The Program on conservation of Marine Turtles

nesting at Three Sites West of Sirte, Libya

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Summery

From July 12th till September 24th 2005, A program for marine turtle nesting conservation was conducted at three nesting beaches west of Sirte, Libya; in cooperation between EGA and MBRC with support of RAC/SPA-MAPUNEP.

73 loggerhead sea turtle Caretta caretta nests were protected both via insitu protection (n=16, 22%) and through translocation into two separate hatcheries (n=57, 78 %) due to high canine predation and illegal poaching (29.10 and 12.5% respectively). All nesting activity reported was done by Loggerheads. Track density was 13.58 tracks/km (n=77, beach length 5.67 km, Site 1: Al-Ghbeba beach); 17.7 tracks/km (n=63, beach length 3.56 km, Site 2: The thirtieth beach) and 6.3 tracks/km (n=36, beach length 5.72km, Site 3: The fortieth beach). Mean hatching rates were varied between translocated nests and insitu protected nests: 69.8 % and 89.4% respectively at site 1; 85.1 and 95.9% at site 2, whilst at site 3, the mean hatching rates were 74.2 % and no insitu protection was applied.

A total of 3179 hatchlings were successfully released to the Mediterranean Sea. Measurements for four stranded loggerheads (CCL 60, 61, 63, 72 cm) and potential causes of mortality were discussed.

The program was set-up and achieved for the first time in Libya to protect marine turtle nests at selected sites for the whole nesting season, in implementation of national and regional Action plans for conservation of marine turtles adopted by MAP, in addition to the recommendations of past surveys (1995-1997-1998).

The program also targeted training of national biologists and 35 Libyan scout volunteers. The program was a main news line at the local radios and press of Sirte, Misurata and Libyan TV presented for interviews with team members throughout the program period. A final seminar was organized on October, 2nd 2005, to present the results to the local authorities.

1. Introduction:

Two species of marine turtles are nesting in the Mediterranean, the Loggerhead *Caretta caretta* and the green *Chelonia mydas*. main nesting grounds for the loggerheads are Greece, Turkey, Cyprus and Libya (Margaritoulis et al., 2003; Canbolat, 2004; Broderick et al., 2002; Laurent et al., 1997 & 1999). The green turtles are exclusively nesting in the eastern basin of the Mediterranean, i.e. Cyprus and Turkey (Canbolat, 2004; Kasparek et al. 2001; Broderick et al., 2002) .

Information on turtle nesting activity in Libya dated back to late seventies; several researchers have reported tracks of Loggerhead marine turtles on the coasts of Kouf National park (Herbert, 1979; Armsby; 1980; Schleich, 1987). After the adoption of the regional Action Plan for conservation of Marine Turtle in the Mediterranean, the whole Libyan coast were surveyed using single prospecting to identify important nesting beaches and nesting density, from the Egyptian border to Sirte (Laurent et al, 1997); from Sirte to Misuratah (Hadoud & El Gomati, 1996); and from Misuratah to the Tunisian border (Laurent et al, 1999).

The main conclusions of these surveys were: Loggerheads are the only nesting species; the pristine status of Libyan coasts and low human activities may make Libya hosting the largest numbers of nesting females in the Mediterranean. However the findings of the mentioned surveys (regardless it's great importance) were based on single prospecting, without continuous monitoring, therefore it couldn't reflect the actual size of nesting turtle population.

Following the recommendations and priorities set by the earlier surveys, the actions listed at the MAP regional Action for conservation of marine turtles in the Mediterranean (UNEP-MAP-RAC/SPA, 2001), the guidelines of the National Action Plan for conservation of marine turtles and their habitats (Hamza, 2003) elaborated through SAPBIO national report (Howege and Hamza, 2002), The Environment General Authority (EGA) in cooperation with Marine Biology Research Centre (MBRC) and volunteers from the General Movement for Libyan Scouts (GMLS), has conducted a program for assessment nesting activity and conservation of loggerhead marine turtles (the only yet nesting species in Libya) at three nesting beaches located west of Sirte city on the middle region of Libya.

The program was supported by the Regional Activity Centre for Specially protected Areas (UNEP-MAP-RAC/SPA).

The present report presents the results of the first ever continuous nesting conservation activity in Libya.

2. Program Goals:

1. Identifying marine turtle species occurs in the study area.
2. Reporting nesting activity for a whole season at selected beaches.
3. Identifying predators and assessing its impacts on adult, eggs and hatchlings.
4. Capacity building for Libyan conservationists and raising public awareness.
5. Identifying pollution types, sources and its potential effect on marine turtle nesting.

3.0. Materials and Methods:

3.1. Study Area

3.1.1. Beach selection, camping and dates:

Three beaches were selected by preliminary surveys conducted in 18-19 June and in 12-13 July 2005 by the research team. Scout Camps composed of two tents were set-up at both Al Gbeba and the Thirtieth beaches. The whole program duration was from July 14th till September 25th .2005.

3.1.2. Training of participant volunteers:

training was provided by team researchers to participants from EGA and MBRC during the preliminary surveys and roundtable lectures held in Sirte and Tripoli. Training of volunteers from GMLS was provided by a lecture with audiovisual aids (PowerPoint and video film on 1996 survey) on July 14th 2005. While the rest field techniques and surveying skills were provided to all participants during the field work.

3.1.3. Beach prospecting method:

All beaches were prospected by foot, mostly on daily basis, except the fortieth beach was visited for only eight times between July 24th and September 7th 2005. Beach prospecting was carried out by one supervising researcher, along with one assistant and three volunteers, who were acquiring insitu training for one week, followed by a new group take the lead after receiving all information collected during the passed week, at standardized forms.

3.2. Description of selected beaches:

The selected nesting beaches situated at the western part of the Gulf of Sirte, one of the last thirteen natural areas for marine biodiversity in the Mediterranean in urgent need for protection (Ciriaco et al., 2000).

Three beaches were selected, according to beach topography, nesting density and good accessibility.

3.2.1. Al Gbeba Beach:

Located 20 km west of Sirte (31°13 098'N - 16°23 123'E and 31°13.427'N - 16°19.862'E). 5.67 km in length, narrow beach (50-100 m wide), sand is gradually increases in elevation up to 3 meters above sea level at the sand dune area, the separate the beach from a long dry marsh area (Sebkha), flooded in winter. Plant cover do not exceed 25% composed of sand dune plant communities mixed with small shrubs, then an area of salt tolerant plant communities (Salicornium and Arthrocnenum sp.) dominates the Sebkha zone. The beach is used for recreation by local bathers. All 5.67km were surveyed.

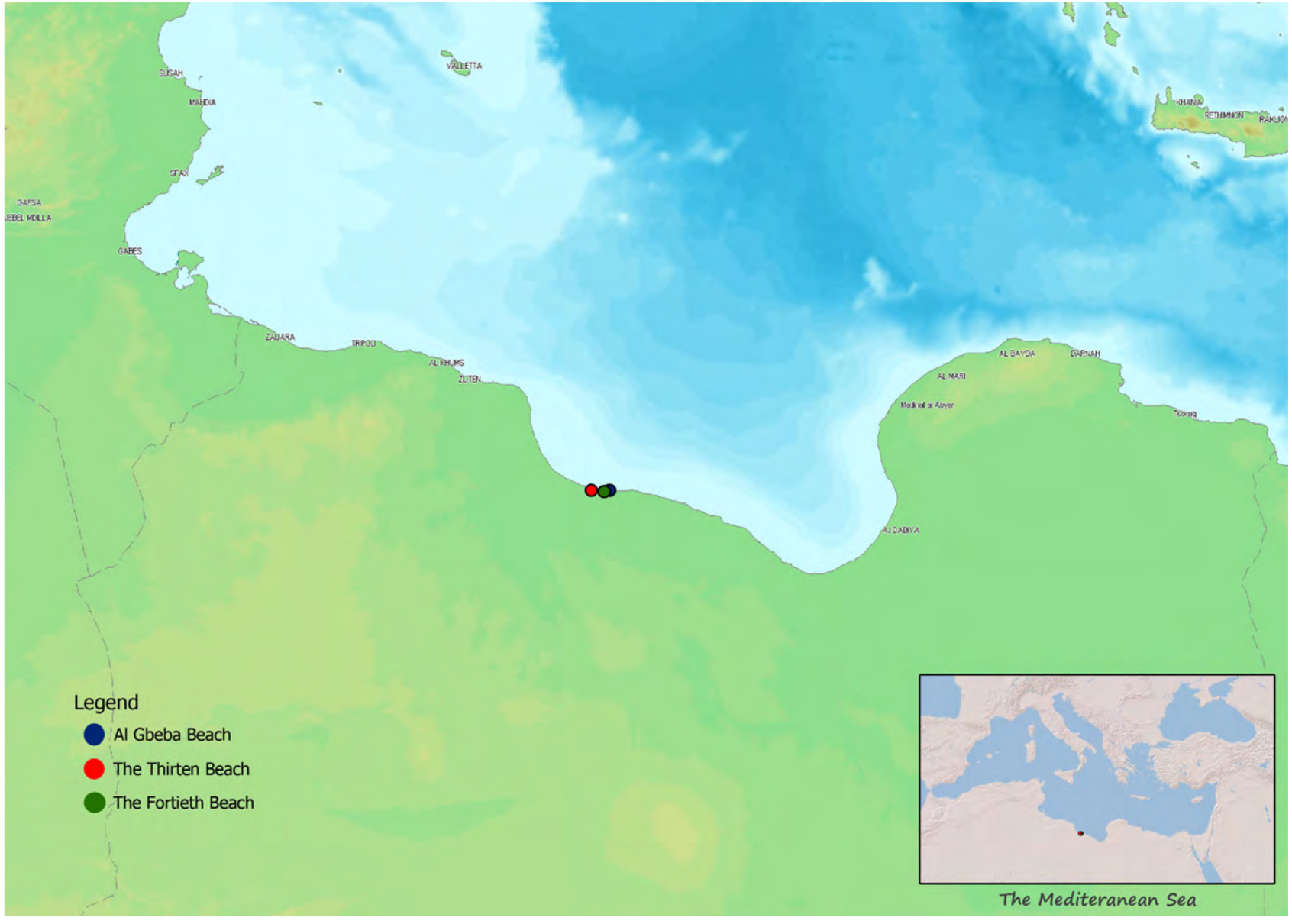
3.2.2. The Thirtieth beach:

Located about 28 km (31°13 429'N - 16°19 860'E and 31°13.666'N - 16°19.473'E), it is separated from Al Gbeba site with 200m of rocky beach (called locally Gharnata beach). Beach length 3.65 km, moderate in width (100-200m). Some parts of this beach are 4m higher than sea level. The middle area of this beach is used by local inhabitants for recreational bathing, especially in weekends. A small landing site with few boats also present. The western edge of the site is hinder with the human activities of the thirtieth village (i.e. bathing, grazing and some waste dispose). All 3.65 km were surveyed.

3.2.3. The Fortieth beach:

located at the 35 km west of Sirte (31°13 429'N ¬16°19 860'E and 31°13.666'N -16°19.473'E). Beach total length is 5.72km, width 150-300 m, with less shrubs and notably denser sand-dune plant communities, possibly due to lower human activities compared to the other two sites. Behind the dunes an area of marsh land, with its typical plant communities of Arthrocnenum/ Salicornium sp.

Accumulation of dead *Posidonia oceanica*/ *Cymodocea nodosa* leaves were observed at each of the three beaches, however, some of these accumulations were permanent whilst smaller ones were temporally formed and washed away by waves.



3.3. Classification of nesting signs:

Based on shape of the track, left by front and hind turtle flippers, nesting signs were classified according to the method used in Laurent et al., 1999, as the following:

Crawl Tracks:

- U-shape Crawl Track (UCT): crawl track without any digging attempt.
- False Crawl Track (FCT): crawl track with one or more digging attempts, without egg deposition.
- Nesting Crawl Track (NCT): crawl track leading to a nest.
- Crawl Track (CT): old crawl track that no means of classification is available.

Nests:

• Nest (N): Nest without crawl track, either opened by predator or a poacher or remained in natural condition.

3.4. Data collection:

At each beach, all types of crawl tracks and nest, were recorded at a previously prepared data forms; these data include: Date, time, beach name, track type, track coordinates (using Garmin e-Trex GPS), measurements for track width (to nearest cm), track distant point from seashore nest depths (total depth and depth from surface till upper egg group), Using 50m measuring tape; nest serial number, nest condition (natural, poached or predated), protection method (insitu protection or translocation to hatchery), , Clutch size, number of viable eggs (Total eggs minus unfertilised and broken); expected hatching date, Actual hatch date, total hatched eggs (from counting egg shells), total dead in egg, dead in nest, Early and late embryonic stages and notes on stranding and dead turtles; carapace measurements, hatchlings and embryo tissue samples were collected for a genetic study.

Nests were identified by main researcher, afterwards with participation of volunteers. Beach patrolling was conducted according to guidelines listed in (Demetropoulis and Hadjichristophorou, 1998).

3.5. Nest translocation:

Due to high poaching and natural predation levels, marine turtle nests were transferred using plastic containers (vol. 10 L), into fenced areas "Hatcheries" were set-up at Al Gbeba and the Thirtieth beaches. They made of 5 cm size metal mesh, on an area of about 100m2, and 15m away of seashore to avoid inundation.

After translocation, each nest was further protected with square metal screen (dimensions 50x50 cm), and labelled with information on clutch size, deposition date and expected hatching date.

4. Results:

4.1. Turtle species observed:

According Based on track asymmetrical arrangement, only the Loggerhead turtles have been observed during the present study, however the other species (green turtle) are frequently reported by fishermen, particularly at the end of nesting season, which in confirms studies on post nesting movements tracked by satellite telemetry (Godley et al., 2002).

4.2. Egg predation and poaching:

levels of nest predation in Libya by foxes, dogs and Jackals are high (44.8% during 1995 survey; and 45.4% during 1998 survey; see Laurent et al., 1997 and 1999).

During this study we found that 29.1% of nests at the three beaches were attacked by either foxes and dogs. No Jackals were observed in the area. A new record of reptile a new record of Varanus sp predation on eggs was reported at Al Gbeba beach. Ghost Crab also represents another active nocturnal predator, on both eggs and hatchlings; holes used by this species have been observed at different densities in the three beaches. No attempt was made to quantify density distribution and predation effect of the species.

Poaching of turtle nests was noticied from signs of poaching on old nests, this continued during the first period of the program, but afterwards it was obviously decreased, probably because of the continuous beach patrolling activities by team members and the announcement by local media that the three beaches are marine turtle protected zones, particularly during nesting season. Mean percentage of poached nests were 12.5%. (See table 1, Annex I for details).

4.3. Stranding marine turtles:

Four Loggerhead turtles were observed stranded. Two turtles at each in Al Gbeba beach and the Fortieth beach. Mortality cause as fishing longline in three turtles and no clear cause has been identified for the fourth one (See Table 2, Annex I).

4.4. Nesting activity:

From track records, the peak nesting activity was reported in July with 166 tracks (69% of total tracks), followed by August with 63 tracks (26%), and the nesting season ends during the first half of September, with only 13 tracks (5%). The program started one month later than the actual start of the season.

4.4.1. Nesting activity at Al Gbeba beach

A total of 77 crawl tracks and 50 nests were observed at this beach from July 12th till the last nest laid on the night of August 31st (See Table 3, Annex I for details). Crawl track mean width was 67.85 cm (SD= 7.17, range 49-86, N=77). Total Crawl density was 13.6 tacks/km, while total nesting density (NCT+N) = 8.8 nest/km.

A total 1329 eggs from 23 nests were collected and transferred in to the Hatchery. Clutch size ranged from 27-153 eggs. 918 eggs were successfully hatched (hatching rate=69.07%). Other 301 eggs from 9 nests were insitu protected using the metal screen; about 259 eggs were hatched (hatching rate= 86.04%).

Distance passed by turtle on the beach, varied from 2-47meters (Mean=18.05m), this reflecting the wide sandy beach utilized by turtles and the low level of disturbance, while searching for suitable place to dig the nest. Nest total depth ranged from 20-49 cm (Mean=47.31 cm).

4.4.2. Nesting activity at the Thirtieth beach

A total of 63 crawl tracks and 47 nests were observed at this beach from July 13th till the last nest laid on the night of September 5th (See Table 4, Annex I). Mean width of crawl tracks was 62.45cm (SD= 7.11, range 50-83, N=63). Total Crawl density was 17.3 tacks/km, while total nesting density (NCT+N) = 12.9 nest/km.

A total 850 eggs from 13 nests were collected and transferred in to the fenced area; Clutch size ranged from 30-104 eggs. Total of 727 eggs were successfully hatched (Hatching rate= 85.52%). Other 307 eggs from 7 nests were insitu protection. 295 eggs were hatched and the hatching rate= 96.09%.

Distance passed by turtle on the beach, varied from 2-49 meters (Mean=17.05m), that closely similar to results in Al Gbeba beach. Nest depth ranged from 40-65 (Mean=49.38 cm).

4.4.3. Nesting activity at the Fortieth beach

At this beach, total of 36 crawl tracks and 41 nests were observed, during the period from July 24th till the last nest laid on the night of September 6th (See Table 5, Annex1). Crawl tracks mean width was 62.36cm (SD= 7.89, range 50-80, N=36). Total Crawl density was 6.3 tacks/km, while total nesting density (NCT+N) = 7.2 nest/km.

A total 1373 eggs from 21 nests were collected and transferred in to the Thirtieth beach fenced area; Clutch size ranged from 33-105 eggs. 980 eggs were successfully hatched (Hatching rate=71.37%). No insitu protected were applied at this site.

Distance passed by turtle on the beach, varied from 3-34 meters (Mean=17.52m). Nest depth ranged from 30-57 (Mean=43.08 cm).

5. Preliminary results of Genetic Analysis:

Nine tissue samples were collected from dead hatchlings/Embryos from nests at hatcheries of Al Gbeba and the Thirtieth beaches. The samples preserved in 70% Ethanol according to specific protocol, elaborated by research group of Barcelona University lead by Carlos Carreras. The samples were delivered to Barcelona University accompanied with CITES export permit from EGA in October 2005. Preliminary results have indicated that of the nine samples, eight samples presented the widespread CC-A2 haplotype, whilst one sample represented the CC-A26 haplotype, which had never been recorded at any nesting site (Exclusive to Libya). Juvenile loggerhead turtles with this haplotype were recovered at feeding grounds in western and eastern Italy, Lampedosa, North Eastern Spain and south Baleartic islands, hence suggesting Libyan marine turtles use these areas as feeding grounds (Carlos Carreras, personal communication). More samples would be needed to clearly identify the genetic structure of nesting turtles in Libya.

6. Beach pollution:

At the three beaches, several types of pollution were observed during the program period. Anthropogenic sources pollutants were the most obvious types; i.e. plastic bags, containers, old nets, fishing lines, cans, used tires. Some cans and containers were driven by currents from as far as Italy and Greece. Natural debris including wood, reed stalks, Posidonia leaves, discarded sponges were observed to in some parts of the three beaches.

Oil pollution was an imperative factor too, Tar balls resulted from oil spills and ballast water of Oil Tankers, were observed in various densities at the program beaches, it ranged from 5-50 balls/m2. Its size was generally small and ranged from 0.25-2 cm in diameter. Measures to minimize this pollution should be applied, especially if the area will be declared as a protected area for marine turtles in future.

7. Capacity building:

The program was achieved a good results in training of 38 scout volunteers and about six biologists from EGA and MBRC. In addition to appropriate funding and longevity of sandy beaches, the skilled human recourses in marine turtle conservation was and still one of the main constrains that limits the research and turtle conservation programs to be conducted in

Libya. The parties accomplished this program considering training of more young researchers and volunteers from cities and towns around main nesting sites might help greatly in obtaining clearer idea on density and distribution of marine turtles along the Libyan coast.

8. Public awareness activities:

Turtle conservation program depends largely on public understanding of its goals and means, especially in country like Libya, where such programs still new to the local community. Therefore the program team set-up a strategy that utilize all media tools and means available to campaign the local stakeholders to support the conservation activities. Thus the current marine turtle conservation program was a main interest of local media in Sirte and Misuratah, starting from live coverage of the opening ceremony on July 14th, and live interventions from the field with team researchers during news bulletin and other live programs in Radios of Sirte and Misuratah. Good Morning Jamahiriya TV live program made four interviews with team members and some scout volunteers from Sirte studios, the local news paper 'AL Gurdabiyah' made a coverage of field work in the program beaches (See Annex 2). Some of the program budget oriented to make some 300 T-Shirts (A turtle paint on T-Shirts was generously granted to the program by MEDASSET). About 500 leaflets on marine turtle biology and 200 posters were printed by contribution from Secretariat of culture and public media of Sirte Shabiyah (Municipality). On July 16 an interview with two research members was held in Sirte Radio studios, where one hour discussion on marine turtle biology and conservation was recorded for broadcasting during the nesting

season. Furthermore on September 15th a panorama live program 'Our Environment' broadcasted by Misuratah Radio specified a whole series on marine turtles and egg poaching threat, where speakers (program coordinator, Dr. M. Almeheshi, a famous Libyan Gynaecologist and EGA Chief in Misuratah, presented the current knowledge on marine turtle conservation, illegal poaching and the useless of using turtle eggs as medication for fertility disorders.

All of these awareness activities through media were conducted throughout the program period, made the team members to realise how much this campaign has succeeded to reach the local community and local stakeholders

The final ceremony held in October 2nd in Sirte City hall, beside the program team, the NMLS volunteers, was featured with the supervision of Secretary of the Peoples Committee, and presence of the Assistant Secretary of Sirte Shabiyah (Acting Mayor), EGA Branch chief in Sirte and Mr. Atef Ouerghi, the program officer of marine turtle conservation at UNEP-MAP¬RAC/SPA. Live coverage from Sirte local Radio and press were present too.

A presentation on preliminary results was delivered by the program coordinator. Then certificates of appreciation and gifts were presented to the Scout volunteers and other local agencies and personnel cooperated during the program period.

9. Discussion

Understanding of population trends, nesting density and predation effects on marine turtles is largely depending on continuous monitoring of nesting beaches for a whole season. This work is the first attempt to gather data through continuous monitoring of nesting activity in three sites on the Libyan coast, and this is what recommended at the end of national coastal surveys (Laurent et al., 1999).

The results on nesting activity at the three beaches were obviously higher than results obtained in 1997, unquestionably due to continuous monitoring used in present study.

References:

1. 1. Armsby J. K. 1980. Kouf National Park marine survey. Final Report : April-July 1980. ACSAD. Unpublished report.
2. Broderick, A. C.Glen, F.Godley, B. J.Hays, G. C. 2002. Estimating the number of green and loggerhead turtles nesting annually in the Mediterranean Oryx; 2002, v. 36, no. 3, p. 227-235.
3. Canbolat A.F. 2004. A review of sea turtle nesting activity along the Mediterranean coast of Turkey. Biol. Conservation. 116:81-91.
4. Godley, B.J., S. Richardson, A.C. Broderick, M.S. Coyne, F. Glen, and G.C. Hays. 2002. Long-term satellite telemetry of the movements and habitat utilization by green turtles in the Mediterranean. Ecograpphy 25 : 352-362.
5. Hadoud D.A., El Gomati H. 1996. The coast survey of marine turtle activity along the coast of Libya. Phase 2: between Sirte and Misratah. MBRC unpublished report (Arabic).
6. HAMZA, A. 2003. A Proposed program for conservation of sea turtles inthe Libyan Arab Jamahiriya. The 23rd international symposium on sea turtle biology and conservation. Kula Lumpur: 17-21 March 2003.
7. Herbert J. 1979. Kouf national park. Wildlife survey and development.ACSAD. Unpublishd report.
8. HOWEGE, H.M. and A. HAMZA 2002 Libyan National Report on Strategic Action Plan on Marine and Coastal Biological Diversity in The Mediterranean. A report prepared for UNEP-MAP-RAC\SPA/ Tunis.
9. Kasparek, M., B. J. Godley & A. C. Broderick 2001. Nesting of the Gree-Turtle, Chelonia mydas, in the Mediterranean: a review of status and conservation needs. Zoology in the Middle East 24:45-74.
10. LAURENT, L., M.N. BRADAI, D.A. HADOUD & H.M. EL GOMATI. 1997 Assessment of sea turtle nesting activity in Libya. Marine Turtle Newsletter 76: 2-6.- 18 -
11. Laurent, L.Bradai, M. N.Hadoud, D. A.El Gomati, H. M. and Hamza A.A.1999. Marine turtle nesting activity assessment on Libyan coasts.Phase 3: Survey of the coast to the west of Misratah Joint Project of: Marine Biology Research Centre (Tajura, Libya), MEDASSET, RAC/SPA (MAP-UNEP), TCEP (Tripoli), WWF International Mediterranean Programme; 1999, 47 pp.
12. Margaritoulis D., Argano R., Baran I., Bentivegna F., Bradai M.N.Caminas J.A., Casale P., De Metrio G., Demetropoulos A., Gerosa G.,Godley B., Houghton J., Laurent L., Lazar B. 2003. Loggerhead turtles in the Mediterranean Sea: present knowledge and conservationperspectives. In: A.B. Bolten and B. Witherington (Eds.) Loggerhead Sea Turtles. Smithsonian Institution Press. 175-198.
13. RAC/SPA, 2001. Action plan for the conservation of Mediterranean marine turtles. 51 pp.
14. Schleich, H. H. 1987. Contributions to the herpetology of Kouf National Park (NE-Libya) and adjacent areas. Spixiana 10(1):37-80.
15. Ciriaco, S., R. Odorico, M. Spoto, M. Tempesta, P. Guglielmi, ELeonardi, M. Mercurio And C. Franzosini .2000. The Mediterranean Marine Gap Analysis project. Les Aires Marines Protegees En Mediterranee. Colloque des 09-11 Novembre 2000 à Porticcio-France.

Annex I

Table 1. Nest status at the three studied beaches

Table 2. Curved Carapace measurements for four stranded loggerheads

Table 3. Loggerhead marine turtle nesting activity at Al Gbeba beach

Table 4. Loggerhead marine turtle nesting activity at the Thirtieth beach

Table 5. Loggerhead marine turtle nesting activity at the Fortieth beach

Table 1. Nest status at the three studied beaches

Beach name	Natural %	Poached %	Predation %
Al Gbeba	72.7	11.3	16.0
Thirtieth	48.8	14.7	36.5
Fortieth	53.5	11.6	34.9
Mean (%)	**58.3%**	**12.5%**	**29.1%**

Table 2. Curved Carapace measurements for four stranded loggerheads

Beach Name	**Recovery Date**	**CCL***	**CCW****	**Cause of Mortality**
Al Gbeba	21.07.2005	72	64	No clear cause
Al Gbeba	30.08.2005	60	56	Fishing hook& line
The Thirtieth	26.07.2005	61	57	Fishing hook& line
The Fortieth	01.08.2005	63	60	Fishing hook& line

* Curved Carapace Length; ** Curved Carapace Width.

Table 3: Loggerhead marine turtle nesting activity at Al Gbeba beach

Coastal zone	Surveyed beach						Observed nesting signs								
	Name	Length	Surveyed length	Beach coordinates	Date	Method	Crawl tracks						N	NCT+N	
							UCT	FCT	CT	NCT	Total	Density		Total	Density
Gulf of Sirte	Al Gbeba beach	5.67 km	5.67 km	centre point N 31 13 18, E 16 21 77	13/07/2005	Walking	3	5	0	12	20	3.5	3	15	2.6
					16/07/2005		0	2	0	2	4	0.7	4	6	1.1
					17/07/2005		0	0	0	1	1	0.2	0	1	0.2
					18/07/2005		0	2	0	0	2	0.4	1	1	0.2
					19/07/2005		0	0	0	0	0	0.0	1	1	0.2
					21/07/2005		0	2	0	5	7	1.2	0	5	0.9
					22/07/2005		0	2	0	0	2	0.4	0	0	0.0
					23/07/2005		1	4	0	3	8	1.4	0	3	0.5
					25/07/2005		1	0	0	2	3	0.5	0	2	0.4
					28/07/2005		0	0	0	1	1	0.2	0	1	0.2
					29/07/2005		1	2	0	0	3	0.5	0	0	0.0
					31/07/2005		3	5	0	3	11	1.9	0	3	0.5
					02/08/2005		0	1	0	1	2	0.4	0	1	0.2
					15/08/2005		0	1	0	0	1	0.2	0	0	0.0
					17/08/2005		1	3	0	1	5	0.9	1	2	0.4
					18/08/2005		0	1	1	0	2	0.4	1	1	0.2
					23/08/2005		1	1	0	0	2	0.4	0	0	0.0
					26/08/2005		0	2	0	0	2	0.4	1	1	0.2
					31/08/2005		0	1	0	0	1	0.2	4	4	0.7
					01/09/2005		0	0	0	0	0	0.0	3	3	0.5
			5.67			Total	**11.0**	**34.0**	**1.0**	**31.0**	**77.0**	**13.6**	**19.0**	**50.0**	**8.8**

UTC, FCT, CT, NCT see materials and methods.

Table 4: Loggerhead marine turtle nesting activity at the Thirtieth beach

Coastal zone	Surveyed beach						Observed nesting signs								
	Name	Length	Surveyed length	Beach coordinates	Date	Method	Crawl tracks						N	NCT+N	
							UCT	FCT	CT	NCT	Total	Density		Total	Density
Gulf of Sirte	The Thirtieth beach	3.65 km	3.65 km	Centre point N 31 12 642, E 16 22 336	13/07/2003	Walking	0	6	0	2	8	0.9	4.0	6.0	0.7
					14/07/2004		3	5	4	7	19	5.2	2	9	2.5
					16/07/2005		0	0	0	2	2	0.5	0	2	0.5
					18/07/2005		0	1	0	0	1	0.3	0	0	0.0
					19/07/2005		0	1	0	0	1	0.3	0	0	0.0
					21/07/2005		0	4	0	2	6	1.6	0	2	0.5
					22/07/2005		0	0	0	0	0	0.0	2	2	0.5
					23/07/2005		2	1	0	0	3	0.8	0	0	0.0
					25/07/2005		2	3	0	3	8	2.2	1	4	1.1
					28/07/2005		3	0	0	1	4	1.1	1	2	0.5
					29/07/2005		1	1	0	1	3	0.8	0	1	0.3
					30/07/2005		0	1	0	1	2	0.5	0	1	0.3
					31/07/2005		0	1	0	1	2	0.5	0	1	0.3
					01/08/2005		0	1	0	1	2	0.5	1	2	0.5
					04/08/2005		0	0	0	0	0	0.0	2	2	0.5
					17/08/2005		1	1	0	0	2	0.5	2	2	0.5
					18/08/2005		0	0	0	0	0	0.0	5	5	1.4
					26/08/2005		0	0	0	0	0	0.0	1	1	0.0
					01/09/2005		0	0	0	0	0	0.0	1	1	0.0
					02/09/2005		0	0	0	0	0	0.0	3	3	0.0
					06/09/2005		0	0	0	0	0	0.0	1	1	0.0
			3.65				**12.0**	**26.0**	**4.0**	**21.0**	**63.0**	**17.3**	**26.0**	**47.0**	**12.9**

UTC, FCT, CT, NCT see materials and methods.

Table 5: Loggerhead marine turtle nesting activity at the Fortieth beach

	Surveyed beach						Observed nesting signs								
Coastal zone	Name	Length	Surveyed length	Beach coordinates	Date	Method	Crawl tracks						N	NCT+N	
							UCT	FCT	CT	NCT	Total	Density		total	Density
Gulf of Sirte	The Fortieth	5.72 km	5.72 km	Centre point N 31 14 22, E 16 12 47	24/07/2005	Walking	1	0	0	5	6	1.0	1	6.0	1.0
					26/07/2005		3	4	0	3	10	1.7	9	12.0	2.1
					01/08/2005		0	0	0	1	0	0.0	2	3.0	0.5
					03/08/2005		0	0	0	1	1	0.2	2	3.0	0.5
					04/08/2005		0	0	0	7	7	1.2	2	9.0	1.6
					19/08/2005		0	0	0	0	0	0.0	1	1.0	0.2
					24/08/2005		1	5	0	4	10	1.7	1	5.0	0.9
					07/09/2005		0	2	0	0	2	0.3	2	2.0	0.3
			5.72				**5.0**	**11.0**	**0.0**	**21.0**	**36.0**	**6.3**	**20.0**	**41.0**	**7.2**

UTC, FCT, CT, NCT see materials and methods.