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Aspects On Libyan Legislations For Biodiversity Conservation and Propose Farwa Complex As Protected Area

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Summary

Natural environments and habitats suffer from different kinds of risks due to the increase of human population and their activities. More attention and hard work is needed to keep the components of biodiversity in natural state and under control is needed. Present paper addressed the Libyan legislations concerning the biodiversity conservation and protected areas. Although, there are successive issuances of legislations for the protection of the Libyan environment, but they are mostly focused on the causes of pollution. There are 12 protected areas and national parks in Libya, conversely, there are many other sites with unique landscapes and good biodiversity components in need to be protected such as Farwa complex (Lagoon and Island). In 2009 the Lagoon was declared as a reserve area for prevent the fishing. The area has diverse unique habitats of extensive tidal areas and mudflats and an accumulation of Posidonia oceanica on the northern part of the island. These conditions provide good nesting grounds for some species such as Sterna albifrons (Pallas, 1764), Sterna hirundo (Linnaeus, 1758) and Charadrius alexandrinus (Linnaeus, 1758). Moreover, the area attracts many migratory species in large numbers of individuals during their flight to Africa or to spend winter season in Libya. Four endangered bird species were reported by the area, as well as one of the endangered species in the Mediterranean region Loggerheaded turtle Caretta caretta (Linnaeus, 1758) that uses the Island's sandy beach for nesting. Over all, a high priority for protection measures is necessary to maintain the current character and components of the area.

Key words: Legislation, Conservation and Breeding.

Introduction

Libyan legislations concerning the protection of biodiversity

Natural environments and habitats suffer from different kinds of risks due to human activities. The current situation requires hard work to keep as much as possible the components of biodiversity in natural state and more control is needed to insure the protection and obliges all public institutions, governmental bodies and individuals to avoid practices harmful to the environment and encourage them to maintain the natural resources. Thus, it is necessary to create legislations and roles to conserve and protect the ecosystems. So, there are successive issuances of legislations for the protection of the Libyan environment, but they are mostly focused on the causes of pollution, although the country did not suffer from industrial activities as is the case in many countries. However, the immigration of people from countryside to the cities and the concentration of people on the coastal areas have led to acute depletion of natural resources due to urbanization, reclamation rely on ground water and desertification (LIBYAN NATIONAL BIODIVERSITY STRATEGY, 2002) .

The most important laws and decrees issued in the field of biodiversity conservation are:

- Law number 7 / 1982, regarding the protection of environment. The third chapter addressed the protection of marine biology and the hazards of oil pollution on fishes.
- Law number 14 / 1989, related to the exploitation of marine resources and its implementing regulations.
- Decision of the General People's Committee in 1991, concerning the reorganization of the Authority of marine wealth.
- Act number 25 / 1950, for protection of forest.
- Law number 12 / 1956, for forest organizing.
- Law number 47 / 1971, for the protection of forests and pastures.

- Law number 5 / 1982 related to the protection of forests and pastures; amended by Law No. 14 / 1992.

- Act number 3 / 1984, issued by General People's Committee of Agriculture and land reclamation concerning the protection of grasslands and forests from fire.

- Decision of the Secretary of General People's Committee of Agriculture No. 365 / 1995 for issuing some roles to protect the forests and pastures.

- Law number 15 / 1984, for prevent overhunting of wild animals.

- Act number 453 / 1993, issued by the General People's Committee of Agriculture and animal wealth to prohibit the hunting of terrestrial and sea turtles.

Decisions related the institutional and regulatory framework of protected areas and national parks

- Act number 11 / 1990, issued by the General People's Committee concerning the establishment of Technical Committee for Wildlife, which conferred upon the technical and administrative supervision on the protected areas and national parks.

- Act number 326 / 1998, related to the transfer of the responsibility and supervision of protected areas to the municipalities' councils.

- Act number 205 / 2001, issued by General People's Committee regarding the establishment of Animal wealth General Authority and one of its tasks to take care about the protectorates and national parks.

- Finally a total of 12 Acts to establish some protected areas and national parks in different years as showed in table 1.

Problems that prevent the implementation of legislations:

Although there are many roles and legislations aimed to protect the biodiversity and natural habitats, the actual implementation has been limited and these laws need to be activated and enhanced. However, these difficulties can be summarized as follows:

1. Lack of coordination between the organizations and institutions who supposed to implement these legislations as well as the overlapping in their tasks.
2. Instability in the administrative bodies and institutions.
3. Lack of public environmental awareness.
4. Lack of specific bodies and agencies to implement these legislations, as well as no capacity in building and training on the field of environment protection.
5. The current legislations do not address the new problems of biodiversity (need to be updated), and in some issues, there is no roles for example legislations for Biosafety.

International framework

Libya is one of the Contracting Party to most of the international biological diversity concerned conventions, including, CITES, Biological Diversity, Barcelona Convention and Ramsar convention. Furthermore, it is become a party to the Bonn Convention on Migratory Species (CMS), and after that it has ratified on AEWA (the Afro-Eurasian Waterbird Agreement of the Convention on Migratory Species) with effect in 2005 (AZAFZAF *ET AL.*, 2005).

Table 1. Protected areas and national parks in Libya

Name of protected area	Establishing date	Area/ha	Landscape
Wadi El-kouf national park	1978	100.000	Mountain and coastal forest
El-heesh protected area	1984	160.000	Sobkha and fresh water springs
Al-Gharabolli national park	1992	8000	Coastal forest
Aboghilan national park	1992	4000	Mountain area
Ber Aiad protected area	1992	1200	Mountain to plain area
Sorman national park	1992	400	Forest of pine trees
Annagaza national park	1993	4000	Mountain forest
Sobrata national park	1995	500	Coastal forest of pine trees
Msallata protected area	1998	1800	Mountain area
Tala protected area	1998	200	Mountain area
Zolton protected area	1998	1000	Coastal salt marshes
Farwa lagoon	2009	33	Coastal lagoon

Farwa complex as a protected area

The coast line of Libya has different kinds of wetlands such as salt marshes, bays, lakes, lagoons and islands (DEFOS *ET AL*., 2001). These habitats provide good shelters and foraging sites for migratory birds during their flight from Europe and Asia to Africa and return. Furthermore, some of these sites provide residential and nesting areas for some species. Farwa Lagoon and Island, the most important tidal wetland in Libya (SMART *ET AL*., 2006), has unique diverse habitats of extensive tidal areas and mudflats and an accumulation of *Posidonia oceanica* on the northern part of the island and at Ras-Attalgha, beside the plant cover of the island itself (ETAYEB AND ESSGHAIER, 2007).

Due to the location and the unique biodiversity, Farwa Island and Lagoon attracted concerns and researchers from different countries. Some studies were carried out by scientific missions from Italy and other European countries during thirties. The first studies of Farwa date back to the beginning of the last century (SCORDIA, 1937, cited in PERGENT *ET AL*., 2002), while the recent regular scientific studies were undertaken by the Marine Biology Research Centre of Tajura and the University of Tripoli: fauna and flora (SALAH, 1974; EL GHIRIANI, 1977; MABRUK, 1977; WADIDA, 1980), pollution (MARINE RESEARCH CENTER, 1981; GHANNUDI AND DAWD, 1986). However, during the last three decades the area was targeted by local researchers where a comprehensive study of the lagoon was carried out during 1983-85 in order to determine the possibility of establish agricultural site (ANNAJAR AND GADMOUR, 1984). After that, successive studies and researches on this area included a study of Sea Turtles and counting the nests of Loggerheaded turtle *Caretta caretta* that using the Island's sandy beach for nesting. This species is one of the endangered species in the Mediterranean region due the increased numbers of resorts and touristic facilities on the shore line. It is also threatened due to the Oil pollution and other land-based sources (LAURENT *ET AL*., 1998). This survey was divided into three phases during the period from 1995 to 1999; this survey was conducted under the supervision of Environment General Authority (EGA, Libya), Marine Biology Research Center (MBRC, Libya) and Regional Activity Center for Specially Protected Areas (RAC/SPA, MAP, UNEP).

In addition, many studies took place in this area such as, the study of Sea grass *Posedonia oceanica* in order to protect this species in the Mediterranean region. This study also was sponsored by EGA, MBRC and RAC/SPA. This study reported that Farwa Lagoon is the

most important area for Sea grass and a good example (model) of natural environment for the *Posedonia oceanica* (PERGENT *ET AL*., 2002). These results were presented in different international events and forums.

In term of Ornithology, Farwa complex (Island and Lagoon) is considered as one of important stopover wetland for migratory birds in Libya during their crossing in winter (DEFOS, 2001, ETAYEB AND ESSGHAIER, 2007). In summer it is a nesting site for Redshank *Tringa tetanus* (Linnaeus, 1758), Little Tern *Sterna albifrons* and Caspian Tern *S. caspia* (Pallas, 1770), the latter rarely recorded as a breeding species in the Mediterranean (ETAYEB 2002). Many studies have been conducted on the birds of this area, and large numbers of aquatic birds were reported (DEFOS, 2001, ETAYEB, 2002, SHEETA, 2008, AZAFZAF *ET AL*., 2005, 2006, ETAYEB *ET AL*., 2007). Moreover, it is worth to mention that Farwa complex was a study area of five projects conducted by MSc. students from the University of Tripoli, three of them from Zoology department and two from Botany department. Those studies resulted in the importance of this area and identify its biodiversity.

ETAYEB (2002) observed four endangered species in Farwa area; Ferruginous duck *Aythya nyroca* (Güldenstädt, 1770), Lesser Crested Tern *Sterna bengalensis* (Lesson, 1831), Audouin gull *Larus audouinii* (Payraudeau, 1826) and Shag *Phalacrocorax aristotelis*(Linnaeus, 1761). These species were reported in the IUCN Red list. Moreover, international action plans were prepared and sponsored by the UNEP to protect these species.

In the year 2003, a total of three national action plans were adopted in the conference of contracting parties of Barcelona Convention, UNEP. These action plans were prepared by Libyan experts in cooperation with RAC/SPA, and they are as follows:

1. National action plan to protect sea turtles along the Libyan coast.
2. National action plan to protect Marine and Aquatic birds in Libya.
3. National action plan to propose and establishing Marine protected areas in Libya.

The main recommendation of these action plans was to protect the whole area of Farwa complex and remove the threats to its biodiversity.

Farwa complex is a natural heritage and unique ecosystem, and therefore any deterioration or anthropogenic intervention will affect its natural balance and food chain. Thus, we provide this paper as trying to encourage the decision makers to establish a protected area to conserve the remaining biodiversity of this habitat.

General description of the area

Farwa Lagoon and Island is situated in the north-west of Libyan coast (11°54'45"E, 33°05'33"N), 150km west of Tripoli at the border area between Libya and Tunisia (fig. 1). The lagoon covers a surface area of 31 km² (13 km long and 2.5 km wide on average). Its depth varies from 0.5 to 2.5 m, with a depth of 6 m in the central channel; tidal area is about 40 cm, large, on average (sand and mudflats). The lagoon is separated from the sea by Farwa Island (sand bar), an elongated sand bar extending from east to west for 11km and which is 0.5–1km wide (AZAFZAF *ET AL.*, 2005; ETAYEB AND ESSGHAIER, 2007). There is a blocked opening at the eastern end of the sand bar; it was replaced by an artificial opening in 1995 about 3 km west to the natural one. As a result, the eastern region of the lagoon is characterised by shallow depths and a high degree of confinement. The rest of the Lagoon is dominated by three benthic macrophyte species, namely the marine phanerogams *Cymodocea nodosa* (Asch, 1870)*, Posidonia oceanica* and the alga *Caulerpa prolifera* (Lamouroux, 1809; PERGENT *ET AL,*. 2002). At the far western part of the Island there are accumulations of Posidonia and other sea grass which appears in large area during low tide. This area called Ras-Attalgha, is one of the most important roosting sites for marine birds.

Methodology

The present paper is a review of some results of ornithological works through the last ten years that have been done at Farwa complex. Some results from the study of ETAYEB (2002), where a highest number of species and individuals; weekly accounted in winter were used, in order to match the data with the results of wintering birds survey (2005 – 2009). This study also reported some important species (endangered and threatened species). Moreover, present some results on the nesting of some species in the Island from ETAYEB (2002) and SHEETA (2008). The other sources of information are the Libyan wintering birds survey reports from 2005 to 2009. Those reports were conducted and organized under a Memorandum of Understanding between the EGA (Environment General Authority of Libya), RAC/SPA (the Regional Activities Centre on Specially Protected Areas of the UNEP Mediterranean Action Programme, based in Tunis), and AEWA. These surveys were conducted during winter and focused on wetlands along the Libyan coast-line, although some visits to inland sites were achieved. These surveys were performed by local and international ornithologists and because of the vast area, the group usually split into teams, covering different sites or different parts of some large wetlands. The census was made during the whole daytime, using binoculars and telescopes, and care was taken to eliminate possibilities of double counting. In total, 65 sites were covered (SMART *ET AL.*, 2006). However, in this paper we focused on the data collected on water birds in Farwa area, and the visits were two days for each year.

In order to examine the population trend of water birds in Farwa area through the years from 2005 to 2009, the Living Planet Index (LPI) was used. The use of LPI was started in 1997 by the World Wide Fund (WWF) to investigate the changes of global biodiversity over time, especially for measuring the average trends of vertebrate populations (LOH *ET AL.*, 2005). In this paper, the Chain method was used to calculate the index, where the logarithm of the ratio of the population of each pair of years was calculated using the formula:

$$d_t = \log(N_t/N_{t-1})$$

where N= population size and t= years (time). The specific values of d_t were generated for n_t as:

$$\bar{d}_t = \frac{1}{n_t} \sum_{i=1}^{n_t} d_{it}$$

Finally, the index for the water birds population in Farwa complex in a standard year *t* was calculated as:

$$I_t = I_{t-1}\, 10^{\bar{d}_t}.$$

Results and Discussion

Habitat type and important species

The unique landscape of Farwa complex led to classify the area, based on Ramsar categories, to: (i) **B. Marine subtidal aquatic beds**; includes kelp beds, sea-grass beds, tropical marine meadows and (ii) **J. Coastal brackish/saline lagoons**; brackish to saline lagoons with at least one relatively narrow connection to the sea. According the RAC/SPA SDF (Standard Data Form) site classification: Coastal areas: Mudflats and sandbanks Coastal wetland (lagoon); Dunes. This type of habitat attracts huge number of water birds particularly sea birds and different species of waders in winter season and therefore, it has been reported as an excellent example of a tidal bay (a rare wetland type in the Mediterranean), and as such is a high priority for protection measures (SMART *ET AL*., 2006).

In term of ornithological value, the area has been reported as one of the important stopover of migratory birds in Libya (ETAYEB AND ESSGHAIER, 2007). Moreover, four threatened and endangered species have been observed in the area named; Ferruginous Duck, Lesser Crested Tern, Audouin Gull and Shag (ETAYEB, 2002; SMART *ET AL*., 2006; ETAYEB *ET AL*., 2007 and HAMZA *ET AL*., 2008) this is an additional reason to give more attention to protect the area. However, one of the IUCN criteria to establish a Wildlife Management Reserve is to ensure the protection of important groups of species or landscapes or seascapes of important natural features, and permitted activities are the scientific research, monitoring and environmental education. Consequently, the findings of the above mentioned studies are in accordance with this criterion, where the necessary conservation processes of these endangered species are needed.

Wintering birds at Farwa complex

Study of ETAYEB (2002) resulted in a total of 54 water-birds species and 6813 individual's, whilst the results of winter census (2005-2009) were fluctuated in individual's number between 2725 in 2005 and 7201 in 2007 and the number of species ranged between 27 – 33 (table 2). The high number of species and individuals in 2002 can be explained because the survey was

Fig. 1 - A map of Farwa Lagoon and Island.

in regular weekly visits along the season, thus the chance of missing species or individuals was reasonably small. Although, the number of observed species during the winter survey from 2005 to 2009 shows no big difference, the number of individuals was varied. This variation is may be related to the time of census, where the highest number was observed in February or may be the difference was related to the rate of precipitation. However, regardless to this fluctuation, the area attracts many different water-bird species in large populations and it is worthy to mention that these data are only for winter season; so increasing probably occur during spring season as it is the time of crossing of migratory birds.

Population trends

The Chain method revealed that the population index of the wintering water birds of Farwa has increased by up to 50% during the period from 2005 to 2009, with a peak of up to more than 100% in winter 2007 (fig 2). However, wintering water birds survey is the only regular study of Libyan birds, there are no other studies to compare or investigate the trend of birds in this area. The results of this survey indicate the suitability of the area as good shelter and stopover for birds during their migration as well as for some resident species (ETAYEB, 2002).

Table. 2. Number of water birds accounted in farwa area during winter.

Years	Month	Number of Species	Number of Individuals
2002	Dec – Feb	54	6813
2005	Jan	33	2725
2006	Jan	29	4031
2007	Feb	30	7201
2008	Jan	27	5742
2009	Late Jan – Early Feb	29	4313

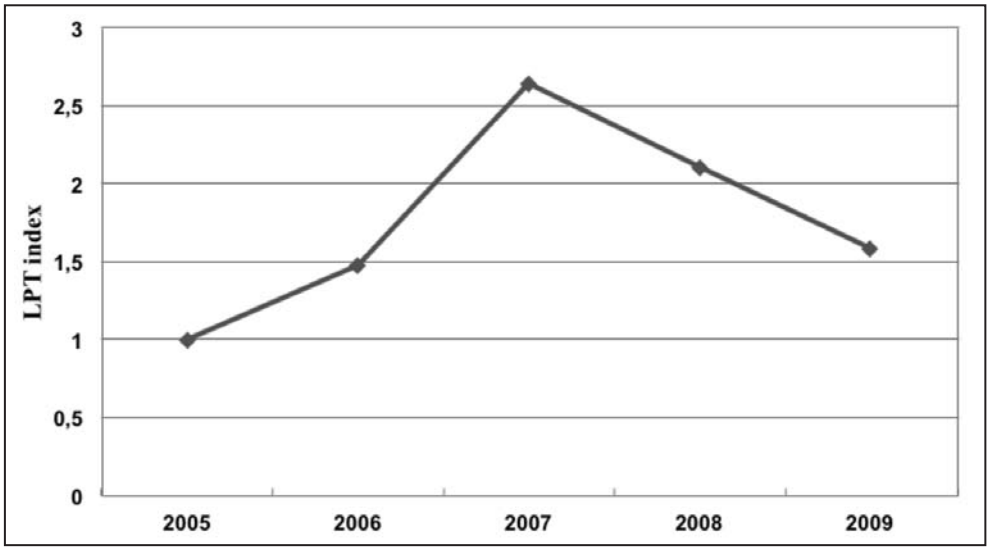

Figure 2 - The population index of water-birds in Farwa complex. The population index is derived from Living Planet Index (see Methods).

Nesting at Farwa

The unique diverse habitats of the area provide good nesting grounds for some species. Many studies reported the nesting of sea-birds and waders species at Farwa Island (BUNDY, 1976; HADOUD AND ZGOUZI, 1998; ETAYEB, 2002 and SHEETA, 2008; see table 3). Moreover, the first record of breeding of Caspian tern *Sterna caspia* in Libya was during the period from 1999 to 2001 in Farwa (ETAYEB AND ESSGHAIER, 2007). Some species are common breeders at the area in good number of nests such *Sterna albifrons* (SHEETA, 2008), *Sterna hirundo* (ETAYEB, 2002), *Larus cachinnans* (HADOUD AND ZGOUZI, 1998) and *Charadrius alexandrinus* (BUNDY, 1976). In addition, other species were reported as breeders because of their aggressive behaviour toward the investigators such as Red Shank (*Tringa tetanus)* and Dunlin *Calidris alpina* (Linnaeus, 1758; ETAYEB, 2002; SHEETA, 2008).

Table 3. Species bred at farwa area and the references.

Species	Citation	Remark
Charadrius alexandrinus	Bundy, 1976 Etayeb, 2002 Sheeta, 2008	C BE C
Calidris alpina	Sheeta, 2008	BE
Tringa totanus	Hadoud and Zgouzi, 1998 Etayeb, 2002 Sheeta, 2008	C BE BE
Sterna albifrons	Bundy, 1976 Hadoud and Zgouzi, 1998 Etayeb, 2002 Sheeta, 2008	C C C C
Sterna hirundo	Hadoud and Zgouzi, 1998 Etayeb, 2002	C C
Sterna caspia	Etayeb and Essghaier, 2007	C
Larus cachinnans	Hadoud and Zgouzi, 1998	C
C = Confirmed, BE = Behavioral Evidence.		

Conclusion

There are successive issuances of legislations for the environment protection, but they are focused on the causes of pollution. However, it is necessary to create legislations and roles to conserve and protect the ecosystems. It is also required to create a body or sector to supervise and organize the protected areas and national parks. The necessity of capacity building in the field of protectorates has to be adressed, particularly in training for managers and rangers.

Farwa complex (Lagoon and Island) is an excellent example of a tidal area (a rare wetland type in the Mediterranean), and matches the numerical criteria, in terms of bird numbers, for designation as a wetland of international importance under the Ramsar Convention and as Special Protected Areas of Mediterranean Importance (SPAMIs) under the Barcelona Convention. The area also attracts many birds species such as marine birds and waders including some important species (endangered species), as well as it is a good nesting ground for many species which are reported in some recent studies. Therefore, a high priority for protection measures is necessary to maintain the current character of the area.

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