



MedMPAnet project

ECONOMIC AND SOCIAL SURVEY OF EL KOUF NATIONAL PARK IN LIBYA

The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of UNEP/MAP-RAC/SPA concerning the legal status of any State, Territory, city or area, or of its authorities, or concerning the delimitation of their frontiers or boundaries. The views expressed in this publication do not necessarily reflect those of UNEP/MAP-RAC/SPA.

Published by: RAC/SPA

Copyright: © 2015 - RAC/SPA

Reproduction of this publication for educational or other non-commercial purposes is authorized without prior written permission from the copyright holder provided the source is fully acknowledged. Reproduction of this publication for resale or other commercial purposes is prohibited without prior written permission of the copyright holder.

For bibliographic purposes, this volume may be cited as:

RAC/SPA - UNEP/MAP, 2013. Economic and social survey of El Kouf National Park in Libya. By Ibrahim BEN AMER and Shakman ESMAIL. Ed. RAC/SPA - MedMPAnet Project, Tunis: 29 pages.

Layout: Zine El Abidine MAHJOUB and Asma KHERIJL.

Cover photo credit: Mathieu FOULQUIÉ.

Photos credits: Environmental Working Group and Omar Mukhtar University, Ibrahim BENAMER, Gérard PERGENT and Mathieu FOULQUIÉ.

This document has been elaborated within the framework of the Regional Project for the Development of a Mediterranean Marine and Coastal Protected Areas (MPAs) Network through the boosting of Mediterranean MPAs Creation and Management (MedMPAnet Project).

The MedMPAnet Project is implemented in the framework of the UNEP/MAP-GEF MedPartnership, with the financial support of EC, AECID and FFEM.



Together for the Mediterranean Sea



ECONOMIC AND SOCIAL SURVEY OF EL KOUF NATIONAL PARK IN LIBYA



MedMPAnet project

Regional Project for the Development of a
Mediterranean Marine and Coastal Protected
Areas (MPAs) Network through the boosting
of MPA creation and management

Study required and financed by:

MedMPAnet^{project}

Regional Activity Centre for Specially Protected Areas (RAC/SPA)
Boulevard du Leader Yasser Arafat
B.P. 337
1080 Tunis Cedex - Tunisia

In charge of the study:

Atef LIMAM, MedMPAnet Project, RAC/SPA
Elmaki AYAD ELAGIL, Director of Nature Conservation Department, Environment General Authority (Libya)

Scientific responsible of the study:

Ibrahim BENAMR, Faculty of Natural Resources and Environmental Science, Omar Mukhtar University (Libya)
Esmail SHAKMAN, Zoology Department, Tripoli University (Libya)

Reference of the study:

Contract N° 03 and 03 bis/MedMPAnet/2012

FOREWORD

The present study has been undertaken within the framework of the Regional Project for the Development of a Mediterranean Marine and Coastal Protected Areas (MPAs) Network through the boosting of MPA Creation and Management “MedMPAnet Project” (<http://medmpanet.rac-spa.org>), executed by the Regional Activity Centre Specially Protected Areas (RAC/SPA - UNEP/MAP; www.rac-spa.org) as part of the Strategic Partnership for the Mediterranean Sea Large Marine Ecosystem “MedPartnership¹” (www.themedpartnership.org) Sub-component 3.1: Conservation of coastal and marine diversity through the development of a Mediterranean marine and coastal protected areas (MPAs) network.

The MedMPAnet Project mainly deals with the processes leading to the creation of marine and coastal protected areas (MPAs) in several Mediterranean countries (Algeria, Albania, Croatia, Egypt, Lebanon, Libya, Montenegro, Morocco, Tunisia). The MPA establishment process goes generally through the following steps:

- (i) legal and Institutional framework assessment for conservation of coastal and marine biodiversity ;
- (ii) ecological studies ;
- (iii) socio-economic and fishery studies ;
- (iv) management planning ;
- (v) elaboration of stakeholders’ participation and engagement mechanisms ;
- (vi) elaboration of sustainable financing mechanisms.

These activities are accompanied with technical support in view of improving MPA management and building capacities of MPA managers and practitioners.

In Libya, the main objective of the MedMPAnet Project is to provide the Libyan environmental authorities with a strong (ecological and socio-economic) argument in favour to initiate the establishment of a network of coastal and marine protected areas along the Libyan coasts.

The present study intends to undertake a socio-economic assessment of both marine and coastal areas of El Kouf National Park. It has led to compile the collected information to elaborate a report on the subject with concrete proposals serving to the elaboration of the integrated management document of both marine and coastal areas of El Kouf National Park.

¹ <http://www.unepmap.org/index.php?module=content2&catid=001015>

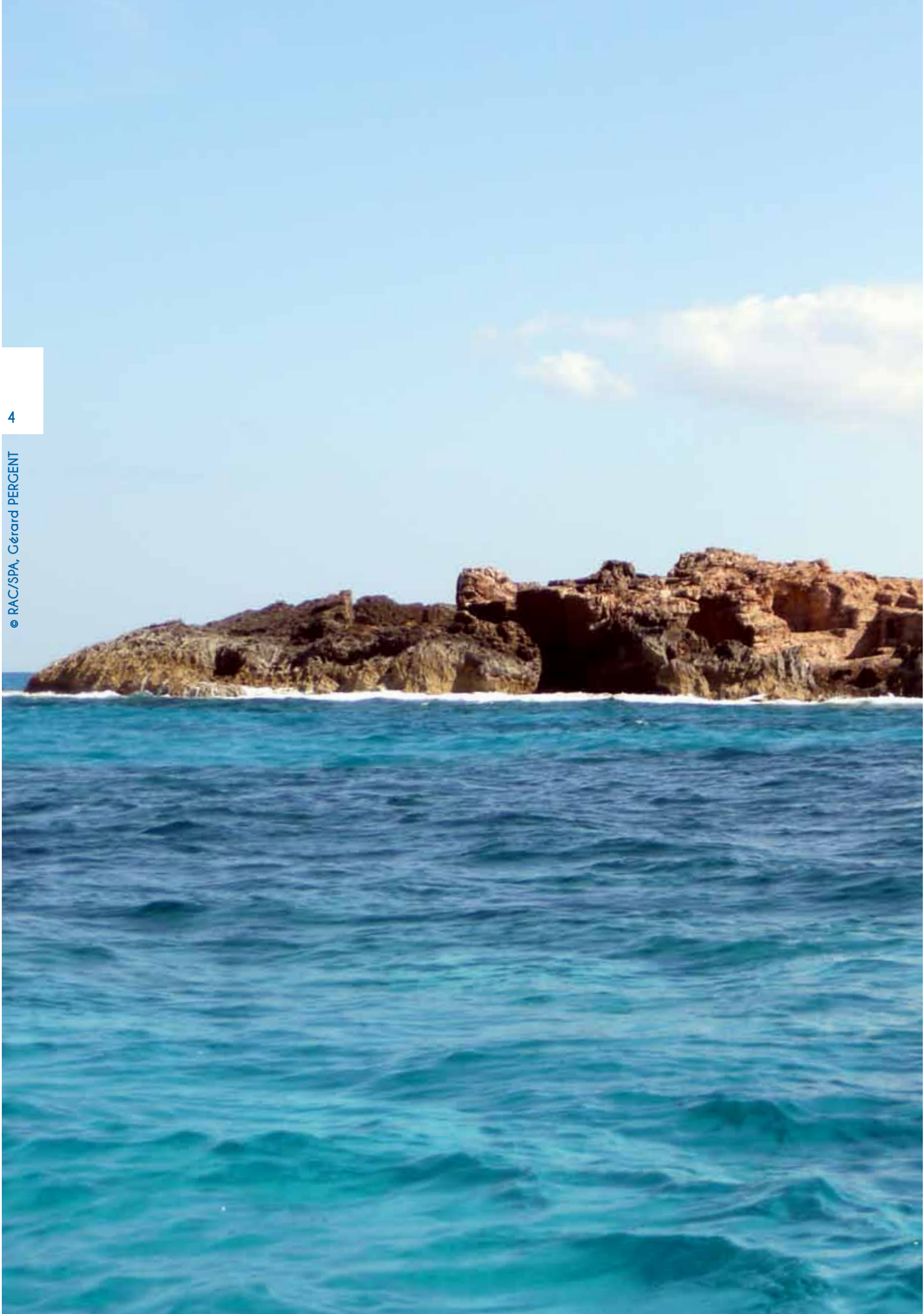


TABLE OF CONTENTS

Foreword

1. Introduction	9
1.1. Diversity of El Kouf coast.....	11
2. Materials and methods.....	13
3. Results and Discussion	15
3.1. Fisheries	15
3.1.1. Personal information	15
3.1.2. Knowledge and relation to El Kouf National Park	16
3.1.3. Characteristics of the fishing fleet.....	17
3.1.4. Fishing gear and fishing grounds	18
3.1.5. Targeted fish species, seasons and marketing.....	18
3.1.6. Other information.....	21
3.2. Birds hunting	21
3.2.1. Personal information	21
3.2.2. Hunting seasons and hunting trips	21
3.2.3. Hunting gear and targeted species	22
3.2.4. El Kouf national park and conservation efforts.....	23
3.3. Sand Dredging (Removing sand material from the Beaches).....	23
3.4. Unregulated urbanising of the coastline in El Kouf area	24
4. Conclusion and final remarks	27
References	29

LIST OF FIGURES

Figure 1. Map of Cyrenaica and the location of El Kouf National Park in relation to some of the large cities and locations

Figure 2. Ain Al-zarga

Figure 3. Ain Al-shaqiqah

Figure 4. A more detailed map of the NP area with the locations of every activity

Figure 5. The personal details of all the questioned people in the survey

Figure 6. Dynamite fishing charges. Hazardous to assembly even for the most expert users, (B) shows a modified military-based explosive charge

Figure 7. A dynamite charge thrown from a boat.

Figure 8. Destruction underwater, the outcome of an old dynamite charge used on a rocky bottom. In the picture two species of great ecological importance can be seen, the two brown algae *Padina pavonica* and *cystoseira* sp.

Figure 9. Remains of a dynamite fishing and bird hunting posts. The space can be used by both to spot approaching fish shoals or bird flocks.

Figure 10. Local hunters found within El Kouf National Park

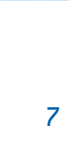
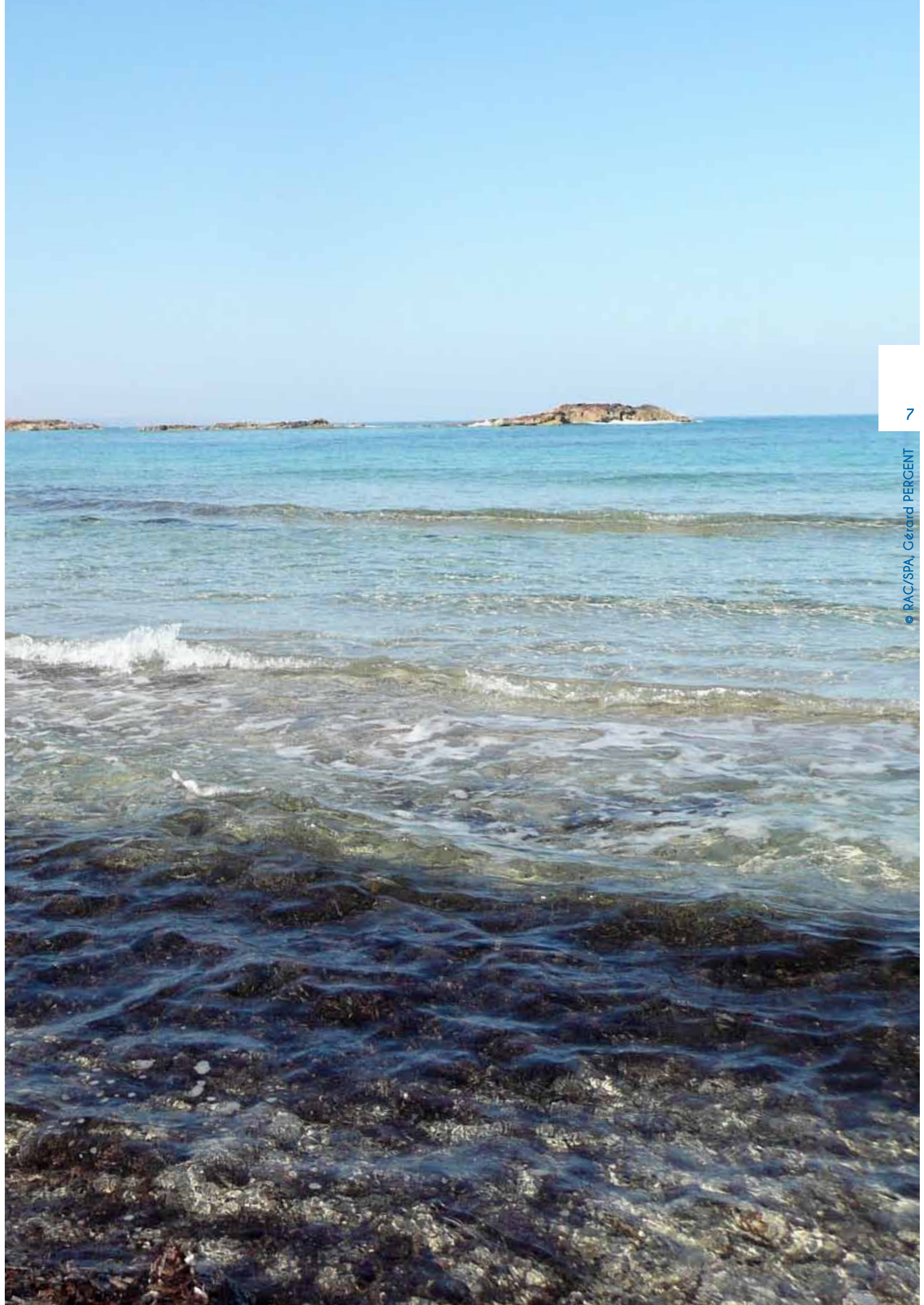
Figure 11. Remains of birds found after the hunters moved out. Anseriforms and Pelecaniformes can be seen among the remains. Although the picture was taken outside the NP borders, but similar scene were recorded within El Kouf

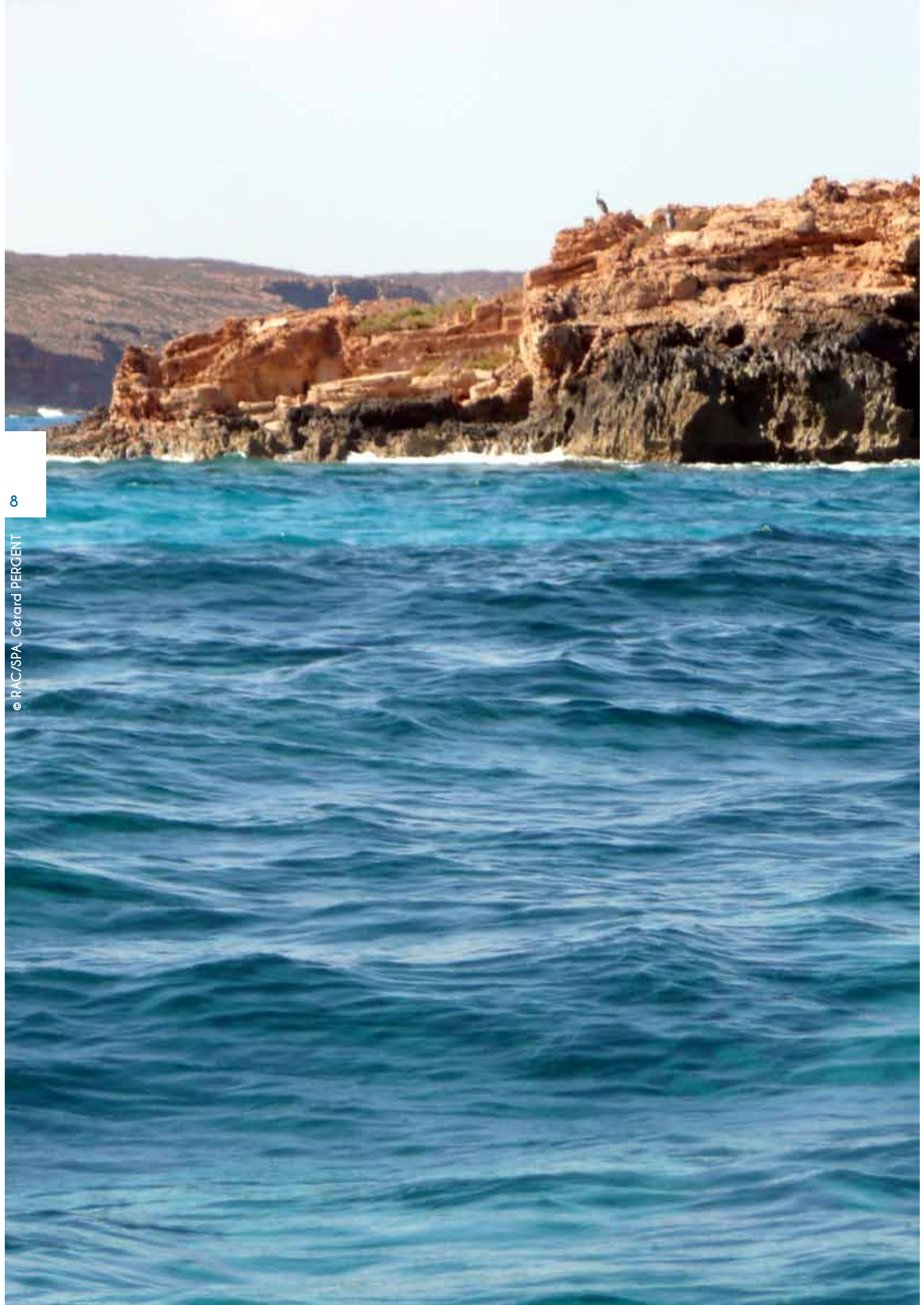
Figure 12. Sand dredging site, the removal of the sand material is so deep that the under layer of clay is revealed

Figure 13. Sand dredging operations with heavy machinery. A truck shown in the picture is loading up sand to be carried to nearby urban areas

LIST OF TABLES

Table 1. Fish species caught within El Kouf National Park





1. INTRODUCTION

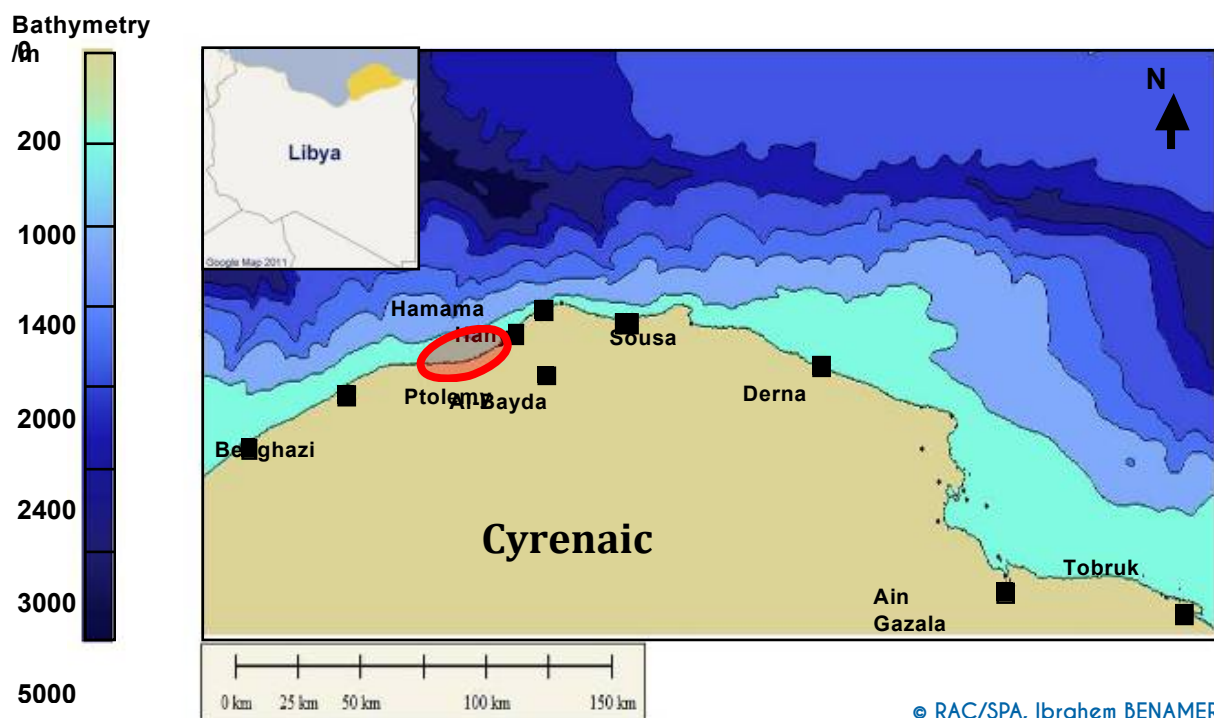
El Kouf National Park is located to the west of the city of El-Beida, in Cyrenaica District (Fig. 1). The park is about 15 km wide from east to west, and stretches from the coast to the south for about 160 km. There are three major eco-zones presented in the area, these are; sandy beaches and dunes give way to muqui shrub-land at higher elevations, with a associated microhabitat along the course of the valley. The park protects both marine and land wildlife, it is also the first designated Natural Reserve in Libya and became established as a National Park in 1979. The park originally covered 32,122 ha; it has reportedly become restricted to only 9,000 ha. Cyrenaica is the second-most populous region of Libya, it has been inhabited for many centuries.

However, the natural vegetation of the site appears not to have been cleared in historic times. There are at least 229 sites of archaeological importance in the area. In 1984, 2,500 people were living within the park; their livelihoods were based on pastoralism and the cultivation of olives and barley. At least until recently the park suffered from excessive grazing, timber exploitation, hunting and illegal bushfires. There is also concern over the introduction of exotic animal species and the misuse of hunting firearms and agricultural chemicals. In addition, there is heavy pressure from tourists, with 100,000 visiting the site in 1980, rising to 300,000

in 1985. The park is seen as a key resource for national and international tourism as well as for education and the conservation of wildlife.

The landscape of El Kouf NP includes cliffs and caves. It was projected with the aid of the Arab Centre for the Studies of Arid Zones and Dry Lands (ACSAD). A Secretariat of the State for Marine Resources, established in 1975, gave a high priority to the creation of Marine.

The site covers the northern slopes and plateau of the Jabel Al Akhdar (the Green Mountain), bordering on the Mediterranean. Jabel Al Akhdar is the only naturally forested mountain range of the North African coast between the Gulf of Gabs and Haifa Gulf. The rectangular watershed of El Kouf valley is part of Jabel Al Akhdar Mountain which is of deep layers of limestone rock with carsick caves and cracks (max. altitude 860 m). Wadi El Kouf, with its tributaries, Wadi Beit Saleh and Wadi Sudan, make up the main Jar-Jar Ummah valley which flow its water into the Mediterranean Sea during the rainy season. The Wadi made its paths through many rocky high and narrow valleys. Some valleys are about 200 m long and 25m deep. Moreover, springs are restricted to the coastal area and ground water can be obtained between 100 and 400 m.



© RAC/SPA, Ibrahim BENAMER

Figure 1. Map of Cyrenaica and the location of El Kouf National Park in relation to some of the large cities and locations

Beaches, sand dunes and seasonal wetlands are found on the eastern edge of the coast, a rocky low cliff formation characterizes the western part of the frontage.

The land vegetations in the Park are mainly, *Juniperus phoenicea*, *Pistacia lentiscus*, *Arbutus pavarii*, *Olea europaea*, *Myrtus communis*, and *Quercus coccifera*. In few protected localities, good groves of *Cupressus sempervirens* can be seen. Its Fauna has been considerably reduced by hunting and it includes; *Hyaena hyaena*, *Canis aureas*, *Vulpes vulpes*, *Genetta genetta*, *Felis libyca*, and *Hystrix cristata*. In the marine environment; *Delphinus delphis* and *Tursiops truncatus* have been recorded. Bird species include *Phoenicopterus ruber*, and several birds of prey. Libya, being one of the Mediterranean countries and at the same time occupying a large space of the Mediterranean southern shore (about 2000 km), deserves to have some studies conducted on its significant shores. Several archaeological remains, including Greek and Roman ruins linked to the ancient cities of Apollonia and Cyrene located 40 km east of the Park.

The National Park extends along the country's Mediterranean shore for approximately 20 km (12 miles) of coastline and encompasses beaches, sand dunes and wetland lagoons, whilst also covering a protected area that includes the northern slopes of Jabel Al Akhdar Mountain. As well as providing an ideal protective environment for marine fish and mammals, such as common and bottle-nosed dolphins, the coastal section of the park consists of sandy beaches interspersed with rock outcrops and coastal cliffs. Behind the beach is adherent band of sand dunes which are followed by shallow, seasonal brackish lagoons. The coastal strip and dunes are covered with the grass species *Ammophila arenaria* and *Agropyron junceum* together with scattered shrubs. The woody plants *Limoniastrum monopetalum* and *Tamarix nilotica* are also common on the dunes. Species found on the seasonal mudflats include the halophytes *Suaeda fruticosa* and *Cakile maritima*. The edges of permanent water are lined with *Phragmites*

australis. Wadis up to 200 m deep cut steep-sided gorge into the limestone. The vegetation is mainly dense maquis shrubland, in which *Juniperus phoenicea* is common. The maquis (shrubland biome) grades in places into Garrigue with abundant herbaceous communities. Associated with the juniper are *Cupressus sempervirens*, *Pistacia lentiscus* and *P. atlantica*; along with *Myrtus communis*, *Olea europaea* and *Rhamnus* spp. The vegetation of the rocky slopes includes *Cichorium spinosum*, *Alkanna tinctoria*, *Urginea maritima* and other grass species. *Cupressus sempervirens* grows in the gorges along with *Quercus coccifera* trees up to 10 m high in the more sheltered areas. The shrubs *Smilax aspera*, *Viburnum tinus* and *Pistacia lentiscus* are also common amongst the rocks. There is no permanent water except for small springs by the lagoon of Ain al Shaiqah while the wadis carry water only for short periods following heavy rains, mainly during November to February; annual rainfall is in the range 300 - 700 mm.

In this area there are two Ramsar sites. The first one is Ain Al-zarga (32° 47,955 N 21°27,411 E; Fig. 2) 50 hectares, fed partly by incursions of sea water through channels connecting the site to the sea, but also by springs probably of karstic origin. It is situated in the coastal plain below the limestone plateau of the Jabel Al Akhdar, and unusual in being surrounded not by sand dunes but by limestone formations. The site retains humidity all the year round, but salinity increases in summer due to evaporation. Vegetation on the inland side included extensive fringe of *Tamarix*, with more freshwater-loving plants such as *Juncus*. The RIS also mentioned *Phragmites* sp. and *Ruppia* sp., and notes presence of amphibians (*Rana saharica* and *Bufo viridis*), together with endemic fish and the following molluscs: *Hydrobia acuta*, *Ventrosia ventrosa*, *Cernuella jonica*, *Spondyllus spectrum* and *Cerastoderma glaucum*. Waterbirds included several species of Anseriforms (mainly Shoveler), small numbers of waders (Kentish Plover, Dunlin and Little Stint). Non-waterbirds included a male Hen Harrier, a Short-eared Owl (most unusual) and 40 Crag Martins (Hichem *et. al.* 2005).



Figure 2. Ain Al-zarga

The second is Ain Al shaqiqah (32° 49 N 21°29 E; Fig. 3). It is a coastal lagoon covering a few hundred hectares, very close to the first lagoon. The site fed partly by incursions of sea water through channels, connecting the site to the sea, but also by springs from Jabel Al Akhdar, probably of karstic origin. Ain Al shaqiqah is situated in the coastal plain, below the limestone plateau of the Jabel Al Akhdar, and unusual in

being surrounded not only by sand dunes but also by limestone formations, covered by well-preserved typical vegetation. The area retains humidity in the summer, but salinity increases. Vegetation on the inland side included an extensive *Tamarix* sp. wood growing on flooded soil, and relatively large *Juncus* sp. stands. This site has the similar vegetation, amphibians and molluscs as that from Ain Al-zarga (Hichem *et al.* 2005).



Figure 3. Ain Al-shaqqiqah

1.1. Diversity of El Kouf coast

Thirty one marine algae have been recorded in this coast, most of them are common and live in the rocky habitat except *Caulerpa* sp., *Euspongia zimocea* (Spongiidae) and *Geodia muelleri* (Geodiidae) are founding the area. Different Mollusca species have been found in the coast represented in three classes; Gastropoda is represented by seventeen species, Class Bivalvia is represented by twelve species and the Cephalopods is represented by two species *Octopus vulgaris* and *Sepia officinalis*, the crustaceans is represented by eight species belongs to eight families, and one species of Annelids *Nereis pelagica* (Nereidae) has been recorded and three species belongs to three families of Echinodermata (ACSAD, 1986). Sixteen Lessepsian fish species have been recorded in the eastern part of Libya. Five of them have become commercial (Shakman & Kinzelbach. 2007).

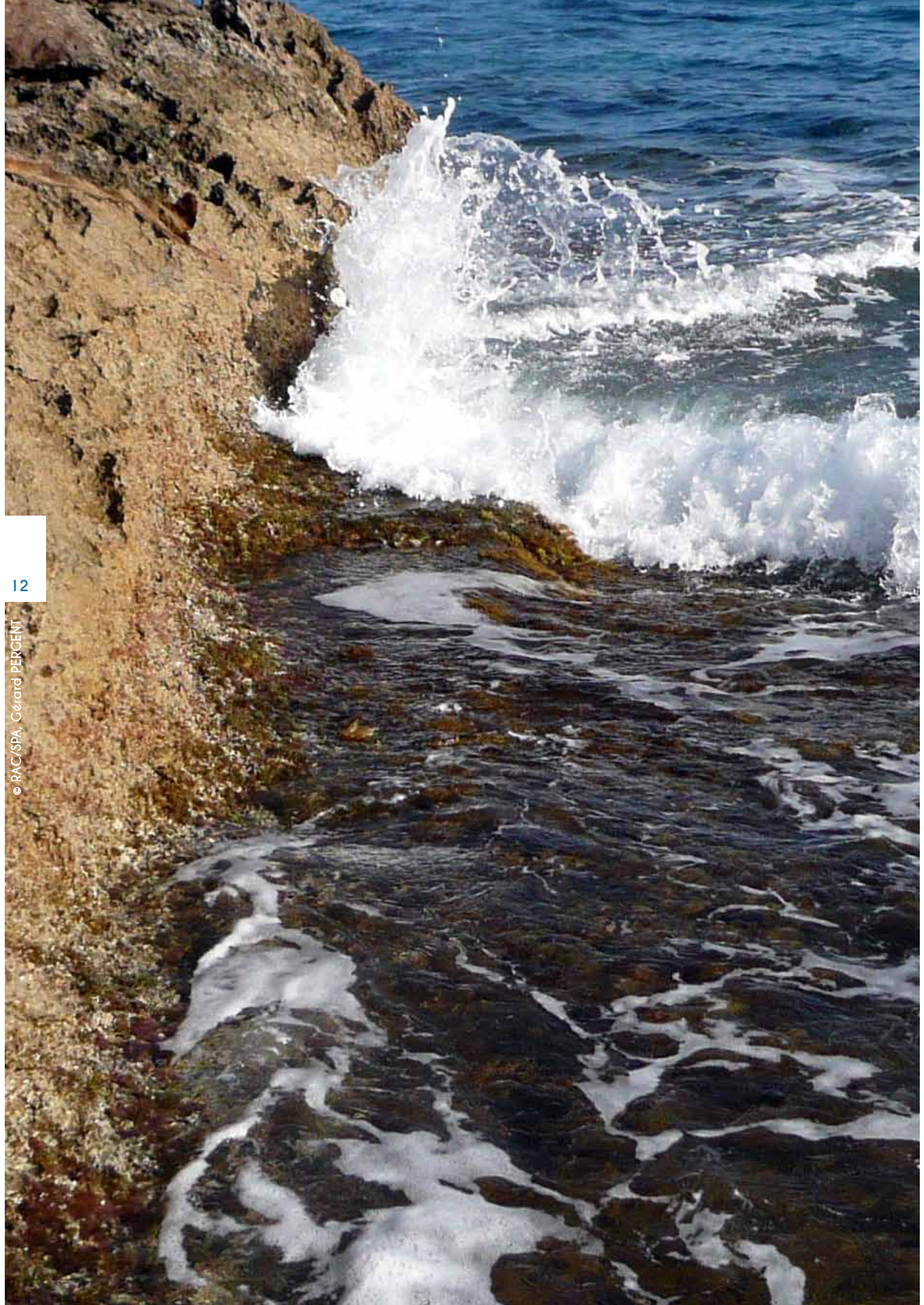
The effectiveness of a protected area depends on a complex set of interactions between biological, economic, and institutional factors. While MPAs might provide protection for critical habitats and cultural heritage sites and, in some cases, conserve biodiversity, as a tool to enhance fishery management and their impact is less certain (James *et al.* 2000).

MPAs could provide «undisturbed» areas creating new opportunities for scientific research and offering a hedge against management errors. Scientists argue that

these areas can be used as controls to monitor and study the recovery of fish populations that will improve estimates of population parameters (e.g., more reliable estimates of growth and natural mortality rates) and stock assessments, which currently rely too heavily on commercial catch data (James *et al.* 2000). A significant body of literature examines the theoretical and empirical biological effects of MPAs on habitats and the productivity of fish stocks (Dugan and Davis 1993; Roberts and Polunin 1991; Carr and Reed 1993).

Social sciences have contributed to a relatively small but steadily growing body of literature that examines the economic and social implications of MPAs (Farrow 1996; Hoagland *et al.* 1995; Milon 2000).

The literature asks under what conditions the conservation gains attributed to MPAs might provide the largest benefit for the smallest cost. To answer this question, fishery managers will need to have a better understanding of how fishermen and other stakeholders choose the location of their fishing grounds and how these choices will be affected by the MPA. In fact, displacement of effort both across the fishing grounds and into other fisheries is arguably a fundamental driver in determining the type and magnitude of the benefits from MPAs. Research into these questions will be helpful in guiding public-and private-sector decision making when it comes to determining the scale, scope, and siting of MPAs (James *et al.* 2000).



2. MATERIALS AND METHODS

Frame survey was conducted along the El Kouf coast in order to investigate the status of landing sites, boats, fishing gears and fishermen. Questionnaires were carefully prepared

and then, filled in by the fishermen who are fishing in this area. The data were analyzed using Microsoft Excel and SPSS software.



3. RESULTS AND DISCUSSION

3.1. Fisheries

A total number of 22 questionnaires were distributed randomly in the study area in two time intervals, May and October. This is because most the seasonal fishing activities take

place during that time due to preferred weather conditions. The questionnaires were mainly targeting fishing boats' owners operating in El Kouf National park area but few were distributed among regular fishermen operating from land and using dynamite for gear (Fig. 4).

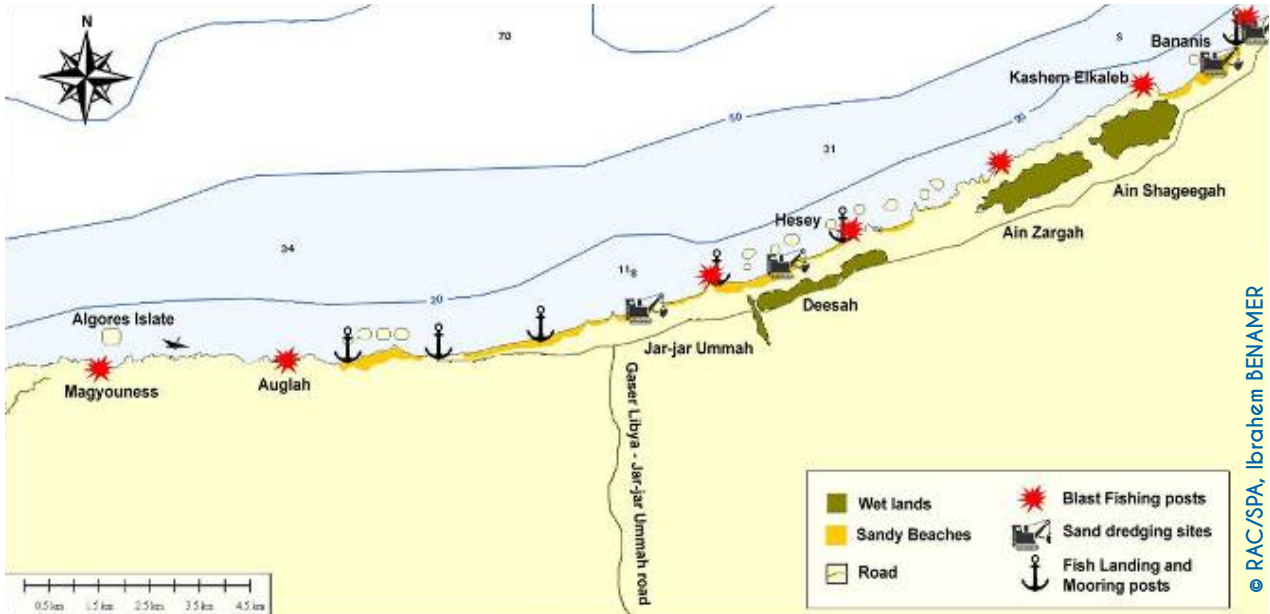


Figure 4. A more detailed map of the National Park area with the locations of every activity

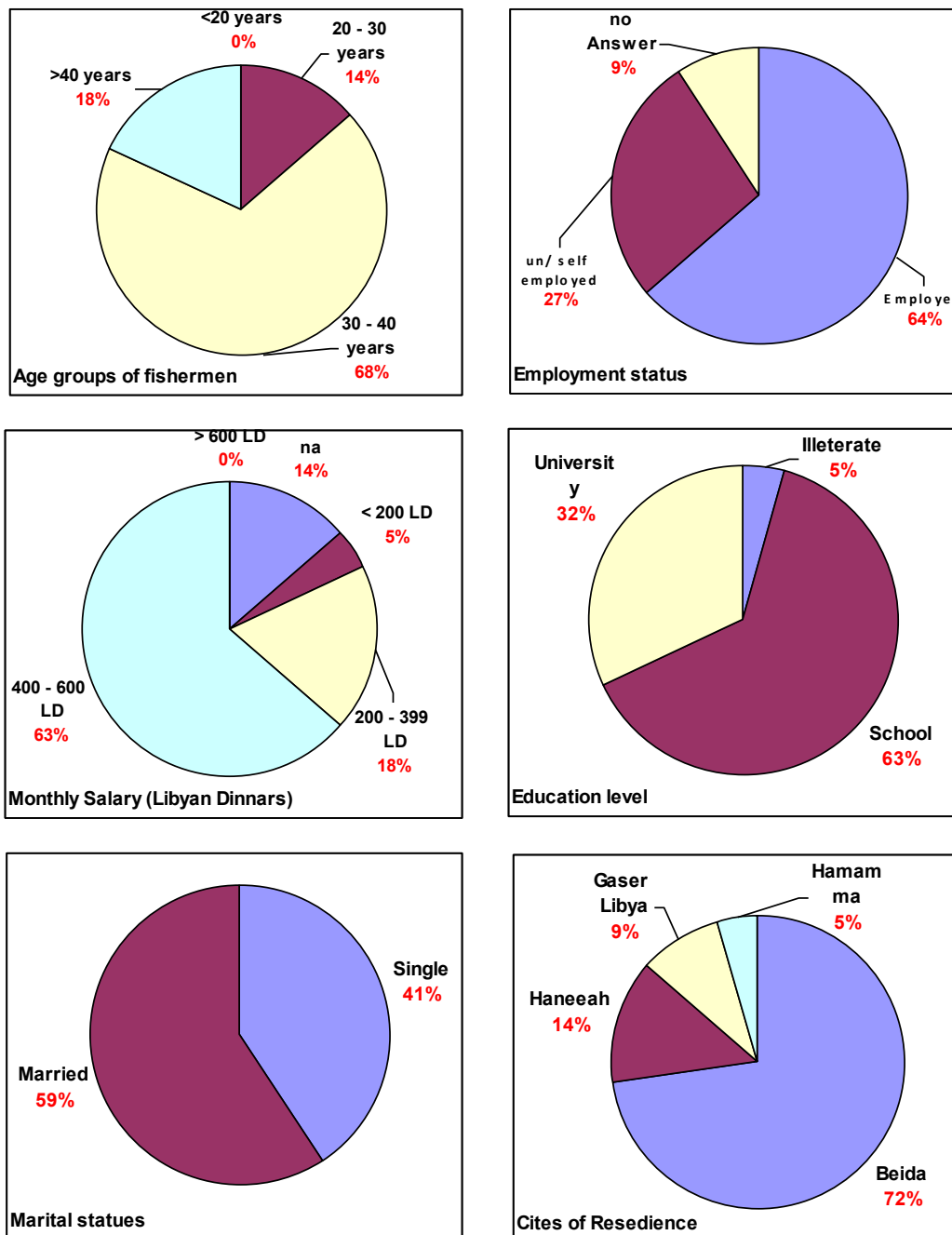
That number of questionnaires might be very small compared to the vast area, however, the results suggest that it is very close to the actual fishing fleet present at the moment and it will be demonstrated later in this chapter. The results are categorised as they appear in the questionnaire as following:

3.1.1. Personal information

The results suggest that among the fishermen who received the questionnaires, most of them fall within the age category of above 30 years of age (86 %) while the youngest ever fishermen recorded during the study was 25 years old. Also, most of the fishermen were at school level education or illiterate, only 32 % of them had higher education of university or high-institute. However, despite the former, almost all of the fishermen have alternative jobs and income

source either through employment in a governmental sector (64 %) or self-employment (27 %). When salaries were investigated, the study shows that most of the local fishermen are on a fixed monthly income ranging from 300 to 600 L.D (equivalent to 180 to 365 Euros, Calculated on the market rate of 1 Euro = 1.65 L.D.).

From the former, it may be concluded that fishing as a craft or a main job may not exist in the area of El Kouf, and only adapted as a second source of income (due to the relatively low salaries given by the government) or as a hobby. Also the level of education and age group suggest that the new generation interest in fishing might be low and insignificant (Fig. 5). Management plans and conservational approaches should take these points in consideration when operating in El Kouf National Park.



© RAC/SPA, Ibrahem BENAMER

Figure 5. The personal details of all the questioned people in the survey

3.1.2. Knowledge and relation to El Kouf National Park

The results from the study suggest that the local community's involvement and knowledge regarding the National Park is very limited. Almost all of the fishermen interviewed (93 %) didn't recognise El Kouf area to be under any protection or conservation, and those who barely recognise it, were referring to the old sea turtles nursery present in Al-Banannes beach. Also information about marine conservation and protected areas is in general misunderstood or very limited, almost 77 % of the interviewed people said that any conservation program in El Kouf will contradict with their activity as fishermen and will have a negative effect on their

income directly. Given the fact that most of the fishermen are married and with large families, this point should be considered carefully to insure the success of the NP policy which should be beneficial (in conserving way) to the local community and the local environment. To support this, 89 % of the answers showed that establishing a marine protected area would not have a benefit to the local economy nor it will increase their income (73 %) despite their believe that it will improve the marine environment condition (66 %).

Based on results from this study and previous approaches to conservation, most of the local community and stakeholders in the area expressed distrust in any governmental approach for conservation.

This is mainly due to the poor implementation of former conservation programs which regularly involve unfulfilled promises of prosperity and profit to the local community. Hence, any future conservation programs an management should gain the trust of the local community by keeping them “in the loop” of events and decisions taking place.

3.1.3. Characteristics of the fishing fleet

More than 70 % of the questioned people owned boats, others either fish from the main land using longlines and other methods or work on fishing boats that they do not own. Also, most of the boats operating in the area are of small recreational scale (31 % are less than four meters, 69 % are four to six meters long) and made either from fibreglass or inflated (known locally as Zodiacs). Since there is no marina or fishing harbour in the region, most boats simply depart and land from scattered points across the coastline without any license or regulation by the government. In the majority of the questionnaire, fishermen expressed the need of a marina or a small fishing harbour in that area, giving that the closer ones to them are in Sousa (a.k.a Apollonia 50 km to the east) and Tolmaitha (a.k.a Ptolemy, 40 km to the west) (Fig 1). However, such demand should be considered carefully by the authorities in the Libyan government. There are pros and cons for constructing such a facility inside the NP. A small fishing harbour may act as a gathering point for the small number – yet scattered – boats operating in the area. This gathering point may also increase regulation control and licence monitoring by the authorities. On the other hand, this act may attract more fishing and non-fishing boats to the area and may act as a hotspot for pollution such as the other fishing boats in the area.

Looking at the fishermen habits and schedules, most fishermen spent an average fishing time of five hours and cross up to ten km in a single fishing trip (day). This might be an indication that fishermen from other coastal regions (outside the protected area) may cross over to fish in the NP. The Bay of Best, the Royal Beach and Al-hammama are all west of the NP zone and they contribute to 52 % of the departed sailing points to fish in the NP vicinity. When the fishermen were asked about the number of fishing boats operating in the protected area, more than two thirds of the questioned answered that there are less than five boats working in the region while the remaining group declared that there are more than that (21 % said 10 boats and 16 % said 20 boats). This result confirms and justifies the small number of questionnaires collected in this study since it was mainly targeting boat owners.

However, there are indications that other (rather larger) wooden boats and trawlers vesting the NP frequently. The origin of these large vessels are either foreign (from Egypt, Tunisia, Italy and even Asia) or from larger neighbouring harbours such as Sousa, Derna and Ptolemy. Another aspect shown by the results is the rather significant increase of fishing activities and the number of fishermen visiting the area, this increase of fishermen took place mainly during the armed conflict period that took place in the country. As demonstrated earlier, most of the people rely on monthly salaries from the government as their main source of income and during that time they had to look for alternative income source. Most of the people living in the nearby urban areas switched to farming and fishing especially when the gear (dynamite) is available (Fig 6) and relatively cheap during the event. Some of these fishermen continued this activity even after the crises when financial matters dip from time to time.



Figure 6. (A) Dynamite fishing charges. Hazardous to assembly even for the most expert users, (B) a modified military-based explosive charge

© Environmental Working Group and Omar Mukhtar University

© Environmental Working Group and Omar Mukhtar University

3.1.4. Fishing gear and fishing grounds

Various fishing gears were found under use in the area; gillnets longlines, spear and dynamite fishing. Most of the fishermen (63 %) are adapting more than one method, and the most frequently used is dynamite fishing (30 %) followed by gillnets and longlines (28 % and 26 %). The provider of the gear is mainly private sector with no distinctive role for the government to monitor or regulate their impacts. The gear cost varies depending on type, gillnets are the highest in cost (estimated to cost 20 % of the final yield) while the lowest is the dynamite (less than 5 %) (Fig 7). When questioned about whether some of these methods are considered illegal and have an impact on the marine environment, 95 % of them show a good knowledge about their impacts (Fig 8) and their danger even for the



Figure 7. A dynamite charge thrown from a boat

fishermen themselves, yet they insist that the lack of other gear in the market is one of the reasons they used these destructive and illegal methods.

As for fishing grounds, the analysis shows that fishermen do not concentrate on certain areas as to be identified as fishing grounds. Gillnets are usually used in areas where rocky, marine vegetation bottoms occurred and at low depth (less than 10 m) while longlines tend to go deeper for fishing (10 to 20 m). On the other hand, dynamite fishing activities showed no relation to bottom formation ($R^2 = 0.135$) nor to change in depth ($R^2 = 0.072$). Again this can be attributed to the targeted fish species, as explained later, most of the targeted species caught in the NP area are pelagic and their distribution and movement is not mainly related to bottom composition or depth.



Figure 8. Destruction underwater, the outcome of an old dynamite charge used on a rocky bottom. In the picture two species of great ecological importance can be seen, the two brown algae *Padina pavonica* and *Cystoseira* sp.

3.1.5. Targeted fish species, seasons and marketing

A total number of 26 targeted species was highlighted by the fishermen; the great majority of these were ichthyofauna (table 1). The ichthyofauna can be divided to pelagic and demersal species. Although there are more demersal species in the fish catch and the market (20 demersal vs. 6 pelagic), the pelagic species have slightly higher percentage of the catch (53 % pelagic vs. 47 %). This is mainly attributed to the market demand and costumers' preference, the local community in the area (although fish consumption is low) prefer pelagic fish such as *Seriola dumerili* and *Trachurus mediterraneus* against demersal fish. In regard to fishing seasons, demersal (mostly non-migratory) species are fished around the year without a distinctive relation to variation in seasons ($R^2 = 0.235$) while

pelagic species seems to have a distinctive seasons in which the fishermen increase their effort and catch. The previously mentioned Amberjack (*S. dumerili*) for example, has two fishing seasons, the juveniles (known locally as Bereemah) are fished mostly in the spring and summer while the adults (known as Shoolah) are fished in the autumn, and both are treated separately in the market with different price. In general most pelagic fish species are targeted in early summer and late autumn, In regard to Barracuda species, there are more than once species found and caught within the NP area, although fishermen can relatively distinguish between them, they are all treated equally in terms of price when sold in the market. The last point that should be mentioned here is that the local markets target very few species of elasmobranchs. Only two species of sharks (*Galeorhinus galeus* and *Lamna nasus*) were mentioned in the questionnaires and were observed in the local market during visits.

Table 1. Fish species caught within El Kouf National Park

N	Family	Species	Occurrence	Pelagic / Demersal	English name	Local name	Frequency	season 1	season 2	Price * LD	Price * Euro
1	Sparidae	<i>Sparus aurata</i>	native	Demersal	Gilthead seabream	قاصوج	7	Spring	Autumn	7	4.24
2	Carangidae	<i>Seriola dumerili</i>	native	Pelagic	Greater amberjack	شولة وبريمة	24	Spring	Autumn	8	4.85
3	Carangidae	<i>Trachurus mediterraneus</i>	native	Pelagic	Mediterranean mackerel	صاورو	15	Autumn		7	4.24
4	Sparidae	<i>Lithognathus mormyrus</i>	native	Demersal	Sand steenbras	مكوس	3	all year		5.75	3.48
5	Sparidae	<i>Spondylosoma cantharus</i>	native	Demersal	Black seabream	تنتون	6	all year		6	3.64
6	Serranidae	<i>Epinephelus marginatus</i>	native	Demersal	Dusky grouper	فروج	6	Autumn	Summer	7	4.24
7	Sparidae	<i>Oblada melanana</i>	native	Demersal	Saddled seabream	كحلة	4	all year		5.5	3.33
8	Fistulariidae	<i>Fistularia commersonii</i>	introduced	Demersal	Bluespotted cornetfish	مشطة	2	all year		3	1.82
9	Balistidae	<i>Balistes capricus</i>	native	Demersal	Grey triggerfish	حلوب	1	Summer	Autumn	5	3.03
10	Sparidae	<i>Dentex dentex</i>	native	Demersal	Common dentex	حمرايا	4	all year		8	4.85
11	Sphyraenidae	<i>Sphyraena</i> sp.	introduced	Pelagic	barracuda	مغزل	8	Autumn	Summer	7.5	4.55
12	Scariidae	<i>Sparisoma cretense</i>	introduced	Demersal	Parrotfish	قرنة	2	all year		2	1.21
13	Sparidae	<i>Sarpa salpa</i>	native	Demersal	Salema	شبة	2	all year		4	2.42
14	Mugilidae	<i>Mugil cephalus</i>	native	Pelagic	Flathead grey mullet	بورى	4	all year		5.5	3.33
15	Siganidae	<i>Siganus luridus</i>	introduced	Demersal	Dusky spinefoot	بطاطا	3	all year		4	2.42

N	Family	Species	Occurrence	Pelagic / Demersal	English name	Local name	Frequency	season 1	season 2	Price * LD	Price * Euro
16	Serranidae	<i>Epinephelus costae</i>	native	Demersal	Goldblotch grouper	ماني	4	Summer	Autumn	6	3.64
17	Mullidae	<i>Mullus surmuletus</i>	native	Demersal	Surmullet	ترييا	2	all year		6	3.64
18	Sparidae	<i>Diplodus</i> sp.	native	Demersal	Annular seabream	قراقوز	8	all year		7	4.24
19	Sparidae	<i>Pagrus pagrus</i>	native	Demersal	Red porgy	مرجان	5	all year		7.5	4.55
20	Scombridae	<i>Auxis rochei rochei</i>	native	Pelagic	Bullet tuna	بلاييط	6	Autumn	Summer	6.5	3.94
21	Scombridae	<i>Euthynnus alletteratus</i>	native	Pelagic	Little tunny	رزام	2	Autumn	Spring	6.5	3.94
22	Moronidae	<i>Dicentrarchus labrax</i>	native	Demersal	European seabass	قاروص	2	all year		6	3.64
23	Scorpaenidae	<i>Scorpius</i> sp.	native	Demersal	Scorpion Fish	العقرب	2	all year		4	2.42
24	Labridae	<i>Thalassoma poma</i>	native	Demersal	Parrot Wrasse	عروس بحر	3	all year		3.5	2.12
25	Labridae	<i>Labrus</i> sp.	native	Demersal	Wrasse	خضارية	4	all year		4	2.42
26	Triakidae	<i>Galeorhinus galeus</i>	native	Demersal	Tope Shark	كلب بحر	3	Spring	Summer	6	3.64
28	Lamnidae	<i>Lamna nasus</i>	native	Pelagic	Porpeagle	زرقايا	6	Spring	Summer	5	3.03

3.1.6. Other information

Few remarks were highlighted in this group of questions. Among these was the prospective of fishermen towards other activities taking place in the NP area. Most fishermen expressed strong negative attitude towards trawlers and trawling activities taking place in the area. This is mostly because the trawlers visiting the region are either of foreign origin or from far ports. Fishermen who use gillnets and dynamite have a mild negative attitude toward recreational diving and snorkelling in the area, simply because it would be hard for them to use their gear in the presence of others, and longline fishermen also presented a negative attitude toward dynamite fishing saying that the noise drive the fish away from the fishing area.

3.2. Birds hunting

The same approach was adapted by the team to assess the impact of birds hunting within the NP. The area of El Kouf holds a significant land features used as foraging, resting and roosting sites to resident and migratory birds, such as the seasonal wetlands that attract various wader and aquatic species. Other areas of interest (rather than the aforementioned wetlands) are the coastal capes protruding in the sea which the hunters used as posts to shoot passing migrating birds. Questionnaires were distributed mainly in two period, the first is from March to May and the second from September to November in 2012, mainly because these period coincide with the crossing migration between Europe and Africa. During this time, most hunters will build up tents around key hunting grounds and stay for long periods there. The key areas within the NP identified as wetlands are; Ain Al-shaqiqah, Ain Al-zarga, Deesa (Fig. 2). The results of the questionnaires can again be categorised as following:

3.2.1. Personal Information

The personal information extracted from the questionnaires (education level, age, marital status, etc) seemed to follow the same pattern as that of the fishermen. The hunters

interviewed in the two periods were; mostly employed in governmental sectors (90 %), with salaries ranging from 400 to 700 L.D. (180 - 400 Euro), in age group between 30 to 45 with complete absence to hunters aged under 30, mostly with education levels before universities (83.6 %) and all were married. Most of them (78 %) are from the near city of El-Beida and the nearby villages (fig. 3), while the rest are from other large cities close by such as Benghazi (6 %), Marj (9 %) and Tobruk (7 %). this might give an indication of the interaction between the hunters from all of Cyrenaica who moves between the wetlands of Tobruk (where the Ain-Gazala MPA is located) to El Kouf NP, some of the hunters go as far as 750 km to Tazerbo to the south (near Kufra Oasis) searching for game. On the other hand, only a minor percentage (1.3 %) of the questioned hunters were actually resident within El Kouf NP borders and were mainly from Al-Hanya village.

3.2.2 Hunting seasons and hunting trips

All of the interviewed hunters said that they consider their hunting activity to be a hobby, 36 % of the them hunt all the year around with no preference to any season while the rest (64 %) hunt mostly in late summer and autumn. Those hunters sometimes collaborate and share the space with dynamite fishermen who use the same capes for fishing (the high posts enables the fishermen to spot approaching fish shoals. In few cases, dynamite charges (for blast fishing) were sighted inside the bird hunters' tents and the interaction of the two activities seemed far from competition (Fig. 9), this point should be highlighted for any management plan to target both activities at the same time and to consider that most of the fishermen could switch to birds hunting if the first is regulated or banned. In terms of daily schedule, hunters living nearby usually visit the hunting grounds during weekends with an average four hours a day spent in hunting (nine hours a week). On the other hand, hunters coming from distant areas tend to camp during hunting seasons for several weeks (up to two months in some cases). During that time, one can find falcon capturers, fishermen and bird hunters occupying the same tent.



© Environmental Working Group and Omar Mukhtar University

Figure 9. Remains of a dynamite fishing and bird hunting posts. The space can be used by both to spot approaching fish shoals or bird flocks.

3.2.3. Hunting gear and targeted species

All hunters used shell guns (Fig. 10) which are bought (along with the ammunition) from the private sector, this is despite the Ban Law that was issued during the 1990's which prohibit carrying, using or selling hunting rifles and shot guns. During the survey, the most encountered brands are the semi-automatic five shells capacity and the Turkish double-barrelled guns. Their prices vary from 500 to 3000 L.D (350 to 1900 Euro) depending on condition and brand. The most used calibre of shells was Five (39 %) and Six (37 %) and they are bought at a black-market price of two – three L.D. per shell, and they are mostly of Mediterranean countries made. The hunters also complained about the high price and availability issues.

The results from the questionnaire also show a total number of 19 bird species targeted by shot gun hunters. Most of these are of water and wader birds, the species were hard to identify in some cases because the hunters avoid showing their hunt (Fig. 11). However, key species highlighted in the list and are targeted in the NP including: Greater Flamingo (*Phoenicopterus roseus*), Glossy Ibis (*Plegadis falcinellus*), Great Cormorant (*Phalacrocorax carbo*), Grey Heron (*Ardea cinerea*), Gadwall (*Anas strepera*), Northern Shoveller (*Anas clypeata*), Moorhen (*Gallinula chloropus*), Common Coot (*Fulica atra*), Eurasian Curlew (*Numenius arquata*), Greylag Goose (*Anser anser*), Pintail (*Anas acuta*), Blue-winged Teal (*Anas discors*). Other terrestrial birds including: common Starling (*Sturnus vulgaris*), European Turtledove (*Streptopelia turtur*) and Barbary partridge (*Alectoris barbara*).



Figure 10. Local hunters found within El Kouf National Park



Figure 11. Remains of birds found after the hunters moved out. Anseriforms and Pelecaniformes can be seen among the remains.

Although the picture was taken outside the NP borders, but similar scenes were recorded within El Kouf.

3.2.4. El Kouf national park and conservation efforts

When asked about possible impacts of hunting on the bird's populations, the answers varied between those who believed that the number of hunters had increased lately and that the numbers of birds had dropped in consequence in the last five/seven years (73 % of the hunters). The other group (24 %) argued that the drought and the seasonal variations may have a higher effect than the hunting activity. The late and irregular rainfall rates had affected the wetlands formation. Hence, "it has altered the birds' behaviour to find other migration routes or spend less time in the previously known areas". This statement should be investigated thoroughly in a separate survey to see if it is valid and does take place in the NP wetlands. The hunters also showed neither knowledge of existing protected areas in the region nor any conservation programs except of the previously mentioned turtles' nursery. When asked about a possible establishment of bird conservation program in the area both refusing and accepting answers were aroused. There seems to be a pattern given by the hunters living close to the NP area who wish the program to be adapted to regulate the increasing number of outsider hunters coming from other far regions (like Tobruk). While others, argued that such program will make them "lose their hobby" and prevent them from accessing the area completely (an experience they lived during the old El Kouf NP program). Some of the ideas suggested by the hunters to help regulate the hunting activity were:

- Re-establish the old hunting associations from the 1960's and 1970's ;
- Arrange for a (breeding in captivity) program to some of the non-migratory game species to increase their numbers such as the Barbary Partridge (*A. barbara*), the Common Quail (*Coturnix coturnix*) and the Houbara Bustard (*Chlamydotis undulata*). This step would reduce the pressure on some of the migratory birds visiting the area and help maintain the population numbers of the mentioned terrestrial birds ;



© RAC/SPA, Ibrahim BENAMER

Figure 12. Sand dredging site, the removal of the sand material is so deep that the under layer of clay is revealed

- Arrange for public awareness campaigns so that people would know more about the NP and its role and to use a religious approach to show the impact of over hunting ;
- Include the local community in the NP management and decision making to give them confidence in the NP goals and secure their cooperation ;
- Regulate the black market wares since some of the ammunitions and rifles were poorly made and accidents harming the hunters happened frequently.

3.3. Sand Dredging (Removing sand material from the Beaches)

The removal of sand material from the beaches and the sand dunes on the coastline is considered one of the main issues to the marine and costal environment within El Kouf NP (Fig. 12). This stage of the survey was the most sensitive part of the study since there was little cooperation from the people running the dredging operations, in several occasions, efforts for collecting data ended up in confrontations.

Hence, remote and distance approaches had to be adapted to get preliminary results to address the issue. Random hours of observation were adapted to count the number of sand carrying vehicles interring the larger city of El-Beida where most demand of sand material is (Fig. 13). A group of graduate students from the local Omar Mkhtar University aided in this effort as part of their graduation project. The group made a total effort of 55 hours during two months period and counted up to 286 trucks carrying sand to El-Beida. An average truck cargo is 12 tons which may indicate that more than 600 tons of sand was removed in the two months period. However, caution should be adapted when interpreting these results since it is subject to market demand and may vary between seasons and availability. Also it appears that the most affected beaches are those closer to the main road for the ease of operations.



© RAC/SPA, Ibrahim BENAMER

Figure 13. Sand dredging operations with heavy machinery. A truck shown in the picture is loading up sand to be carried to nearby urban areas

A frequent visits to the dredged sites showed that at least four large beaches within the NP borders under dredging operations, these are (from east to west) (Fig. 4):

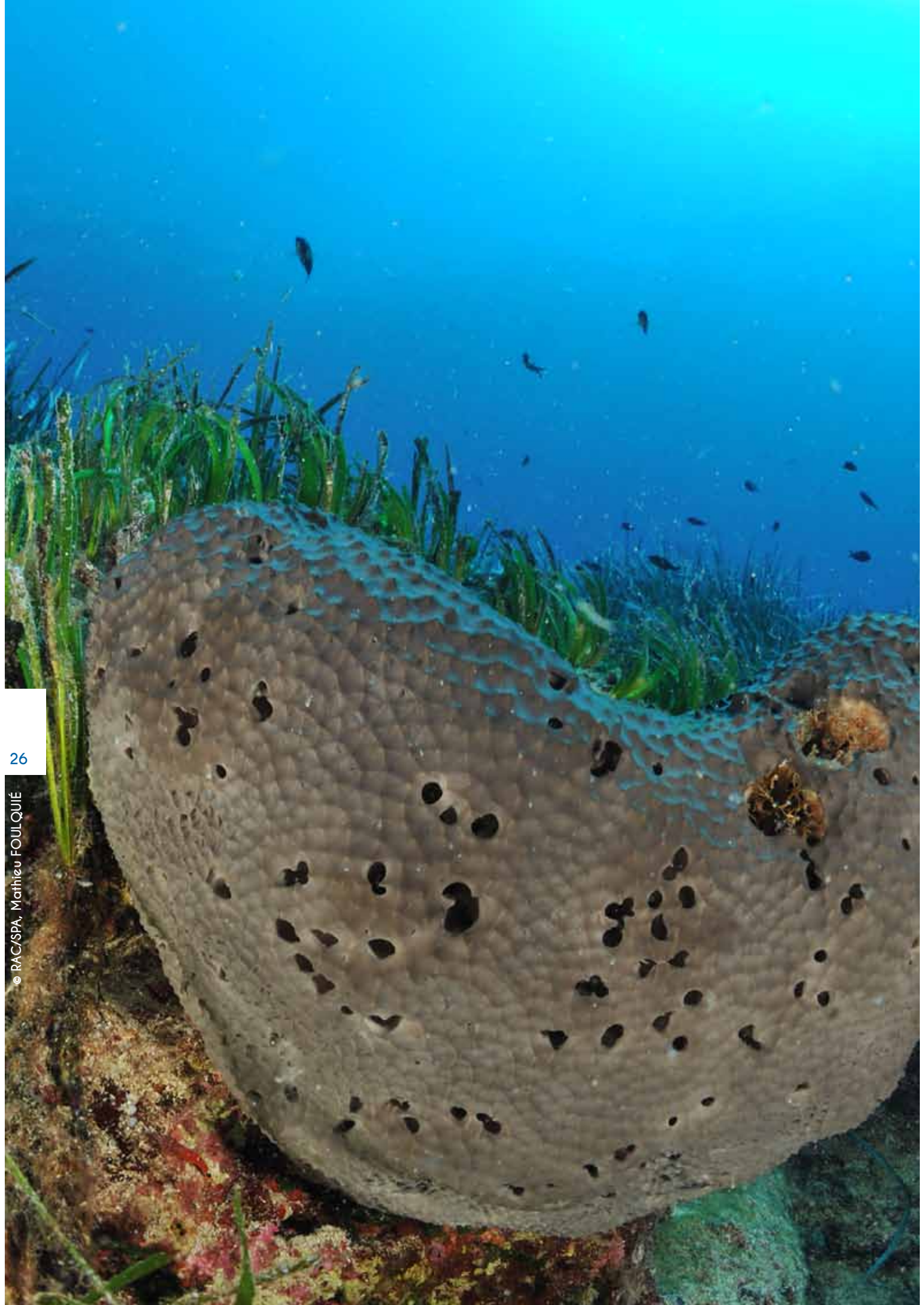
1. Bananess beach: lay at the eastern boarder of the NP and considered one of the most important nesting sites for sea turtles in the region, the beach has been heavily dredged with at least five dredging trucks operating in this beach alone.
2. Goot Al-dees beach: only minor dredging operations take place in this beach, the main reason may be related to the long distance between the beach and the main road. During the observation and field visits to the beach, no dredging operations were recorded or noticed despite the presence of compiled sand ready to be transported.
3. Jar-Jar Ummah beach: Lies at the mouth of El Kouf valley, the beach is close to the main road but still far from large urban areas. Some dredging activities are taking place at the two (east and west) ends of the beach with two dredging trucks present at all time.

Another approach which may be adapted in the future to monitor the effect, impact and progress of this operation is through comparing high resolution satellite images of the National Park costal area.

3.4. Unregulated urbanising of the coastline in El Kouf area:

This might be one of the lesser concerns to the NP borders for the time being; although there is future possibility that new urban construction would take place but at the moment, the small village of Al-Hanya is the only concentrated urban area within the NP costal borders. Scattered farm houses can also be seen within the NP but they have minor impact on the marine environment being located far from the shoreline. Giving that, only minor swage pollution can be seen in relation to the marine environment and it is coming from Al-Hanya village. The sewage of the village is dumped in the sea directly without any treatment despite the presence of a non-operational sewage treatment facility.



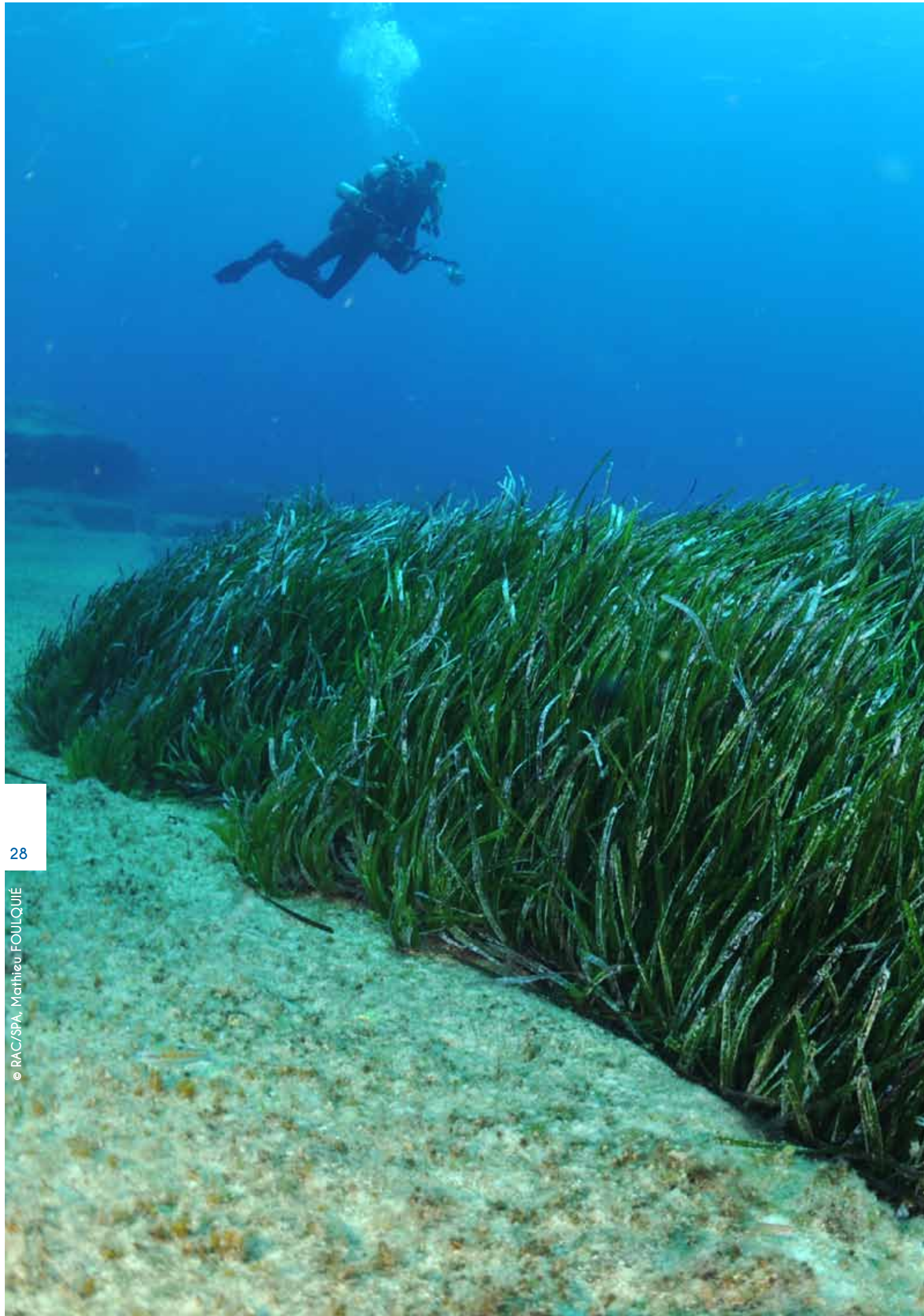


4. CONCLUSION AND FINAL REMARKS

1. This study concentrated mainly on two aspects which were found to be the main stakeholders (or activities) operating within El Kouf region and in relation to the marine environment. These are fishing and sand dredging
2. Although previous actions were adapted to regulate these activities, these attempts had little effect on reducing these them and usually the ban on certain practice would last for few months before they return.
3. A better solution for these environmental issues would be to find an alternative source. For instance a subsidized environmentally friendly gear for fishing would gradually replace the dynamite fishing especially when enforced with intensive public campaigns. A well-managed aquaculture program in the area will not only reduce the fishing, but will also be a source of income to the village and will secure many jobs. However, this approach should be considered cautiously since poor management to such facilities should affect the marine environment negatively and severely.
4. The possibility of establishing terrestrial queries or grinders to ensure the supply of sand to the local market would effectively reduce/eradicate the sand dredging operations from the coastal area. This is especially when presented in better quality (contain less salt and sea water which is damaging to the concrete mixture) and lower price. A separate study with a more geological/engineering approach should be adapted to locate suitable quarries. Another possible (though more expensive) approach can be done via the government subsidising sand dredging operation in the southern desert regions of Cyrenaica. A reduced fuel price and certain benefits to dredging operations in the desert would attract another competional, clean and lower priced sand for the market demand.
5. For bird hunting, the return of the hunting clubs and association could play a major role in regulating hunting seasons, supply certain guns and ammunition which may be less harmful to certain bird species. The club could also be a gathering point where public awareness lectures, tutorials and other activities take place. The use of “religious” approach for conservation was highlighted in few questionnaires to be used to reason with the hunters in public awareness campaigns.
6. A general trend appeared from interviewing all of the stakeholders in the area; it is that most of them are in age above 25 years old and married. Most have a second source of income which is salaries from working in the governmental public sector. The lack of internet and information technology in the area might be one of the reasons their knowledge regarding conservation is limited. This should be the highest priority of the upcoming stages when dealing with the local community.

Acknowledgment:

The research team would like sincerely to thank Jaber Yahia from the Environmental General Authorities, Emssaed Boflega (Omar Mukhtar University) for their help and support. They contributed substantially to this work during the field survey and afterward. We also like to acknowledge the role played by the fourth year students of OMU namely A. Ahmad and L. Marwan, their help in the sand dredging stage was vital and essential to this report. We also like to thank Ghema Herendez for reviewing and proof reading the manuscript.



REFERENCES

- Carr, M.H. and D.C. Reed. 1993. Conceptual Issues Relevant to Marine Refuges: Examples from Temperate Reef Fish. *Canadian Journal of Fisheries and Aquatic Science* 50: 2019- 2028.
- Dugan, J.E., and G.E. Davis. 1993. Applications of Marine Refugia to Coastal Fisheries Management. *Canadian Journal of Fisheries and Aquatic Sciences* 50: 2019 - 2042.
- Farrow, S. 1996. Marine Protected Areas: Emerging Economics. *Marine Policy* 20, no. 6:439 - 446.
- Hichem A., Nicola B., Pierre D., Habib D., Essghaier M., Etayab K., Hamza A., Smart M., 2005. Report on an ornithological survey in Libya from 3 – 17 January 2005. EGA – RAC/SPA – AEWA.
- Hoagland, P., and Yashiaki, K. and J.M. Broadus. 1995. «A Methodology Review of Net Benefit Evaluation for Marine Reserves.» *Environmental Economics Series* No. 027. Washington D.C.: World Bank.
- James N. Sanchirico, K. Cochran, and Peter M. 2002 Marine Protected Areas: Economic and Social Implications. Resources for the Future 2 - 26.
- Milon, J.W. 2000. Pastures, Fences, Tragedies and Marine Reserves. *Bulletin of Marine Science*. 66(3): 901-916.
- Roberts, C.M., and N.V.C. Polunin. 1991. Are Marine Reserves Effective in Management of Reef Fisheries? *Reviews in Fish Biology and Fisheries* 1: 65-91.
- Shakman E. & Kinzelbach R. 2007. Distribution and characterization of Lessepsian migrant fishes along the coast of Libya. *Acta Ichthyologica et Piscatoria*. 37 (1): 7–15.

**Regional Activity Centre
for Specially Protected Areas (RAC/SPA)**

Boulevard du Leader Yasser Arafat
B.P. 337 - 1080 Tunis Cedex - TUNISIA
Tel. : +216 71 206 649 / 485 / 851
Fax : +216 71 206 490
e-mail : car-asp@rac-spa.org
www.rac-spa.org