product of the weather patterns driving the productivity cycles of the lakes (Githaiga in *IUCN97*), dispersal of young birds, aggregation at available breeding sites, and disturbance at the feeding grounds (Howard in *IUCN97*). Most long-distance movements seem to occur during night-time (lesser: Howard in *IUCN97*; greater: *JO89*), probably to avoid predation as well as the high day-time temperatures or the birds may use certain celestial cues for navigation at night.

1.4 Why conservation?

Since the beginning of humanity, people have been concerned about their environment and especially its ability to provide them with food, water, and other resources. As human numbers have grown and our technology has developed, we have become increasingly concerned about the impact we are having on our environment. This concern has lead us, to establish a international conservation union (the IUCN) of sovereign states, governments agencies and non-governmental organisations. IUCN has three basic conservation goals: "secure the conservation of nature, and especially of biological diversity, as an essential foundation for the future; ensure that where the earth's natural resources are used this is done in a wise, equitable and sustainable way; and guide the development of human communities towards ways of life that are both of good quality and in enduring harmony with other components of the biosphere" (*SS97*). By means of setting up international conventions such as the Ramsar Convention (1971) and the Convention on Biological Diversity, launched in 1992 at the United Naton Conference on Environment and Development, conservation of nature and natural resources should be put into practice. A convention that directly benefits flamingo conservation is the Convention on Wetlands of International Importance especially as Waterfowl Habitat. It uses a set of criteria that is used by the contracting parties to designate Ramsar sites, the third criteria being specifically related to waterfowl (including flamingos;*RS97*). These sites will be protected via measures noted in the Convention.

Although flamingos, especially Lesser flamingos, are not yet endangered throughout their range, conservation is necessary. First, because there is a trend in habitat destruction, caused by e.g. commercial salt industry (e.g. Bötswana (Sua Pan), Mauritania), dams for hydro-power and land reclamation for agricultural purposes (*SIM96*; *IUCN97*; see chapter 3). Second, if flamingos disappear from wetlands such as (inter-) tidal lagoons, macro-, and microfaunal numbers will increase significantly causing these ecosystems to become unbalanced. Lesser flamingos, for example, keep

blue-green algae blooms under control (*GB97*). Third, flamingos can be used as biological indicators for environmental monitoring and management. The birds may reflect "exposure", or "response" to a stressor (e.g. high/low water conditions, pollution, disturbance, erosion). Lastly, waterfowl and their habitats are generally of high recreational and aesthetic value to humans (*KU93*) so that flamingos can be used as flagship species to increase the awareness of people, locally and in the region, and to promote management of the wetlands in a more wise and responsible way.

To assess the conservation status of species and their habitats, IUCN and its Species Survival Commission (SSC) are promoting and publishing Action Plans which can specify conservation priorities. The series is one of the world's most authoritative sources of species conservation information available to nature resource managers, conservationists, government officials and NGO's around the world.

1.5 Purpose of this study

The purpose of this study was to compile and evaluate up-to-date information concerning the status of flamingos and current conservation actions in regions of Africa, the Mediterranean, and Asia Minor where *Phoenicopterus ruber roseus* and/or *Phoeniconaias minor* have fed and/or bred on a regular basis during the last 12 years (1987-1998). This was done in order to provide the participants of the second International Flamingo Symposium relevant information for formulating recommendations for the Flamingo Conservation Action Plan. Two major points of interest in this study were the course of the bird's status in the past 12 years (see chapter 2) and the current and future threats to their conservation in the wild (see chapter 3 and 4). Researchers and conservationists working with flamingos in the field were asked to complete the "Flamingo Conservation Action Plan Questionnaire" to gain up-to-date population data and more specific information on the conservation status of flamingos in their area (chapter 4 and appendix 4). At the time of writing this report, 25 persons from 22 different countries had completed the questionnaire for one or more sites.

2 Distribution and movements

-Includes appendix 1-

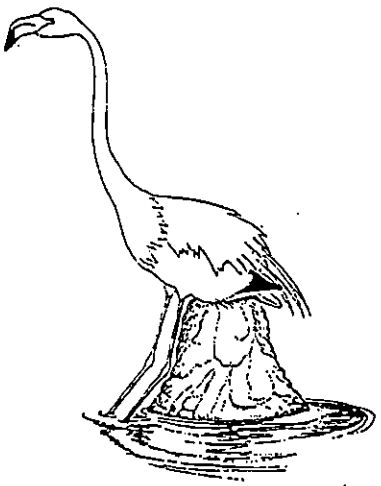
A large proportion of the greater and lesser flamingos seem to be nomadic (lesser: Howard in *IUCN97*; greater: *JO89*). Due to their special diet requirements flamingos are dependent on sites (e.g. lagoons and salt pans) that are not suitable for feeding year around. The abundance of food and numbers of birds feeding and/or breeding that year seem to correlate with the amount of rainfall, which can explain the fluctuations in numbers of flamingos per site shown by the censuses (e.g. Asian and African Waterfowl Censuses). Flamingos mysteriously know how to follow the rains over hundreds and thousands of kilometres.

2.1 Greater flamingo

The greater flamingo occurs in Guinea Bissau, Senegal, Mali and Mauritania (west Africa), Morocco, Algeria, Portugal, Spain, France, Sardinia, Italy (mainland) Tunisia (west Mediterranean), Greece, Cyprus, Turkey and Israel (east Mediterranean) where the more "western population" meets the "eastern population". The eastern population includes Kazakhstan, Turkmenistan and Afghanistan in the north, United Arabian Emirates, Oman and Yemen, Iran, Pakistan and India. Further, in Africa the distribution of the greater flamingo stretches from Ethiopia, via Kenya and Tanzania in eastern Africa to Botswana, Namibia and South Africa in the south. See also appendix 1 for feeding and breeding sites, population numbers and site protection. Although no single bird will cross all these different geographical parts in a life time, one has to see the Old World's greater flamingos as one metapopulation. Recoveries of birds banded as chicks in Fuenta de Piedra (Spain), the Camargue (France), Uromiyeh Lake (Iran) and Lake Tengiz (Kazakhstan, *JG97*) show that greater flamingos can disperse from Spain and France via Morocco to western Africa (*JO97*, *FN6*), or via Sardinia and Tunisia to Turkey, and occasionally from there towards Iran (*A. Johnson, pers. com.*). Birds ringed in Iran seem to disperse even over a larger distance, to Kazakhstan (regular breeding site) in the north or to the south-west (Persian Gulf) and in a smaller extent to southern Asia, and further into Africa (*BB92*). Behrouzi-Rad (*BB92*) suggests that one of the reasons for the larger nonbreeding range of the Iranian population is that a smaller proportion of this population overwinters in Iran, compared to Camargue-ringed birds. Juveniles in particular cross long distances in order to find suitable places to feed and grow during their first five years before breeding starts (*A. Johnson, pers.com.*). Regular observations at the main feeding grounds would give us more insight in the distribution of greater flamingos and dispersal of young.

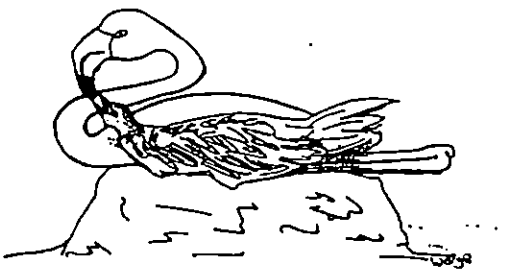
2.2 Lesser flamingo

The dispersal and movements of the lesser flamingo are still quite unknown as they occur in even more inaccessible habitats than greater flamingos, in such numbers that they are difficult to count. No longterm banding study has ever been performed. Howard (*IUCN97*) stresses that in eastern Africa, where the lesser flamingo is the most abundant, movements will remain a mystery until neighbouring states in its range will cooperate to support further studies and to allow easy access across borders to monitor these movements. Questions that should be answered are: What triggers the movement of the lesser flamingo from lake to lake?; how do flamingos find good feeding and breeding sites?; how far do lesser flamingos move and how often?; what makes a site a good site?. Mauritania, Mali and Senegal in west Africa, Botswana, Namibia and South Africa in southern Africa, and Ethiopia, Kenya, Tanzania and Uganda in eastern Africa, together with some 20.000 birds in India, Pakistan and Sri Lanka make the list for regular range of the lesser flamingo complete (*IUCN97*). See also appendix 1B for feeding and breeding sites, population numbers and site protection.



From Dampier's Description (1697).

Incubation as suggested in 1697(*PA56*)



Incubation as observed nowadays.

So we <u>are</u> coming close understandimg the breeding biology of flamingos!

3 Current and potential threats

-Includes appendix 2-

That the family *Phoenicopteridae* is still present after 30 million years (*DE92*) indicates that these birds have already overcome enormous changes in their environment. Flamingos are thus very stable in terms of their evolutionary history. Their nomadic way of living, general habit of breeding in such large numbers and their specialised feeding habits must have allowed survival over this tremendous period. Today, we are concerned if they are still capable of surviving all the rapid changes now occurring in their environment. For example, to what extent are human-related threats to flamingos increasing the possibility of becoming extinct? Are the declining numbers always due to human-related threats or have some threats always been there as a part of the ecological (evolutionary) system?

3.1 Natural threats: weather

Avoiding natural threats by human intervention in sometimes very tempting. Take for example the macabre sights at a saltpan rapidly drying out where a massive breeding attempt of lesser flamingos is going on, e.g. in the Etosha pan (Namibia) and the Sua pan (Botswana), resulting in abandonment of thousands of eggs and chicks. Must we intervene in this dramatic event by capturing the chicks and raise them temporally in captivity? Simmons has written (*SIM96*) that the benefits of such rescue operations are low, a high percentage of the young will die by predation by mammals within the first year. He concluded that rescue operations, when chicks are near to starvation are also expensive and time-consuming, scar the main pan with deep tire tracks and do not improve the long term survival of the population. However, saving chicks from a slow death might be a wise option to acquire new, genetic, "material" for the captive population in zoological gardens. Or, do we have to artificially manage the water levels, build new islands in order to make breeding possible in areas where otherwise breeding attempts would be unsuccessful? In the Camargue (France) and in Fuente de Piedra (Spain), these two measures have resulted in annually successful breeding attempts and increasing numbers of the greater flamingo in both the breeding-, and nonbreeding season *(MJ96)*. Whether these options are relevant for sites in Eastern and Southern Africa are still discussed (*SIM96*). Not only are weather patterns different, but also the natural and historical status of the sites differ. The Camargue has not been restored to its natural state. The flamingo island was built to compensate for the loss of natural sites following the construction of dykes (*A. Johnson, pers. com.*).

Erosion of breeding islands caused by strong winds, unfavourable currents and extensive breeding, have also resulted in a lack of available nesting sites for greater flamingos in e.g. the Camargue (Fr), Fuenta de Piedra (Sp; *MJ96*) and Lake Uromiyeh (Iran; *QR98*).

3.2 Natural threats: disturbance by animals

Disturbance by animals still seems to be a common threat to both the greater and the lesser flamingo according to the threats mentioned in the questionnaires and literature (appendix 2), for example: (wild) dogs in Ethiopia (Debre Zeit; *FN8*), United Arabian Emirates (*QH98*), Sardinia (*SF95*) and on the mainland of Italy (*QB98*); wild boars (*Sus scrofa*) in Spain and Mauritania; gulls (*Larus cachinnans*) at coastal breeding sites; marabous (*Leptoptilos crumeniferus*) and Great White Pelicans (*Pelecanus onocrotalus*) in eastern Africa (*DE91*); wild asses (*Equus hemionus khur*) at the Great and Little Rann of Kutch in India (*SC89*); and jackals in Namibia (*TW?*) and Mauritania (*QL98*).

Losses in flamingo populations due to diseases does not seem to be a current problem. Or is this due to a lack of detailed information?

3.3 Human-related threats: habitat loss/ exploitation

Although we are not always sure what makes population numbers increase or decrease, quite often threats are related to human activities. The influences of the growing world population and advanced techniques to extract valuable sources from the flamingo's habitat do cause habitat loss, disturbance and pollution. More specifically, urbanisation brings disturbance in many ways and is now even effecting the most inaccessible pans. As R. Allen already concluded in 1956: "The flamingo's only effective defence against man has been retreat and isolation, today, it has its back to the wall" (*VH95*). Habitat loss due to simply reclaiming wetlands for housing, business areas and rural developments are a real threat to wetlands and their inhabitants in all regions (*HU96*). A more developed infrastucure, e.g. roads, flyways of planes (France, Italy and Turkey; *FN5, QB98, GE97*, resp.), fences and high tension power lines , (matimba powerline crossing South africa, Botswana and Zimbabwe (*BO98*)), is hazardous for flamingos flying from their feeding to their breeding grounds. In India, Pakistan and Tanzania, wetlands are often threatened by desertification as a result of deforestation for local firewood collection (*SC89, FP91, LM97*). Intensive grazing of cattle in India and Pakistan has also led to desertification (*SC89, SR90*) and will presumably be present in other areas too. Industry (e.g. salt and soda extraction factories, hydro-electric power plants, reservoirs) and agriculture have advanced techniques for drainage or irrigation and therefore are able to expand their activities very rapidly. Take for example Sua Town (Botswana), a newly built town that supplies the needs of a new soda ash plant

with a 500 square km area of salt pans in a part of the Sua Pan which is a major feeding site for the nearby breeding site, especially important for lesser flamingos (*AF90*). However, one must note that these saltpans can also be beneficial to flamingos e.g. additional feeding or even breeding areas.

As the food items that flamingos prefer can usually be found in saline water, the majority of the main feeding and breeding areas are often within or close by salt or soda extraction plants. Expanding salt/soda extraction activities are a frequently suggested potential threat for flamingos (see appendix 2: Threats: an inventory over 1987-1998). Not the actual salt wells but merely the side activities, e.g. repair works on the salt wells, transport and the changing waterlevels, disturb the colonies (*GE97, SC89, AF90*). However, old and abandoned salt wells are recommended to be restored for feeding purposes (*QJF98*).

3.4 Human-related threats: decreasing water levels - water quality

The decrease in water quality is one of the most suggested current and potential threat to both the greater and lesser flamingo areas in the Old world (See also appendix 2). This is a threat that has been recognised since the 1980's and for which the actual negative effects are still unknown. Agriculture, households, marine chemical extraction plants and other factories along the wetlands and their incoming rivers and channels dispose pesticides, fertilisers, detergents and other chemicals into the water. Pesticides, and heavy metals can alter or decrease the micro and macro flora and fauna, which will eventually lead to ecosystem degradation (*HU96, FN7*). Furthermore, detergents from households and industry and other chemicals used in factories (carpet and leather factories) easily eutrophicate the aquatic ecosystem (*FP91, IW92*).

Fluctuation and a decrease in the water levels also have negative effects on the ecology of wetlands. Irrigation and drainage are often linked to wrong water management of wetlands. Clean fresh water is often collected in reservoirs for drinking-water, irrigation and/or power generation, so that the water supply to the wetlands is cut off or artificially regulated via channels causing a decreasing water influx in the wetlands (*SC89, SR90, MM97*). Breeding islands can then become accessible for predators, pollutants can become more concentrated, and marshes can change into more terrestrial sites (*HU96*).

3.5 Human-related threats: hunting and egg collection

Hunting and egg collection by locals is still threat Nr.1 to all flamingo species occurring in the New World (*DE92*). This is not a serious threat to the Old world flamingos, as they, and especially the lesser flamingo, live in inaccessible areas. However, despite the

awareness campaigns and legal protection of the sites, hunting of greater flamingos still occurs in some (eastern) regions of the Mediterranean (*JG97; appendix 2*), southern Asia (*LM97*), and in Afghanistan (*QW98*) and Kazakhstan (*QZ98*) where the nestsites of flamingos are easily accessible and where the meat and eggs are a welcome source of protein. In the Camargue (France) is a potential conflict arising from greater flamingos feeding on newly sown rice grains. Studies are being performed to find ways to keep the flamingos out of these paddies (*JG97*) before farmers take their own measures.

3.6 Human-related threats: tourism

Tourism, especially eco-tourism, is seen as a way to finance management and improvement of habitats of natural importance and to increases local economic activities. However, strong regulation and management are necessary to avoid negative side effects of (eco-) tourism, such as disturbance by tourist boats (*BA97*), photographers, bird watchers and 4WD vehicles entering restricted areas (*appendix 2*). Areas that are not yet protected should be protected.

3.7 Exotic flamingos; a case for concern?

Both the Chilean (*Phoenicopterus chilensis*) and the greater flamingo (*Phoenicopterus ruber roseus*) and also *Phoenicopterus ruber ruber* breed irregularly in Germany (Zwillbrocker Venn) at a few meters of the Dutch border. Currently the birds only breed in Germany and are present in The Netherlands during the rest of the year (*QK98*). It is assumed that the birds have escaped from captivity (*LE96*). Successful mixed flamingo breeding pairs (Chilean with greater flamingos) are known as hybrids and have been observed in Spain, the Camargue, and in Germany (Zwillbrocker Venn) where one chick was successfully raised (*CE92*; *TP94*). Unless ringed birds from the Camargue or elsewhere are observed mixing with exotic taxa in northern Europe, there is no serious threat for hybridisation in the wild greater flamingo population (*CE92; A. Johnson, pers. com.)*. As flamingos are not generalists but specialists in terms of feeding, the effects on the local habitat, recently discovered by flamingos, will not have much impact (*HU96*).

3.8 Conclusions

Flamingos seem to suffer from threats that are threats to wetlands and their inhabitants in general. Roads and dams that form barriers to movements of mammals, birds, reptiles, insects and fish, reclaiming land for housing, agriculture and industry, air and water pollution, erosion, drainage and desertification, do all contribute to degradation of the wetland ecosystem (*HU*96). Threats specifically to flamingos seem to be more regionally specific, such as hunting and disturbance by humans and animals, side activities at the commercial salt pans, slow disappearance of nest sites, drought and

fluctuating water levels. The lack of information and of international collaboration can be seen as a threat as well. The Mediterranean, western, eastern and southern Africa are fairly well represented by a few "flamingo dedicated" scientists and environmentalists. Arabian countries, Kazakhstan, Turkmenistan, Pakistan and India seem to be less represented in literature and international collaboration programmes. Is this due to a lack of international, national and/or regional interest, does perception of nature differ or is there a shortage of money? Hopefully, in the future contacts between the precious few people studing flamingos in the widely seperated areas can be improved.

4 Current and potential conservation actions

-Includes appendix 3-

Several reasons were mentioned in the introduction and chapter 3 for conservation actions to ensure the existence of the greater and lesser flamingo in the Old World. Appendix 3 shows that quite some actions are already being performed (indicated with a C) or will be performed (P). In this chapter the results of extracted literature tabulated in appendix 3 are discussed.

4.1 Africa

In Eastern Africa, Ethiopia is planning conservation actions, however, current actions are scarce. Dellelegn (in *IUCN97*) gives the complicated land use system as the reason. The resentment of local people for a system that placed human welfare second to wildlife conservation have been expressed since the previous military government was toppled in 1990: land use that ignores the needs of the society are doomed. Understanding the people's perspectives and needs, rather than setting up reserves for a threatened species, are necessary to conserve nature in general. "Top down" strategies did not have the expected results in Africa. As the political environment in Africa is changing into a more democratic system, "bottom up" or "grassroots" strategies that involve local human populations should be implemented.

The IUCN Eastern Africa Programme has just published a detailed report about the status, threats and conservation actions and recommendation for the lesser flamingo (*IUCN97*). It also contains a list of practical recommendations including communication and awareness actions on all levels, actions that will be co-ordinated by the African Flamingo Group.

Conservation actions, current and potential, are underway in both Namibia and South Africa. However, South Africa is just starting to realise the importance and benefits of flamingos in that country and awareness programmes and possibilities for ecotourism are just now being developed (*AK94*).

National Park staffs in Mauritania and Senegal cooperate in the longterm ringing programmes in Spain and France coordinated by Alan Johnson at Tour du Valat (France). The information and knowledge exchange between western Africa and the western Mediterranean seems to be fruitful as indicated by the number of publications, personnel exchanges and re-sightings of greater flamingos in Senegal and Mauritania. Even knowing that monitoring in western Africa mainly focuses on the greater

flamingo, it is remarkable that so little information on the lesser flamingo in western Africa appeared in the IUCN report (*IUCN97*) as summaries for southern Africa and Asia were published in this document.

4.2 Mediterranean

France, Spain, Italy, Turkey and Greece are implementing conservation actions, one of the reasons might be that all countries are participating in the long term ringing program headquartered at Tour du Valat. Information is available and persons of the various sites seem to use the expertise in this intensive observation programme covering the entire Mediterranean. Tour du Valat Station Biologique in the Camargue started its unique long term study on the breeding biology, structure and dynamics of the greater flamingo population in the Camargue in 1954. This station is now a well-known research station for the conservation of the Mediterranean wetlands and coordinates one of the biggest monitoring studies on birds ever done. Recommended conservation actions for the Mediterranean are mainly focused on wetlands in general. Highlights in the Wetlands International programme (*WI92*) are: rehabilitation and restoration of wetlands, study *how* to restore wetlands; regulating fisheries and agriculture projects and promote traditional fishing techniques so that eutrophication and over-fishing can be avoided; managing hunting activities; and conserving saltpans that are deserted by the salt industry and otherwise will be used for agricultural/industrial/housing purposes. As (eco)tourism is growing, strict management plans and studies to understand the impact of tourism should be initiated as well (*WI92*).

4.3 South-west and southern Asia

It is hard to find detailed information in literature on most Arabian countries as well as Kazakhstan and Turkmenistan. However, the recent Flamingo Conservation Action Plan Questionnaire has provided us with new information on most of these countries (see appendix 3). Tourism is less developed in comparison to the African countries where wildlife sanctuaries are becoming more popular each year. National and regional parties might not yet realise the positive impact flamingos can have for their area.

Both Pakistan and India have protected areas (including Ramsar sites) and are well aware of their rich natural wetland resources (*SC89*), however, within these areas poaching, habitat fragmentation due to increasing infrastructure development, and desertification due to intensive grazing and firewood collection are still proceeding on a large scale. Censuses done in Pakistan and India between 1994 and 1996 show a decline in the number of wetlands covered and waterfowl counters participating in comparison to 1993 (*LM97*). India is planning actions but the current actions seem to be mainly focused on one area, Little Rann of Kutch (*appendix 3*).

4.4 In general

All countries in appendix 1 take part in midwinter waterfowl censuses, generally held in January, such as the African Waterfowl Census and the Asian Waterfowl Census, coordinated by Wetlands International. Hopefully, these yearly censuses will increase the local and regional awareness and further actions. That this can happen is demonstrated by a successful first attempt for a yearly waterfowl survey in Kenya, Tanzania and Uganda, July 1994, organised by both the Kenya and Uganda wetland working group, and wetlands bird counters from Tanzania (*FN7*). Education, training and networking (by publishing articles in the newspaper, spreading outreach material and allowing the local community to access and work at the nearby N. P.) at local wildlife clubs and women clubs seems to increase awareness for nature as well. (African) values concerning nature may differ at local, national and international levels. Values change and because of the great variety in ethnic (African) groups it is hard to determine what their values are, however, the variety gives also a lot of possible solutions as traditional ways in conservation can be used nowadays (*USAID*).

According to the threats cataloged in appendix 2, a decrease in water levels and water quality is one of the main threats for the lesser and especially the greater flamingo and their wetlands, now and in the near future. Conserving flamingos has to start with conserving their habitat. In general, implementation of site management plans were often recommended and scheduled for the near future, but were not often listed as current actions (*appendix 3*). Understanding the wetland system is vital for its conservation. If information is available plans and legislation can be set up for sustainable use of this keystone ecosystem. Tom Kabii (*KA97*) stated that wise use of wetlands in Africa is still far away as knowledge, understanding and awareness among the decision makers and technical staff is lacking resulting in poor formulation and implementation of wetland policies (*KA97*).

5 Conclusions

The purpose of this study was to compile and evaluate up-to-date information concerning the status of flamingos and current conservation actions in Africa, the Mediterranean, and south-west Asia where *Phoenicopterus ruber roseus* and/or *Phoeniconaias minor* have fed and/or bred on a regular basis during the last 12 years (1987-1998). By means of available literature and information gained from the "Flamingo Conservation Action Plan Questionnaire" an inventory was made of important feeding and breeding sites, including maximum and minimum population numbers and site protection status (appendix 1).

Primarily because of long term ringing programs of chicks at Fuenta de Piedra (Spain), de Camargue (France), Lake Uromiyeh (Iran) and Lake Tengiz (Kazakhstan; *JG97*) and the re-sightings, the movements of the greater flamingo are becoming less mysterious. Expanding regular observations to the main feeding grounds would give us more insight in the distribution of greater flamingos and dispersal of young. Although it is believed that lesser flamingos are as nomadic as the greaters, there is little information available about their movements. The lack of information is partly due to the fact that no long term banding study has ever been performed and lesser flamingos live in even more inaccessible areas than greater flamingos. However, interest in these birds is increasing as the IUCN Eastern Africa Programme has just published the proceedings of "the lesser flamingo in eastern Africa" workshop that took place at Lake Bogoria in Kenya in 1997. The resulting publication discusses and formulates conservation actions regarding the conservation of the lesser flamingo in eastern Africa and beyond (*IUCN97*). In botswana (Sua Pan) a biologist (PhD) is planning to start at the end of end of 1998 with a flamingo satellite tracking study (*QBO98*).

Flamingos seem to suffer from threats that are threats to wetlands and their inhabitants in general. Roads and dams that form barriers to movements of animals, reclamation of land for housing, agriculture and industry, water pollution, drainage and desertification all contribute to degradation of the wetland ecosystem (*HU*96). Threats specific to flamingos seem to be more regionally problematic, such as collisions with high power lines, hunting and disturbance by humans and animals, expanding salt extraction activities, drought and fluctuating water levels (see also appendix 2). The lack of information and of international collaboration can be seen as a threat as well. The Mediterranean, western, eastern and southern Africa are fairly good represented by a few "flamingo dedicated" scientists and environmentalists. Arabian countries,

Kazakhstan, Turkmenistan, Pakistan and India seem to be less represented in literature and international collaboration programmes.

Conserving flamingos has to start with conserving their habitat. Implementation of site management plans and improvement of management are often recommended and scheduled for the near future according to literature and the completed questionnaires (*appendix 3*). Although some wetlands in Africa are managed with a great interest for conservation, wise use of wetlands in a big continent like Africa is still far away as knowledge, understanding and awareness among the decision makers and technical staff is lacking, resulting in poor formulation and implementation of wetland policies (*KA97*). However, education, training and networking at e.g. the local wildlife club and women clubs seem to increase awareness for nature. One should be aware of the changing values concerning nature as they can differ at local, regional, national and international levels (*USAID*). That all countries in appendix 1 take part in midwinter waterfowl censuses, often coordinated by the Wetland International departments, is a valuable tool to integrate international with regional/local activities and increase local awareness and involvement and hopefully will stimulate local workers to publish their findings (follows the "bottom up" or "grassroots" strategy).

The "Flamingo Conservation Action Plan Questionnaire" (appendix 4) was a great help in this study to acquire more detailed and up-to-date information on regional/local threats as well as potential threats for flamingos and the conservation actions that are currently being performed or planned in the near future. Sending this type of questionnaire to persons participating in flamingo research and conservation in the wild every couple of years might not only be a tool to monitor the status of flamingo conservation per site but also refresh one's ideas and facilitate intensive national and international communication.

Hopefully, this study and the suggestions can contribute in avoiding one of the most ancient bird families of slowly disappearing due to the human ignorance after having survived for more than 30 million years.

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Appendix 1A

Feeding and/or breeding sites, maximum and minimum population numbers censused in January (unless other month is noted), and area/site protection status for the greater flamingo, *Phoenicopterus ruber roseus*, between 1987 and 1998.

Note: "?" means that no clear information was found. Maximum and minimum population numbers are noted as numbers can fluctuate enormously. Areas/sites are only included in this list if more than 100 greater flamingos were censused or if the site was frequently noted in literature regardless the observed low numbers.

	area/ site	max - min	non-breeding (period)	egg-laying period	area/ site protection status
Eastern Africa					
Ethiopia	Lake Abijata	36.321-3792 (FN9; DO97)	wintering ground (FN8)	June	Abijata-Shala lakes National Park
	Lake Chitu	1500 (DO97)	yes	no	not protected (QD98)
	Debre Zeit (Green lake)	1000 nov'93 (TR94)	yes	no	not protected
Kenya	Lake Bogoria	10708-2941 (TR94; DT95)	year around (QT98)	no	National Reserve (QM98)
	Lake Elmenteita	7012-322 (TR94; DO97)	yes	yes	No legal protection (QM98)
	Lake Magadi	1119-609 (DO97; DT95)	yes	no?	not protected (IUCN97, QN98)
	Lake Nakuru	1350-36 (DT95)	yes	no	National Park (IUCN97, QN98)
Tanzania	Lake Natron	small nrs. (FN7)	Oct.-Feb. (QMW98)	yes	Game controlled area (IUCN97)
	Lake Manyara	1800 (TR94)	Oct.-Feb. (QMW98)	no	National Park (IUCN97)
	Lake Eyasi	?	yes	no	Ngorongoro CA (IUCN97)
	Momella lakes	>10.000-2700 (FN9; TR94)	yes	no	Arusha National Park
Southern Africa					
Botswana	Makgadikga-di pans: e.g. Sua Pan	44000 (April)-8000 (FN6; FN7)	seasonally (QBO98)	April-June (IUCN97, JG97)	partly: wihin game reserve, within sanctuary and partly unprotected (JO98)

	area/ site	max - min	non-breeding (period)	egg-laying period	area/ site protection status
Zimbabwe		200 (mean: QJ98)	yes	no	partly within National Parks (QJ98)
Zambia		not known (QDO98)	yes	no	partly within Mweru wantipa National Park and Lochinvar National Park (QDO98)
Namibia	Etosha Pan	35.000-1000 (IUCN97; SIM96)	no	Feb.-May (FN5; FN8)	National Park
	Mile 4 Saltworks	1931-0 (DT96; TR94)	yes	no	owned by salt extraction company
	Walvis Bay	31.800-3127 (QS98; DO97)	Dec.-June (QS98)	no	private nature reserve (QS98)
	Sandwich Harbour Mud flats	18.000-2500 (QS98; TR94)	Dec.-June (QS98)	no	private nature reserve (QS98)
Malawi	Lake Chilwa	not known (QDO98)	yes	no	not protected
Mozam-bique	area south of Save River	5000-30.000 (month ?; QP98)	peak between July-Oct. (QP98)	no	most areas not protected, protected: Maputo elephant Reserve, shoreline of Bazaruto Archipelago and lakes of Bazaruto Island (QP98)
Madagascar		669-121 (BO98)	yes	no	?
South Africa	Kamfers dam	>24.000-1467(DT95 ; IUCN 97)	year around (AK94)	no	Ramsar site (AK94)
	St. Lucia (Zululand), De Hoop Vlei	?	yes	no	both nature reserves and Ramsar sites (JO98).
Western Africa					
Mauritania	Banc d'Arguin	30.800-1590 (FN8; GO96)	year around (QL98, QJM98)	April-Sept. (GG96)	Banc d'Arguin National Park
	Chott Boul	?	yes	yes	not protected
	Aftout es Saheli, e.g. Etang de Diawling	12.270-6000 (TD96; FN5)	year around (QJM98)	May (FN4) Dec. (FN7)	not protected
Senegal	Lagoons de St. Louis	2195-111 (DT95; FN7)	yes	Jan.-Mar. (JG97), April (FN8)	Geumbeul National Park
	des Oiseaux du Djoudj	20.544-320 (FN9; DT95)	yes	no	des Oiseaux du Djoudj National Park

	area/ site	max - min	non-breeding (period)	egg-laying period	area/ site protection status
Guinea Bissau		130-54 (April: FN6; FN9)	yes	no?	not protected
Mediter-ranean					
Portugal	Estuário do Tejo	350-21 (FA92)	seasonal	no	Reserva Natural (partly)
	Estuário do Sado	255-0 (FA92)	yes	no	?
	Castro Marim	93-0 (FA92)	yes	no	Reserva Natural (partly)
	Ria Formosa	524-0 (FA92)	yes	no?	?
Spain	Fuente de Piedra	13.278-5000 (FN4; FN5)	yes	Feb.-May (JG97)	Nature Reserve, Ramsar site
	Marismas (Huelva-Sevilla)	73 (may) 30.000 (July; FN5)	feeding site for F. de Piedra	Feb.-May (JG97)	Donana Nature Reserve and National Park. Ramsar site (JO98)
	Salinas de Santa Pola, El Hondo	700 (mean)	yes	Feb.-May	Natural Park, Ramsar site (JO98)
	Ebro delta	3000 (mean)	yes	March-June (FN7)	owned by INFOSA within regional park (JO98)
	Cadiz area	x	yes	no	
	Cabo de Gata (Almeria)	x	yes	no	
France	Languedoc-Roussillon	10.000's (MOJ)	year around (QJF98)	no	not protected
	Camargue e.g. Cam. Island	1700 (MOJ)	year around (QJF98)	March-June	owned by salt company, within Camargue Regional Park
	Piesquide de Giens (Var)	1282 (MOJ)	year around (QJF98)	no	not protected
	Bouches-du Rhône	2500 (MOJ)	year around (QJF98)	no	not protected
Italy	Sardinia e.g. Cagliari Province	1100 (Mean; 93-97; QC98)	year around (QC98)	March-June	protected, e.g. Ramsar site (QC98)
	Orbetello (Tuscany)	569-185 (FN7)	year around (QB98)	March-June	Partly WWF "Oasis", Ramsar site (JO98)
	Salinas de Margherita di Savoia	243-1 (FN8; AL97)	year around (QB98)	March-August, 2nd wave Sept.-Dec. (FN8)	partly: Natural Reserve, Ramsar site, Important Bird Area (JO98)
Morocco	Iriki	4318-1477 (FN7)	yes	no	no protection

	area/ site	max - min	non - breeding (period)	egg-laying period	area/ site protection status
	Meria Zerga (Kentira region)	1000's	yes	no	?
	Zima (Safi region)	1000's	yes	no	?
	Briech (Tetouan region)	1000's	yes	no	?
Algeria	Oran province	1000's	over-wintering	no	no protection
	Boughzoul	1000's	over-wintering	no	no protection
	Constantine province	1000's	over-wintering	no	no protection
Tunisia	Salines of Sfax	4252- 1700 (FN7)	year around (juveniles), over wintering (adults)	no	no protection
	Chott Mansour, Ch. Djerid, El Guettar	1000-10.000	year around	Feb.-May (JG97)	no protection
	Kelbia, Sidi el Hani	10.000's	yes	no	no protection
Egypt	NW Sinai	14550 (WA91)	yes	no	no protection?
Libya	Benghazi coast	?	wintering Sept./Oct. -April (FN2)	no	Wadi Kouf National Park (partly)
Greece	Thrace, Macedonia, Islands of eastern Aegean	2500 (mean)	year around (QG98)	no	Most sites are Ramsar sites (QG98)
Turkey	Tuz Gölü	21.300 (Dec.) -0 (FN7; FN5)	yes	yes	protected, site of natural value (JO98)
	Camalti Salines (Izmir)	3000-200 (FN8; FN6)	yes	March/ April (GE97)	owned by state salt company, Important Bird Area, site of natural value (JO98)
	Seyfe Gölü, Eregli Marshes	100's-1000's	yes	yes	both are Natural Reserves and site of natural value, S.G. also Ramsar site (JO98)
	Sultan Marshes	?	yes	no	wildlife reserve, site of natural value, Ramsar site (JO98)

	area/ site	max - min	non breeding (period)	egg-laying period	area/ site protection status
Cyprus	e.g. Larnaca, Akrotiri salt lakes	12.000-550 (April) (Johnson pers. com.;FN7)	peak: Nov.-March	no	?
Western Asia					
Saudi Arabia		7652-755 (FN7; AW91)	yes	no?	
Oman	e.g. Bar Al Hikman	7488-1287 (AW90; FN7)	yes	no?	?
Iran	L. Uromiyeh	88.049 (RT93)	year around, winter: few hundred (BB92)	late April-Sept. (BB92; QR98)	National Park, Ramsar site
	Lake Bakhtegan	100's-10.000's (BB92;AW89)	over-wintering	irregular, small(BB92) groups	?
	L. Qom	?	yes	no?	?
Qatar	e.g. Al Ali-yah Island	100's	yes	no	?
United Arabian Emirates	Kohr Dubai	2300-298 (AW91; RT93)	year around (QH98)	no	shooting is banned (FN2)
	Abu Dhabi: Isl. of Sir Bani Yas	>100's (FN8)	yes	no	?
Israel	Mediterrane-an coastline and Eilat	10's - 100's (QY98)	year around	no	no protection, private land (QY98)
Afghanistan	Ab-e-Estada	5000-6000 (me an, QW98)	March-Nov. (QW98)	yes (QW98)	sanctuary; currently no protection due to war (QW98)
	Dasht-e-Nawar	5000-6000 (me an, QW98)	March-Nov. (QW98)	yes (QW98)	sanctuary; currently no protection due to war (QW98)
Turkmenis-tan	Caspian sea coast	?	yes	no	?
Kazakhstan	Lake Tengiz	15.000-12.000 (average breeding nr.: QZ98)	March-Oct. (QZ98)	yes (QZ98)	Korgalzhin Sate Nature Reserve (QZ98), Ramsar site (JO98)
Kuwait		19.608- 6 (?; RT93)	yes	no	
Southern Asia					
Pakistan	Indus delta (Sindh)	32.855-7404 (FN6)	yes	no	partly protected (SC89)
	Pujab region: e.g. Ucchali lake	1360-948 (SC89; AW88)	over-wintering	?	Game reserve. Proposed for Wildlife sanctuary Ramsar site (SC89)

	area/ site	max - min	non - breeding (period)	egg-laying period	area/ site protection status
India	Orissa: e.g. Chilika Lake	6488-385 (LM97)	yes	no?	Chilika Lake: government owned (protected), Ramsar site (LM97)
	Sambhar Lake	21.500-390 (Dec.) (FN8)	after monsoon	Jan. (FN8)	Ramsar site (FN8), unprotected (LM97)
	Gujarat area :G+L Rann of Kutch	50.058-m 751 (AW91; LM97)	peak in Dec. (FN2)	autumn-early spring (EW89)	No protection. L. Rann: Wildlife Sanctuary (SC89).
	Tamil Nadu area: Calimere, Vedharanyam swamp	9024-448 (FN6: AW91)	after N.E. monsoon	no?	Vedharanyam: sanctuary (SC89)
	Andhra Pradesh area	15.000-486 (LM97: AW90)	yes		partly in sanctuaries (SC89)
	Maharashtra area	1203 (month?: LM97)	yes	?	?
	Sultanpur Jheel near New Dehli	102 (mean: QSH98)	year around (QSH98)	no	Sultanpur National Park
ADDITIONAL					
Germany	Zwillbrocker Venn	*Phoenicopterus Chilensis, Ph. ruber ruber, Ph. ruber roseus*	no, wintering in the Nether-lands (QK98)	Yes, 50 (mean breeding population; QK98)	Nature protected area (QK98)

Appendix 1B

Feeding and/or breeding sites, maximum and minimum population numbers censused in January (unless other month is noted), and area/site protection status for the lesser flamingo, *Phoeniconaias minor*, between 1987 and 1998.

Note: "?" means that no clear information was found. Maximum and minimum population numbers are noted as numbers can fluctuate enormously. Areas/sites are only included in this list if more than 100 lesser flamingos were censused or if the site was requently noted in literature regardless the observed low numbers.

	area/ site	max - min	non - breeding (period)	egg-laying period	area/ site protection status
Eastern Africa					
Ethiopia	Lake Abijata	233.000-6368 (FN8; IUCN97)	wintering ground (FN8)	no	Abijata-Shala lakes National Park
	Lake Chitu	25.000-100's (DO97; FN8)	yes	no	not protected (QD98)
	Debre Zeit (Green lake)	23.000 (FN8)	yes	no	not protected
	Lake Shalla	6000 (FN5)	?	Aug.-Oct. (FN5)	not protected?
Kenya	Lake Bogoria	865.254-174.106 (TR94; IUCN97)	year around (QT98; QM98)	no	National Reserve (QM98)
	Lake Elmenteita	466.648-2497(TR94; IUCN97)	June-Dec. (QM98) year around (QMO98)	no	No legal protection (QM98)
	Lake Magadi	36.000-2121 (FN7; IUCN97)	year around (QMO98)	March-July (IUCN97; JG97)	Unprotected (IUCN97, QN98)
	Lake Nakuru	750.169-15102 (IUCN97)	June-Dec. (QM98)	no	Nat. Park (IUCN97, QN98)
	Logipe	?	yes	no	not protected (IUCN97)
	Amboseli (oi Tukai)	?	yes	no	?
Tanzania	Lake Natron	238.942 upto 1milj. July '94 (FN7)	yes	important Aug.-Nov. (FN7)	Game controlled area (IUCN97)

	area/ site	max - min	non - breeding (period)	egg-laying period	area/ site protection status
	Lake Manyara	377.370-16800 (IUCN97)	yes	no	National Park (IUCN97)
	Lake Eyasi	700.000 (IUCN97)	yes	no	Ngorongoro CA (IUCN97)
	Momella	?	yes	no	Arusha National Park
	Embagi (or Empaki)	?	yes	no	?
Uganda	Crater lakes	18.770-9.094 July '95 (IUCN97)	yes	no	Queen Elizabeth National Park (IUCN97)
	Lakes in KWR (Bagusa, Masekye, Nshenyi Lakes)	30.000-10.000 (total Uganda; QA98)	year around	no	Kyambura Wildlife Reserve (QA98, IUCN97)
Southern Africa					
Botswana	Makgadikga-di pans: e.g. Sua Pan	110.000 (average non-breeding population ; QBO98)	Nov. - ? : seasonally (QBO98)	April-June (IUCN97, JG97)	partly: unprotected, owned by salt extraction company, within sanctuary (QBO98)
Zimbabwe		200 (mean; QJ98)	yes	no	partly National Parks (QJ98)
Zambia		?	yes	no	partly within Mweru wantipa National Park and Lochinvar National Park
Namibia	Etosha Pan	?	no	Feb.-May (FN5; FN8)	National Park
	Mile 4 Saltworks	?	yes	no	?
	Walvis Bay	33.060-24.055 (QS98; FN8)	Dec.-June (QS98)	no	private (QS98)
	Sandwich Harbour Mud flats	10.000 (QS98)	Dec.-June (QS98)	no	private (QS98)
Malawi	Lake Chilwa	?	yes	no	not protected
Mozam-bique	area south of the Save River	<1000 (month?; QP98)	peak between July-Oct. (QP98)	no	most areas not protected, protected: Maputo elephant Reserve, shorelineof Bazaruto Archipelago and lakes of Bazaruto Island (QP98)
South Africa	e.g. Kamfers dam	20.000-3600(IUCN 97:FN9)	year around (AK94)	no	not protected, Ramsar site.
Central Africa					
Cameroon	Rio del Rey	500-200 (mean; QDO98)	year around (QDO98)	no	not protected

	area/ site	max - min	non - breeding (period)	egg-laying period	area/ site protection status
Western Africa					
Mauritania	Banc d'Arguin	2000-0 (FN8; FN 9)	year around (QJM98), Nov.-April (QL98)	yes (QL98)	National Park, however, breeding site is unprotected (QL98)
	Aftout es Saheli, e.g. Etang du Diawling	3500-0 June (FN8; FN7)	year around (QJM98), Nov.-April (QL98)	no	partly within Diawling National Park (QJM98)
Senegal	Lagoons de St. Louis	occasionally	yes	no	Geumbeul National Park
	des Oiseaux du Djoudj	320-20.544 (DT95; FN9)	yes	no	des Oiseaux du Djoudj National Park
Guinea Bissau		1500 (FN)	yes	?	not protected
Western Asia					
Yemen	Aden area	120 (IUCN97)	yes	?	not protected?
	Red sea coast	1250 March (IUCN97)	yes	?	not protected?
	Al-Hudaydah lagoons	500-147 (SC95; RT93)	yes	?	not protected?
Southern Asia					
Pakistan	Indus delta (Sindh)	3150-3200 (AW88; FN6)	yes	no	partly protected (SC89)
	Lake Siranda (Baluchistan)	241-300 (IUCN97)	yes	?	?
India	Sambhar Lake	?	after monsoon	Jan. (FN8)	not protected (LM97), Ramsar site (FN8)
	Gujarat area :G+L Rann of Kutch	15.785-149 (LM97; AW87)	peak in Dec. (FN2)	autumn-early spring (EW89)	No protection (SC89)
	Tamil Nadu area: Calimere, Vedharanyam swamp	448-0 (FN6; AW89)	yes	?	Vedharanyam: sanctuary (SC89)
	Orissa, e.g. Chilika Lake	2.295-82 (LM97)	yes	?	Chilika Lake: owned by government (protected), Ramsar site (LM97)

	area/ site	max - min	non - breeding (period)	egg-laying period	area/ site protection status
	Andhra Pradesh area	2603-97 (AW90: LM97)	yes	?	partly in sanctuaries (SC89)
	Sultanpur Jheel near New Dehli	?	yes	no	Sultanpur National Park (QSH98)

Appendix 2

Threats to greater and lesser flamingos and their habitat: An inventory over 1987-1998

Note: G, L, GL *in front of the literature source indicates if the information concerns greater, lesser or both greater and lesser flamingos. No* G, L, *or* GL *means that it is not clear if the information concerns the greater or the lesser flamingo.*

2.1 Habitat loss/ exploitation

Salt/Soda exploitation:

*Botswana (Sua):in main feeding area (GLQS98),

*Ethiopia (L. Abijata; LIUCN97),

*India (Sambhar, Tamil Nadu and Andhra Pradesh): expansion of salt extraction activities (GLSC89) e.g. clay removal from the lake bottom to prepare new salt beds (GLFN8 by S. Kumar & R.N. Bhargava),

*India (Little Rann of Kutch): side activities of salt extraction activities (GLSC89),

*Kenya (QN98; L. Magadi, LIUCN97),

*Mainland Italy (GQB98),

*Malawi (Lake Chilwa; GLQS98)

*Tanzania (Lake Natron): salt mining (GLQMW98),

*Turkey (Camalti): disturbance by machinery during the repair of the salt pans at the start of the breeding season (GGE97).

Habitat loss:

*Regional problem in Afghanistan (QW98),

*India (Andhra Pradesh area, Vedharanyam swamp): deforestation of the mangroves for local firewood collection (GSC89),

*Kazakhstan (Lake Tengiz; GQZ98),

*Kenya (L. Bogoria; GLQT98 and Lake Nakuru; LQMO98, GLQN98),

*Tanzania: (GLQMW98), by deforestation (mangroves) for local fuel (GLFP91).

Urbanisation:

*Wetlands of Namibia (TW?): e.g. Etosha Pan: urbanisation in feeder streams (LIUCN97),

*Turkey (Camalti): new settlements and industrial area (GGE97),

*Tanzania: reclamation of wetlands for housing and in some cases industrial purposes (GLFP91),

*Mediterranean: in general lagoons close to the coast are under high urban pressure (GJG97),

*UAE (Kohr Dubai; GQH98).

Agricultural activities:

*Turkey (Sultan marshes) intensification (GMM97),

*Pakistan (Punjab, e.g. Ucchali Lake, Indus delta; GSC89),

*Tanzania (L.Eyasi, L. Manyara, Lake Natron, Momella lakes; LIUCN97).

Grazing of cattle:

*Ethiopia (Lake Chitu): Drinking area for cattle (LQD98),

*India (Sambhar, Great/Little Rann of Kutch, Andhra Pradesh area, Vedharanyam swamp): heavy grazing pressure (GSC89) as well as in Sultanpur National Park (GLQZ98),

*India (Great Rann of Kutch): Overgrazing can lead to desertification (desert) in India

*Kenya (Lake Bogoria; LQM98),

*Mauritania + Mali (GLQL98),

*Pakistan (Lake Ucchali, Indus delta): heavy grazing pressure (GSR90),

*Tanzania (L. Manyara, L. Natron; LIUCN97).

erosion of nest sites:

*France (Camargue; GMJ96, GJO97),

*Iran (Lake Uroyimeh; GQR98),

*Mauritania (coastline; GLQL98),

*Spain (Fuenta de Piedra; GMJ96),

* UAE (Kohr Dubai; GQH98).

2.2 Pollution

*Israel: Alternative feeding areas are heavily sprayed with biochemicals (GQY98),

*Kenya : (QN98), Lake Bogoria: habitat loss (poll. of dikes and ponds), pollution by human activities (GLQT98), Lake Nakuru: pollution (LQM98),

*Namibia: pollution in the harbour near Walvis Bay (GLDO97).

Water quality:

*Ethiopia: Lake Metehara is a fine example of a lake that decreased in salinity (fact)the flamingos, decrease was probably due to subterranean seepage from the basin and spillage from the nearby river Awash (GLFN8 by Y. Dellelegn and S. Desta),

*India (Great Rann of Kutch and Sultanpur National Park area): incoming additional fresh water brings pesticides and other chemicals and sweetens the water (GLHI91 and GLQSH98, repectively),

*India (Vedharanyam swamp): marine chemical factories and salt extraction factories pollute the water and have increased the salt concentration (SC89) which might be beneficial to the flamingos,

*Mauritania (Chott Boul): water quality is threatened by draining irrigation waters to the site, coming from the rice fields containing pesticides and fertilisers (GJO98),

*Namibia coastal wetlands (TW?),

*Pakistan (Indus delta): the Indus river carries down a load of urban, industrial and agricultural effluents into the coastal wetlands (GLSC89),

*Tanzania: industrial and domestic sources increase the pollution and eutrophication ((GLQMW98, GLFP91),

*Turkey (Camalti) Gediz river: heavily poll. by industrial sources and household (GMM97),

*Turkey (Sultan marshes): decreasing by carpet-, brick-, felt factories (GMM97),

*Turkey (Eregli marshes and Tuz Gölü): polluted water (household, factories, sewage) from three incoming drainage channels. Tuz Gölü also pesticides and fertilisers from agricultural activities, no clean water is coming is as two reservoirs keep it all (GMM97).

2.3 Unfavourable water levels by the weather or manipulation

Manipulation:

*Ethiopia (Lake Abijatta): terminal lake of a closed drainage system which makes the water levels variable, high water levels seem to decrease the salinity thus the food abundance for flamingos (GLFN8 by Y. Dellelegn and S. Desta),

*Mainland Italy (GQB98),

*India (sambhar lake): dam/barrage construction (GLLM97),

*Italy (Cagliari province of Sardinia; GQC98),

*Kazakhstan (Lake Tengiz; GQZ98),

*Kenya (Lake Bogoria, L. Elmenteita, L. Nakuru; LQM98),

*Libya (Benghazi coast): varying water levels (GFN2),

*Pakistan (Ucchali Lake): water levels have decreased due to less influx of water as a result of increasing water supplies for irrigation (SR90), the same in the coastal wetlands of the Indus delta (GLSC89),

*Turkey (Camalti): Influx of fresh water is regulated on basis of agricultural effectiveness. Lagoons are becoming more saline, changes of the waterlevels during breeding season (GGE97). *Turkey (Sultan marshes): unfavorable water management (agric.) decreases the water level (GMM97),

*Turkey (Eregli marshes): decreasing levels due to reservoir (GMM97),

*UAE (Kohr Dubai; GQH98),

*Zambia (Lochinvar): waterlevels are too high due to hydroelectric dam (LQBO98).

Natural:

*Botswana (Sua Pan): unfavorable waterlevels (GLQBO98),

*Ethiopia (Lake Chitu): unfavorable waterlevels (LQD98),

*France: bad spring weather (GFN4),

*Greece: frost (GRO90),

*Iran (Lake Uromiyeh): high water levels (GQR98),

*Italy (Cagliari Province of Sardinia): erosion nestsites (GQC98),

*Kazakhstan (Lake Tengiz; GQZ98),

*Kenya (Lake Bogoria, L. Elmenteita; LQM98)

*Malawi (Lake Chilwa): too high waterlevels (GLQDO98),

*Mauritania (coastline): unfavorable waterlevels (GLQL98),

*Tanzania (Southern Rift Valley Lakes; GLQMW98),

*Uganda (Crater Lakes): unfavorable waterlevels (LQA98),

*Zambia (Mweru wantipa National Park): Climatic fluctuations (GLQBO98).

2.4 Diseases

*Ethiopia (Y. Dellelegn in LIUCN97),

*Kenya (L. Bogoria; GLQT98, and L. Elmenteita: LQM98),

*Mauritania (GLQL98).

2.5 Decrease in food availability

*India (Sambhar lake): clay removal from the lake bottom to prepare new salt beds, which restricts the propagation of the micro-organisms (*Spirulina*), aquatic fauna (GLFN8 by S. Kumar & R.N. Bhargava),

*Kazakhstan (Lake Tengiz; GQZ98),

*Kenya (L. Bogoria; GLQT98, and L. Elmenteita, L. Nakuru; LQM98): not further specified,

*UAE (Kohr Dubai; GQH98): not further specified.

2.6 Human disturbance

War:

*Afghanistan (GQW98),

*Cameroon - Nigeria: border conflicts (LQBO98).

Fences:

*Sua pan: veterinary cordon fences across the pans kill the adults (GLQS98, GLQBO98).

Tourism:

*Botswana (Sua pan;GLQBO98, GLFN9 by G. Mc. Culloch),

*Israel (Mediterranean coastal region and Eilat; GQY98),

*Mainland Italy, photographers (GQB98),
*Sardinia: bird watchers, photographers (GQC98, GSF95),
*Tanzania (L. Embagi, Momella lakes; LIUCN97),
*UAE (Kohr Dubai; GQH98),
*Uganda (LQA98).

Transport:

- *Aircrafts* -:

*France: flamingos are becoming less afraid of planes and even are foraging near airports e.g. Montpellier (GFN5),
*Mainland Italy (GQB98),
*Namibia (Etosha, Walvis Bay; LIUCN97),
*Turkey (Camalti; GGE97),
*UAE (Kohr Dubai; GQH98).

- *4-wheel drive* -:

*Botswana (Sua): 4-wheel bikes access breeding colony (GLQS98),
*Israel (Mediterranean coastal region): 4-wheel drive vehicles (GQY98),
*Kenya (Lake Bogoria): roads in general are too close to sites (LQM98),
*Turkey (Sultan marshes): tractors transporting the cut reed (GMM97),
*UAE (Kohr Dubai): 4-wheel drive vehicles (GQH98).

- *High tension cables* -:

*in general: collision with high tension power lines (GLAF90), for example in Italy ((Sardinia; GQC98) and the Matimba Powerline crossing South Africa, Botswana and Zimbabwe (GLQBO98).

- *Others* -:

*Ethiopia (Debre Zeit, Green lake): attacks by shepherd boys (LFN8 by Y. Dellelegn and S. Desta),
*France: children's balloon (GFN4),
*Greece: fishermen and salina workers etc. (GQG98),
*India (Great Rann of Kutch): military activities (GSC89),
*Kazakhstan (Lake Tengiz): scientists, vandals (GQZ98),
*Mauritania: fishermen at breeding site (GQJM98),
*Sardinia: ornithological fieldwork (GSF95),
* UAE (Kohr Dubai): municipal works (GQH98).

2.7 Hunting by humans and egg collection

Hunting:

*Afghanistan (GQW98)

*Greece (GFN5 by Hanrinos; FN7; Thrace: RO90),

*India: Tamil Nadu (GSC89), Chilika Lake (GLLM97): poaching,

*Italy (Margherita di Savoia and Sardinia; GAL97, GQC98, respectively),

*Kazakhstan (Lake Tengiz; GQZ98),

*Libya (Benghazi coast; GFN2),

*Mauritania and Mali (GLQL98),

*Mediterranean: In general hunting is in some regions still a threat (GJG97),

*Mozambique (area south of Save River; GLQP98),

*Pakistan (Punjab e.g. Ucchali Lake, Indus delta; GSC89),

*Tanzania (Southern Rifs Valley Lakes; GLQMW98),

*Turkey: also within reserves (GGE97).

Egg collection:

*Afghanistan. (GQW98),

*Kazakhstan (Lake Tengiz; GQZ98),

*United Arabian Emirates (Kohr Dubai; ?),

*Tanzania (Southern Rift Valley Lakes; GLQMW98).

2.8 Predation or disturbance by animals

*Eastern Africa: marabou (*Leptoptilos crumeniferus*) and Great White Pelicans (*Pelecanus onocrotalus*) (DE91),

*Ethiopia (Debre Zeit, Green lake): dogs (LFN8 by Y. Dellelegn and S. Desta),

*France (Camargue): aggressive black swan (*Cygnus atratus*; GFN6), Yellow-legged gulls (*Larus cachinnans*; GDE91),

*India (Great and Little Rann of Kutch): grazing by wild asses (*Equus hemionus khur*; GSC89),

*Iran (Lake Uromiyeh; GQR98),

*Mainland Italy (GQB98),

*Kazakhstan (Lake Tengiz; GQZ98),

*Kenya (L. Bogoria; GLQT98),

*Mauritania: wild boars (*Sus scrofa*: G?), jackals and hyaenas (LQL98),

*Namibia (Walvis Bay): blackbacked jackals (*Canis mesomelas*; TW?),

*Sardinia: dogs, cats (GSF95) and occasionally gulls (GQC98),

*Spain (Marismas): wild boars (*Sus scrofa*; GFN5),

*Tanzania (GLQMW98),

*UAE (Kohr Dubai): feral dogs (GQH98).

2.9 Abandoning of nest sites

Drying out:

*Botswana (Sua pan; GLFN6), drying of the pan as well as flooding of the nests (LQBO98),
*Mainland Italy (GQB98),
*Namibia (GLSQ98),
*Uganda: flooding of the nests (LQA98).

4-wheel bikes:

*Botswana (Sua; GLQS98)
*UAE (Abu Dhabi: Al Ghar lake): cars and people on foot (GQH98),
*Uganda: tourism (LQA98)

Other:

*Kazakhstan (Lake Tengiz): abandoning due to disturbance by humans and animals, flooding of the nestsites, unfavoral feeding conditions (GQZ98),
*Spain (Marismas): wild boars (*Sus scrofa*; GFN5).

2.10 Potential threats

Salt/Soda extraction:

*Botswana (Sua): further extraction sites (GLQS98)
*India (Tamil Nadu, Vedharanyam Swamp): expanding salt extraction activities (GHI91)
*Kenya (Lake nakuru; LQM98)

Habitat loss

*India (Sambhar Lake): plans for new human activities along the incoming rivers (GLFN8 by H.S. Sangha),
*India (Andhra Pradesh area): new road will destruct mangroves, new irrigation works (GSC89),
*Israel (Mediterranean coastal region): habitat loss due to tourism and 4-wheel drive vehicles (GQY98),
*Kenya: Lake Bogoria and L. Nakuru: deforestation (LQM98); Lake Bogoria: road construction (LQM98),
*Mauritania (coastline): unfavorable waterlevels (GQL98),
*Turkey (Izmir bird sanctuary): plans to built a port near sanctuary (Çilazmak Dalyan; GFN9), Further: plans for sewage treatment plant, leather factory and house complexes (GMM97),
*Zimbabwe: habitat loss due to drought and usage of the surface and groundwater (GLQJ98).

Pollution

*Turkey (Camalti): plans for sewage treatment plant, leather factory and house complexes (GMM97),

*India (Sambhar Lake): plans for new human activities along the incoming rivers (GLFN8 by H.S. Sangha),

*Israel (coastal region): alternative feeding areas are polluted with biochemicals (GQY98).

*France: potential conflict arising from feeding on newly sown rice grains in the Camargue (GJG97)

*Mozambique: powerline from the Caborra Bassa to South Africa which crosses a supposed migration route from Botswana to Mozambique (GLQP98).

Appendix 3

Current and potential conservation activities for greater and lesser flamingos and their habitat

Note: This table consists of the main conservation actions given per country, "per country" actually means the areas/sites noted per country in appendix 1. C *means: conservation action is currently performed,* **P** *means: conservation action will be performed in the near future or are being discussed (potential). See appendix 1 for international/ national and regional protection per site.*

country	economy (e.g. ecotourism)	physical protection	inter'l, nat'l and regional protection	habitat management/ improvement	public awareness/ education	research
Eastern Africa						
Ethiopia	set up ecotourism recommended (L.Chitu; PQD98)		International support needed (IUCN97); discussion on regional level (PQD98, PI UCN97); promoting to become a Ramsar country (CI UCN97)		public awareness programmes advisable (Green L.&L. Chitu; PQD98, PFN8); education combined with needs of locals (PI UCN97)	regular monitoring (L. Abijatta; PFN8); water study (pollution Green L.&L. Chitu; CFN8, PQD98) and L. Abijata (PI UCN97); study to understand local traditions and values (PI UCN97)

country	economy (e.g. ecotourism)	physical protection	inter'l, nat'l and regional protection	habitat management/ improvement	public awareness/ education	research
Kenya	(eco-) tourism (L. Bogoria, L. Elmenteita, L. Nakuru; CPQM98, CPQMO98)		nat'l and regional protection, community participation (Bogoria; CQT98), legal protection is needed (L. Elmenteita; QT98, QM98)	habitat management (Bogoria; CQT98); management improvement (L. Bogoria, L. Elmenteita; PQM98)	public education (Bogoria; CPQT98 and L. Elmenteita, L. Nakuru; PQM98)	establish monitoring system, information exchange, institution for education and research N.Rift (PQT98); research on hydrology, fate of pollutants and desertification effects is needed (QM98); L. Bogoria: WWF wetland cons. project in catchment, flamingo ecology and pathology research program (CQM98, CPQMO98)
Tanzania	tourism, live bird trade, meat (IUCN97)		recommendations for lakes to become Natural reserves (CIUCN97)	general conservation of protected areas (CQMW98)	raise awareness (L.Natron, Manyara; PIUCN97)	expanding mammal monitoring with birds (PI UCN97), more research in general is needed (PQMW98)
Uganda	ecotourism (CQA98)			management by locals (CPQA98)		continuing monitoring (CPQA98, CPIUCN97)
Southern Africa						
Botswana			regional discussion with all parties (Sua Pan; CAF90); enforce no-fly zones (PI UCN97)	underground power lines (Sua Pan; CAF90), removal of veterinary fences crossing flamingos flight path (PQBO98)	film made by Tim Liversedge (CQBO98)	research e.g. for appropriate utilisation of site and protection (CPFN9)aerial counts, PhD research "Satellite tracking of flamingos (CQBO98).

country	economy (e.g. ecotourism)	physical protection	inter'l, nat'l and regional protection	habitat management/ improvement	public awareness/ education	research
Zimbabwe	some folklore importance (CQJ98)		national protection (CQJ98)			monitoring collisions of flamingos with powerlines, ad hoc observations (CQJ98)
Zambia	tourism (Lochinvar National Park; (PQBO98)		Inter'l, nat'l and regional agreements (PQBO98)			
Namibia	ecotourism (PTW?, QS98)		management at Walvis Bay (CQS98); enforce no-fly zones (Etosha, Walvis Bay; PI UCN97)		education at Walvis Bay (CPQS98)	yearly monitoring (Etosha, coastal sites), chick rescue at Etosha (CQS98); en force studies on water quality (Etosha, Walvis Bay; PIUCN97)
Malawi						
Mozam-bique						
South Africa	ecotourism (CPAK94)		lobbying for Ramsar site recognition		awareness and education (Kamfers dam; CPAK94)	
Central Africa						
Cameroon			Potential Important Bird Area by Birdlife Inter'l (PQBO98)			

country	economy (e.g. ecotourism)	physical protection	inter'l, nat'l and regional protection	habitat management/ improvement	public awareness/ education	research
Western Africa						
Mauritania	tourism Banc d'Arguin National Park (CQL98)	physical protection (CPQJM98)	int'l, nat'l and regional legal protection (CPQJM98, CPQL98)	dam on Senegal river resulting in regular flooding of Aftout area (CFN4), site management (Diawling; PIUCN97), more focus is needed on lesser flamingos (PQL98)	public education (CQJM98)	inventory and monitoring in Aftout area and Banc d'Arguin (PI UCN97, CCE94, resp.),study determining status and importance of flamingos in W. Africa , more focus is needed on lesser flamingos (PQJM98) more focus is needed on lesser flamingos (PQL98)
Senegal				site management plans (Djoudj; PIUCN97)		monitoring (Djoudj; CPI UCN97)
Guinea Bissau						
Mediter-ranean						
Portugal						
Spain				art. water levels (Fuente); art. breeding sites (Gata, Fuenta; CFN5, MJ96)	education and awareness	several: e.g. long term ringing (Fuente; CMJ96)
France	tourism (CQJF98)	physical protection (CPQJF98)	int'l, nat'l and regional legal protection (CPQJF98)	management and improvement (CPQJF98)	education and awareness (CPQJF98)	several, e.g. long term ringing (CPQJF98)

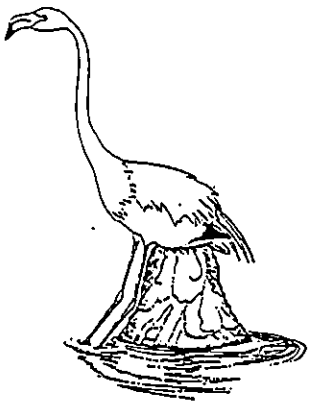
country	economy (e.g. ecotourism)	physical protection	inter'l, nat'l and regional protection	habitat management/ improvement	public awareness/ education	research
Italy	ecotourism (mainland, Sardinia; CQB98, PQC98, respectively)	enforcement of existing protection (mainland, PQB98), physical protection needed (PQC98)	enforcement of institution of Nat. Park (Sardinia; CQC98); artificial nest sites (mainland; CQB98)	Protection management is needed (Sardinia; PQC98); habitat management (mainland, CQB98)	public education (mainland, Sardinia; PQB98, PQC98, respectively)	research, e.g. ringing chicks and monitoring (mainland,Sardinia; CPQB98, CPQC98, resopectively)
Morocco						
Algeria						
Tunisia			enforcing national and regional legislation (PFN6)			
Egypt				artificial breeding island (PMG94)		
Libya			national and regional legislation (PFN2)		education and awareness programmes needed (PFN2)	
Greece	ecotourism (CPQJG98)		nat'l and regional protection (CPQG98)		education and awareness (CPQG98)	annually censuses (CQG98)
Turkey	ecotourism (Çamalti; CMM97)	some Ramsar sites, sites of natural value and Important Bird Areas		wetland restoration project (Çamalti; CMM97); development of management guidelines are asked (PGE97); art. nest sites for waterfowl (Eregli; CMM97)	campaigns and publicity increased local awareness (Çamalti; CMM97)	
Cyprus						

country	economy (e.g. ecotourism)	physical protection	inter'l, nat'l and regional protection	habitat management/ improvement	public awareness/ education	research
Western Asia						
Kuwait						
Yemen						
Saudi Arabia						
Oman						
Iran				habitat management (Lake Uromiyeh; CQR98), management improvement (L. Uromiyeh; PQR98)		long term ringing program (L. Uromiyeh; CQR98)
Qatar						census financed by government (CRT93)
Israel		physical protection needed (PQY98)	nat'l and regional protection needed (PQY98)		education needed (PQY98)	study: effects within flocks due to human disturbances (CQY98)
United Arabian Emirates	ecotourism (CPKH96; QH98)	police post (Kohr Dubai; CKH96)	regional discussion with all parties (low flying planes Kohr Dubai; PKH96); nat'l and regional legislation (CQH98)	Habitat management and improvement (Kohr Dubai; *CPQH98*) artificial nest site (PKH96); controlled flooding (Kohr Dubai; PKH96); development of satellite wetlands recommended, combined with municipal drainage schemes (Kohr Dubai; PQH98)	combined education, visitors and research station (Kohr Dubai; PKH96)	water quality surveys, long term ringing (Kohr Dubai; C, PKH96, resp.)

Country	economy (e.g. ecotourism)	physical protection	Inter'l, Nat'l and regional protection	habitat management/ improvement	public awareness/ education	research
Afghanistan	as food (QW98)	from humans and animals, needed (QW98)	enforcement of existing protection (CPQW98)	management is needed (QW98)	public education (CPQW98)	set up from out of Pakistan by "SAVE" (CPQW98)
Turkmenis-tan						
Kazakhstan	as food (CQZ98), development of ecotourism (CPQZ98)		inter'l, nat'l protection (CPQZ98)		public education (CPQZ98)	long term ringing program (L. Tengiz; CJG97) however, lack of funding might stop research activities (PQZ98)
Southern Asia						
Pakistan	fisheries (L. Ucchali; CPSC89)		proposed for Wildlife sanctuary and Ramsar site (L. Ucchali; SC89)	hunting under permit allowed (L. Ucchali; CSC89); management project of mangrove ecosystem of Indus delta (PSC89)		
India	fisheries, firewood (Andhra Pradesh, Tamil Nadu area; SC89); tourism (L+G R. of Kutch and Sultanpur National Park; PSC89, CQSH98, resp.)	need for warding (Little R. of Kutch and Sultanpur National Park; PSC89, PQSH98, respectively)	national and regional discussion with all parties (Tamil Nadu; CHI91); develop protected area status (Great R. of Kutch; PIUCN97) enforce no-fly zones (Little R. of Kutch; PIUCN97)	develop management plan (Little R. of Kutch, Tamil Nadu; PSC89)	public awareness (Little R. of Kutch; PIUCN97)	Monitoring and further research (L. Sambhar; PFN8), monitoring (of L+G R. of Kutch; PIUCN97); research for optimal exploitation sources (Andhra Pradesh area; PSC89); visitor/research center (Tamil Nadu; PSC89)

Appendix 4

Flamingo Conservation Action Plan Questionnaire



From Dampier's Description (1697).

Flamingo Conservation Action Plan

Questionnaire

To obtain up-to-date information for a formulation of Flamingo Action Plan recommendations during the second International Flamingo Symposium, 24-26 October 1998 (Miami, USA).

If information is available for more than one specific area/region, please feel free to copy this questionnaire and complete it for all regions.

Species: * *Ph. ruber roseus* * *Ph. minor*

Report by: Jacques Peeters
Institution: National Park Direction
Address: B.P 5135 Dakar Fann.
Wetlands International - West Africa
Fax/ e-mail: Fax: (221) 825 2393 Email: cimwet@telecomplus.sn

This report is for Senegal: country/ region/ state/ district/ other _____.

If any of the asked information is available in published/ unpublished articles or reports, please refer to them and include a copy if possible.

Status and habitat

1) Note the name of the area of distribution within the country/ region (list specific breeding/feeding sites of importance to the species) that you are reporting on.

_____

2) *Non*breeding flamingos are present in this area: **0** year around/ **0** seasonally (during at least 5 of the last 10 years) from _____ (month) to _____(month) usually/ **0** sporadically/ **0** presence entirely unpredictable.

3) The average *non*breeding population (if present) in this area is estimated at _____ (number) and has **0** increased/ **0** stayed the same/ **0** decreased in the last 10 years.

4) Breeding has occurred in _____ (number of years) of the last 10 years in this area.

5) The average breeding population in this area is estimated at _____ (number) and has **0** increased/ **0** stayed the same/ **0** decreased in the last 10 years.

6a) I consider the status of the flamingos in this area to be **0** endangered/ **0** vulnerable/ **0** rare/ **0** unknown/ **0** out of danger.

6b) This conclusion is based on: 0 counts/ 0 general surveys/ 0 general impression/
0 literature, communication with others (see question 19).

7) Breeding sites are *in* 0 fresh/ 0 saline/ 0 brackish water, *on* 0 flats/ 0 islands/
0 dams,dikes / 0 other _____

Are these breeding sites legally protected? 0 Yes/ 0 No
If yes, how? _____

8) Feeding occurs in 0 fresh/ 0 saline/ 0 brackish water, in 0 lakes/ 0 marshes/
0 commercial, noncommercial salt pans/ 0 rice paddies/ 0 other _____

Are these feeding sites legally protected? 0 Yes/ 0 No
If Yes, how? _____

9) The approximate distance between feeding and breeding sites is _____(km or mi).

Threats

10) Are flamingos locally or regionally threatened? 0 Yes/ 0 No
If yes, which of the following are certain threats?
0 habitat loss/ exploitation 0 erosion nestsites
0 pollution 0 diseases
0 decrease in food availability
0 unfavorable waterlevels (too low/ high) because of: 0 weather, 0 manipulation
0 human disturbance, by 0 tourism, 0 scientists, 0 car and air traffic, 0 other _____
0 hunting by humans
0 egg collection
0 predation or disturbance by animals
0 other _____

More specifically, present threats entail _____
_____

11) Can you already forecast some potential threats, locally or regionally? 0 Yes/ 0 No
If yes, please explain: _____
_____

12) Have nestsites ever been abandoned in the last 10 years once breeding activities had already been initiated? 0 Yes/ 0 No
If yes, the cause was:
0 predation/ disturbance by _____
0 flooding of the nests
0 unfavorable feeding conditions
0 other _____

Conservation; measures and recommendations

13) Do flamingos presently have any economic (e.g. tourism) or cultural (e.g. folklore) significance in the area you noted at the beginning of the questionnaire? **0** Yes/ **0** No
If yes, what? _____

_____

14) What kind of research and conservation measures have been/ are being undertaken in the region?

0 protection via multi/bi lateral international agreements
0 national/ regional legal protection
0 physical protection from **0** animals/ **0** humans
0 habitat management
0 habitat improvement
0 public education (local/ regional/ national)
0 development of ecotourism
0 research
0 artificial nestsites
0 rehabilitation of chicks (due to certain environmental conditions)
0 restocking of individuals (due to certain reproduction discrepancies)
0 other _____

Efforts have focused on **0** flamingos/ **0** the whole area/ **0** both.

15) Are any research/ conservation measures going to be carried out in the next five years?
0 Yes/ **0** No Please explain: _____

_____

_____

16) What are your conservation recommendations for the flamingos especially in the area you noted above?

0 protection via multi/bi lateral international agreements
0 national/ regional legal protection
0 physical protection from **0** animals/ **0** humans
0 habitat management
0 habitat improvement
0 public education (local/ regional/ national)
0 development of ecotourism
0 research
0 provision artificial nestsites
0 rehabilitation of chicks (due to certain environmental conditions)
0 restocking of individuals (due to certain reproduction discrepancies)
0 other _____

Please elaborate on any of these suggested recommendations:

_____

_____

18) What relevant contact points (e.g. NGOs, government) would be essential in achieving these recomendations? _____

_____

_____

19) If available, useful references (literature), addresses (faxnr., e-mail), or other information on this species, particularly for the region are: _____

_____

_____

Thank you for participating in this survey, please return the completed questionnaire to : Cathy King, Rotterdam Zoo, Postbus 532, NL-3000 AM, Rotterdam (The Netherlands). Fax: 010 - 4677811, e-mail: Cathy.E.King@inter.nl.net

Additional table for *Phoenicopterus ruber roseus*

This additional table includes information on the status of the greater flamingos. The information was extracted from the completed Flamingo Conservation Action Plan Questionnaires.

	area/site	status of *Phoeni-copterus ruber roseus*	this conclusion is based on:	average breeding population has increased/ decreased/ stayed the same in the last 10 yrs.	breeding occurred in "x" out of the last 10 yrs.	average non-breeding population has increased/ decreased/ stayed the same in the last 10 yrs.
Eastern Africa						
Ethiopia	Lake Abijata					
	Lake Chitu					
	Debre Zeit (Green lake)					
Kenya	Lake Bogoria	endange-red (QT98)	general surveys and impression (QT98)	-	-	stayed the same (QT98)
	Lake Elmenteita	vulnerable (QN98)	counts, surveys (QN98)	-	-	?
	Lake Magadi	vulnerable (QN98)	counts, surveys (QN98)	-	-	?
	Lake Nakuru	vulnerable (QN98)	counts, surveys (QN98)	-	-	?
Tanzania	Lake Natron					
	Lake Manyara					
	Lake Eyasi					
	Momella lakes					

	area/site	status of *Phoeni-copterus ruber roseus*	this conclusion is based on:	average breeding population has increased/ decreased/ stayed the same in the last 10 yrs.	breeding occurred in "x" out of the last 10 yrs.	average non-breeding population has increased/ decreased/ stayed the same in the last 10 yrs.
Southern Africa						
Botswana	Makgadik-gadi pans: e.g. Sua Pan	vulnera-ble (QBO98)	literature, com. with ohters (QBO98)	no idea (QBO98)	4,5/ 10 (QBO98)	no idea (QBO98)
Zimbabwe		rare (QJ98)	general impression (QJ98)	-	-	stayed the same (QJ98)
Zambia		vulnera-ble (QDO98)	general surveys (QDO98)	-	-	decreased (QDO98)
Namibia	Etosha Pan	decreased ,? (QS98)	counts, literature (QS98)	?	?	?
	Mile 4 Saltworks					
	Walvis Bay	decreased ,? (QS98)	counts, literature (QS98)	-	-	?
	Sandwich Harbour Mud flats	decreased , ? (QS98)	counts, literature (QS98)	-	-	?
Malawi		vulnera-ble (QDO98)	general surveys (QDO98)	-	-	no idea (QDO98)
Mozambi-que	area south of Save River	?	irregular counts (QP98)	-	-	no idea (QP98)
Madagas-car						
South Africa	Kamfers dam					

	area/site	status of *Phoenicopterus ruber roseus*	this conclusion is based on:	average breeding population has increased/ decreased/ stayed the same in the last 10 yrs.	breeding occurred in "x" out of the last 10 yrs.	average non-breeding population has increased/ decreased/ stayed the same in the last 10 yrs.
	St. Lucia (Zululand), De Hoop Vlei					
Western Africa						
Mauritania	Banc d'Arguin	vulnerable (QL98, QJM98)	counts, general surveys (QL98)	stayed the same (QL98), decreased (QJM98)	10/ 10 (QL98), 9/10 (QJM98)	stayed the same (QL98, QJM98)
	Chott Boul	vulnerable (QJM98)	counts, general surveys, com. with others (QJM98)	-	-	stayed the same (QJM98)
	Aftout es Saheli, e.g. Etang de Diawling	vulnerable (QJM98)	counts, general surveys, comm. with others (QJM98)	-	-	stayed the same (QJM98)
Senegal	Lagunes de St. Louis					
	des Oiseaux du Djoudj					
Guinea Bissau						
Mediterranean						
Portugal	Estuário do Tejo					
	Estuário do Sado					

	area/site	status of *Phoenicopterus ruber roseus*	this conclusion is based on:	average breeding population has increased/ decreased/ stayed the same in the last 10 yrs.	breeding occurred in "x" out of the last 10 yrs.	average non-breeding population has increased/ decreased/ stayed the same in the last 10 yrs.
	Castro Marim					
	Ria Formosa					
Spain	Fuente de Piedra					
	Marismas (Huelva-Sevilla)					
	Salinas de Santa Pola, El Hondo					
	Ebro delta					
	Cadiz area					
	Cabo de Gata (Almeria)					
France	Languedoc-Roussillon	out of danger (QJF98)	counts (QJF98)	-	-	increased (QJF98)
	Camargue e.g. Cam. Island	out of danger (QJF98)	counts (QJF98)	increased (QJF98)	10/10 (QJF98)	increased (QJF98)
	Piesquide de Giens (Var)	out of danger (QJF98)	counts (QJF98)	-	-	increased (QJF98)
	Bouches-du Rhône	out of danger (QJF98)	counts (QJF98)	-	-	increased (QJF98)
Italy	Sardinia e.g. Cagliari Province	vulnerable (QC98)	?	increased (QC98)	6/10 (QC98)	decreased (QC98)

	area/site	status of *Phoenicopterus ruber roseus*	this conclusion is based on:	average breeding population has increased/ decreased/ stayed the same in the last 10 yrs.	breeding occurred in "x" out of the last 10 yrs.	average non-breeding population has increased/ decreased/ stayed the same in the last 10 yrs.
	Orbetello (Tuscany)	vulnerable (QB98)	counts (QB98)	increased (QB98)	3/10 (QB98)	increased (QB98)
	Salinas de Margherita di Savoia					
Morocco	Iriki					
	Meria Zerga (Kentira region)					
	Zima (Safi region)					
	Briech (Tetouan region)					
Algeria	Oran province					
	Boughzoul					
	Constantine province					
Tunisia	Salines of Sfax					
	Chott Mansour, Ch. Djerid, El Guettar					
	Kelbia, Sidi el Hani					
Egypt	NW Sinai					

	area/site	status of *Phoenicopterus ruber roseus*	this conclusion is based on:	average breeding population has increased/ decreased/ stayed the same in the last 10 yrs.	breeding occurred in "x" out of the last 10 yrs.	average non-breeding population has increased/ decreased/ stayed the same in the last 10 yrs.
Lybia	Benghazi coast					
Greece	Thrace, Macedonia, Islands of eastern Aegean	out of danger (QG98)	counts, general surveys (QG98)	-	-	increased (QG98)
Turkey	Tuz Gölü					
	Camalti Salines (Izmir)					
	Seyfe Gölü, Eregli Marshes					
	Sultan Marshes					
Cyprus	e.g. Larnaca, Akrotiri salt lakes					
Western Asia						
Saudi Arabia						
Oman	e.g. Bar Al Hikman					
Iran	L. Uromiyeh	out of danger (QR98)	counts, general surveys (QR98)	decreased (QR98)	10/ 10 (QR98)	decreased (QR98)
	Lake Bakhtegan					
	L. Qom					
Qatar	e.g. Al Aliyah Island					

	area/site	status of *Phoenicopterus ruber roseus*	this conclusion is based on:	average breeding population has increased/ decreased/ stayed the same in the last 10 yrs.	breeding occurred in "x" out of the last 10 yrs.	average non-breeding population has increased/ decreased/ stayed the same in the last 10 yrs.
United Arabian Emirates	Kohr Dubai	vulnerable (QH98)	?	-	-	?
	Abu Dhabi: Isl. of Sir Bani Yas					
Israel	Mediterranean coastline and Eilat	no idea (QY98)	counts, literature, com. with others (QY98)	-	-	stayed the same (QY98)
Afghanistan	Ab-e-Estada	Endangered (QW98)	general impression, com. with others (QW98)	decreased (QW98)	10/10 (QW98)	decreased (QW98)
	Dasht-e-Nawar	endangered (QW98)	general impression, com. with others (QW98)	decreased (QW98)	10/10 (QW98)	decreased (QW98)
Turkmenistan	Caspian sea coast					
Kazakhstan	Lake Tengiz	endangered, unknown (QZ98)	counts, general surveys, impression, literature, com. with others (QZ98)	increased (QZ98)	5, 6/ 10 (QZ98)	increased (QZ98)
Kuwait						

	area/site	status of *Phoenicopterus ruber roseus*	this conclusion is based on:	average breeding population has increased/ decreased/ stayed the same in the last 10 yrs.	breeding occurred in "x" out of the last 10 yrs.	average non-breeding population has increased/ decreased/ stayed the same in the last 10 yrs.
Southern Asia						
Pakistan	Indus delta (Sindh)					
	Pujab region: e.g. Ucchali lake					
India	Orissa: e.g. Chilka Lake					
	Sambhar Lake					
	Gujarat area :G+L Rann of Kutch					
	Tamil Nadu area: Calimere, Vedharanyam swamp					
	Andhra Pradesh area					
	Maharashtra area					
	Sultanpur Jheel near New Dehli	vulnerable (QSH98)	counts, general impression (QSH98)	-	-	decreased (QSH98)
ADDITIONAL						
Germany	Zwillbrocker Venn	*Phoenicopterus Chilensis, Ph. ruber ruber, Ph. ruber roseus*, Increased (QK98)	irregular counts, com. with others (QK98)	increased (QK98)	7/10 (QK98)	-

Additional table for *Phoeniconaias minor*

This additional table includes information on the status of the lesser flamingos. The information was extracted from the completed Flamingo Conservation Action Plan Questionnaires.

	area/site	status of *Phoeni-conaias minor*	this conclusion is based on:	average breeding population has increased/ decreased/ stayed the same in the last 10 yrs.	breeding occurred in "x" out of the last 10 yrs.	average non-breeding population has increased/ decreased/ stayed the same in the last 10 yrs.
Eastern Africa						
Ethiopia	Lake Abijata					
	Lake Chitu	vulnera-ble (QD98)	counts, general surveys (QD98)	-	-	decreased (QD98)
	Debre Zeit (Green lake)					
	Lake Shalla					
Kenya	Lake Bogoria !	out of danger (QMO98), vulnera-ble (QM98) endang-ered (QT98)	counts (QMO98, QM98), general surveys, impression (QMO98, QT98)	-	-	increased (QMO98, QM98), stayed the same (QT98)
	Lake Elmenteita !	out of danger (QMO98), vulnera-ble (QM98)	counts (QJM98, QM98), general surveys, impression (QMO98)	-	-	increased (QMO98), decreased (QM98)
	Lake Magadi	out of danger (QMO98)	counts, general surveys, impression (QMO98)	-	-	increased (QMO98)

	area/site	status of *Phoeni-conaias minor*	this conclusion is based on:	average breeding population has increased/ decreased/ stayed the same in the last 10 yrs.	breeding occurred in "x" out of the last 10 yrs.	average non-breeding population has increased/ decreased/ stayed the same in the last 10 yrs.
	Lake Nakuru !	out of danger (QMO98), endang-ered (QM98)	counts (QJM98, QM98), general surveys, impression (QMO98)	-	-	increased (QMO98), decreased (QM98)
	Logipe					
	Amboseli (oi Tukai)					
Tanzania	Lake Natron					
	Lake Manyara					
	Lake Eyasi					
	Momella					
	Embagi (or Empaki)					
Uganda	Crater lakes	vulnera-ble (QA98)	general surveys (QA98)	-	-	no idea (QA98)
	Lakes in KWR (Ba-gusa, Mase-kye, Nshenyi Lakes)	vulnera-ble (QA98)	general surveys (QA98)	-	-	no idea (QA98)
Southern Africa						
Botswana	Makgadik-gadi pans: e.g. Sua Pan	vulnera-ble (QBO98)	literature, com. with others (QBO98)	no idea (QBO98)	4,5/ 10 (QBO98)	no idea (QBO98)
Zimbabwe		rare (QJ98)	general impression (QJ98)	-	-	stayed the same (QJ98)

	area/site	status of *Phoeni-conaias minor*	this conclusion is based on:	average breeding population has increased/ decreased/ stayed the same in the last 10 yrs.	breeding occurred in "x" out of the last 10 yrs.	average non-breeding population has increased/ decreased/ stayed the same in the last 10 yrs.
Zambia		vulnera-ble (QDO98)	general surveys (QDO98)	-	-	decreased (QDO98)
Namibia	Etosha Pan	?	counts, literature (QS98)			declining (QS98)
	Mile 4 Saltworks			-	-	
	Walvis Bay	?	counts, literature (QS98)	-	-	declining (QS98)
	Sandwich Harbour Mud flats	?	counts, literature (QS98)	-	-	declining (QS98)
Malawi	Lake Chilwa	vulnera-ble (QDO98)	general surveys (QDO98)	-	-	no idea (QDO98)
Mozambi-que	area south of the Save River	no idea (QP98)	irregular counts (QP98)	-	-	no idea (QP98)
South Af-rica	e.g. Kamfers dam					
Central Africa						
Cameroon	Rio del Rey	vulnera-ble (QDO98)	general surveys (QDO98)	-	-	stayed the same (QDO98)

	area/site	status of *Phoeni-conaias minor*	this conclusion is based on:	average breeding population has increased/ decreased/ stayed the same in the last 10 yrs.	breeding occurred in "x" out of the last 10 yrs.	average non-breeding population has increased/ decreased/ stayed the same in the last 10 yrs.
Western Africa						
Mauritania	Banc d'Arguin !	no idea (QJM98), vulnera-ble (QL98)	counts, general surveys, impressions, literature, com. with others (QJM98)	? (QJM98, QL98)	2/10 (some where along Maurita-nian coastline ; QL98)	stayed the same (QJM98)
	Aftout es Saheli, e.g. Etang du Diawling	no idea (QJM98)	counts, general surveys, impressions, literature, com. with others (QJM98)	-	-	stayed the same (QJM98)
Senegal	Lagunes de St. Louis			-	-	
	des Oiseaux du Djoudj					
Guinea Bissou						
Western Asia						
Yemen	Aden area					
	Red sea coast					
	Al-Huday-dah lagoons					

	area/site	status of *Phoeni-conaias minor*	this conclusion is based on:	average breeding population has increased/ decreased/ stayed the same in the last 10 yrs.	breeding occurred in "x" out of the last 10 yrs.	average non-breeding population has increased/ decreased/ stayed the same in the last 10 yrs.
Southern Asia						
Pakistan	Indus delta (Sindh)					
	Lake Siranda (Baluchistan)					
India	Sambhar Lake					
	Gujarat area :G+L Rann of Kutch					
	Tamil Nadu area: Calimere, Vedharanyam swamp					
	Orissa, e.g. Chilika Lake					
	Andhra Pradesh area					
	Sultanpur Jeheel near New Dehli	vulnerable (QSH98)	counts, general impression (QSH98)	-	-	decreased (QSH98)