Republic of Türkiye Ministry of Environment and Forest Nature Conservation and National Parks General Directorate

Mediterranean monk seal (Monachus monachus) in the Karaburun Peninsula, İzmir, Türkiye



T.C. Çevre ve Orman Bakanlığı









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Cem Orkun Kıraç and Nesimi Ozan Veryeri

December, 2009

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Preface

Karaburun Peninsula, located on the west side of İzmir Gulf, is one of natural and cultural rich marine and coastal areas of our country together with its invaluable surrounded marine areas, pristine coasts, islands and relatively clean sea as well.

Karaburun defined as one of the 305 most Important Natural Areas of Turkey thanks to its natural habitats and rich biological diversity. The most important species emphasizing the importance of biological diversity and living within these pristine coasts and nearby 29 islands are Mediterranean Monk Seal notably (*Monachus monachus*), Poseidonias (*Posidonia oceanica*), Kestrel (*Falco naumanni*), Elenora's Falcon (*Falco eleonorae*), Audouin's Gull (*Larus audouinii*), Shag (*Phalacrocorax aristotelis desmarestii*), Grouper (*Ephinephelus marginatus*), Ocean Sunfish (*Mola mola*) and Bottle-nose dolphin (*Tursiops truncatus*). Apart from these species ecologic values, numerous marine and terrestrial species with economic value live in these waters and coasts which have an important role in socio-economic structure of the region.

The area has several protection statutes due to its importance. However the whole region is not classified under protection statues and the difficulty to keep healthy protection only with protection statutes is a known fact as well. Presence of tourism pressure and reconstruction permits given without considering natural protection dimension, harms caused by the interaction between Mediterranean monk seal and fish farms and especially coastal constructions and excessive/illegal fishing come across as most important and increasing threats. Although biological diversity of this special area is well known, most important deficiencies have to be deal with can be summarized as the lack of integrated management plans to provide sustainable protection and emerging implementation problems.

Main purpose of the SAD-AFAG field works conducted for the long years on coastal and marine habitats, avifauna, Mediterranean monk seal and underwater biological diversity in the region has been gathering scientific information to form basis of required integrated marine & coastal zone management planning with details. Certainly Mediterranean monk seal is an important and significantly conservation needed symbol. Conceding this scarce marine mammal as indicator species, principal target of this study considered as the protection of marine & coastal ecosystems within the region as a whole and keep for the next generations.

This booklet is one of the outputs within the "Monitoring and Conservation of Mediterranean monk seal (*Monachus monachus*) in Karaburun Peninsula Project" of Ministry of Environment and Forestry. It's supposed that it will fill an important gap on Karaburun Peninsula as one of the most important living areas of Mediterranean monk seal and on Mediterranean monk seals accommodated. Booklet also will have the function to transfer the important information to the responsible organizations and institutions which will conduct area's integrated planning studies in the future. In this context the required information drawn about actual conditions of threatened Mediterranean monk seal within Karaburun Peninsula and its habitat and precautions to be taken for a better protection in the area thanks to financial support of the Ministry, Underwater Research Consultancy Ltd. Co. engagements and previous experiences and data contributions of SAD-AFAG.

This booklet prepared within the mentioned project provides the introduction of Mediterranean monk seal as one of the world's most vulnerable mammal and rare species in Europe and states the importance of the region for this species. I would like to express my gratitude for the publication of this booklet and thank all who contribute for the preparation of this book.

Prof. Dr. Mustafa Kemal YALINKILIÇ Nature Conservation and National Parks General Director *Ministry of Environment and Forest* December 2009, Ankara

1. Overview of Mediterranean Monk Seal

1.1. Taxonomy

Mediterranean monk seal, being a marine mammal, belongs to the subordo Pinnipedia. In Pinnipedia (=fin-footed) it is a member of "true seals" (Phocidae) family and of "monk seals", genus Monachus. The Mediterranean monk seal is the rarest among al pinnipeds worldwide and they survive only along eastern Mediterrenean and on some parts in the eastern lantic coasts (Figure-2).

The systematic classification diagram of Pinnipeds, in the world is given below:



Figure 1. The pinnipeds of the world and the place of Monachus monachus in the taxonomy¹

¹ Riedman, 1990

1.2. The Status in the World and in Türkiye

Until the beginning of 1900s, this rare marine animal lived on the coasts of whole Mediterranean basin and on eastern Atlantic coasts from Portugal to Senegal-on the western coasts of Africa. After 1950s, its number started to decline within its distribution range and the colonies were divided into remote sub-colonies. In 1980s Mediterranean monk seals remained only in eastern Mediterranean and in eastern Atlantic coasts. Today, this rare marine mammal mainly exists only along the coasts of Türkiye, Greece, Mauritania and Madeira islands of Portugal. Total population is about 600 individuals. It is supposed that approximately 100² Mediterranean monk seals live along Turkish coasts, 200-250 and according to another source 234-300³ in Greece, 180⁴ is in Mauritania and 25-35⁵ in Maderia (Figure-2). The Mediterranean monk seals in Mauritania coasts have been living together in the region of Cape Blanc proving the characteristic of real colony of Mediterranean monk seal; the eastern Mediterranean population living in the waters of Greece and Türkiye are forced to livein scattered groups or individuals and hence monk seals live separated from each other instead of getting colonial form due to pressure of human activities. The monk seals in Madeira Islands (Deserta Grande, Ilheu Caho, Bugio and to a lesser extent in Maderia) and as they are less subjected to human pressure, they live in less scattered groups in comparison with Türkiye.



Figure 2. World population of Mediterranean monk seal and its distribution

The biggest population of the species exists in Aegean Sea in the world. Hence, Türkiye and Greece bear a very critical responsibility so as to contribute the species to render its existence in the ecosystem and to continue its generation in Mediterranean Sea. Therefore, Türkiye is among the countries that has ultimate responsibility for the protection of the species across the world distribution range.

In Türkiye, based on different research conducted between the years of 1987-1998, 32 to 44 individuals were identified determining the distinct marks on the bodies⁶. In 2004, thanks to the more comprehensive data using more recent sighting information collected in SAD-AFAG's database FokData, it was foreseen that nearly 100 Mediterranean monk seals live along Turkish coasts⁷. Considering that the total world population comprises around 600 individuals, this number refers to an important proportion.

² Güçlüsoy et.al. 2004

³ Güçlüsoy et.al. 2004

⁴ Larinnoa pers. comm. 2008

⁵ Pires pers.comm. 2008

⁶ Kıraç et. al. 1998a; Öztürk, 1998

⁷ Güçlüsoy et.al 2004

The distribution range of the Mediterranean monk seal in our coasts shows intermittent characteristics and concentrating along certain coastal segments. The Mediterranean monk seals mainly occur along Turkish coasts as given below:

1 – In Marmara	The coasts between Gürecealtı and Karabiga, Marmara Islands and Mola Islands, Kapıdağ Peninsula, some coasts between Bandırma and Mudanya, northern western coasts of Armutlu Peninsula.
2 – In Aegean	Northern Aegean: Bay of Saroz, Aegean coasts of Gelibolu Peninsula and Coasts between Çanakkale and Behramkale, Southern Aegean: the coasts between New Foça and Cape Knidos of Datça Peninsula
3 – In Mediterranean	Cape Knidos of Datca Peninsula to Kemer Along the coasts from Alanya toTaşucu Along the coast from Arsuz, İskenderun to Syrian border.

In Turkish Black Sea marine and coastal areas, the number of the monk seal have decreased drastically mainly due to delibarate killing and also sharp decline of fish stocks due to overfishing⁸; and since 1997, no confirmed sighting record has been reported on the existence of the species⁹ along Turkish Black Sea coasts.

In the recent years, seal deaths are rare while breeding has been regularly occurring along Turkish coasts¹⁰.

1.3. Habitats

The habitat of Mediterranean monk seal in Mediterranean Sea and in our coasts shows characteristic aspects: "along the remote and untouched coasts that have no urban development, or coasts difficult to be reached by man or far away from human activities, and rocky/cliff coasts preferably having coastal caves or caverns for breeding and/or sheltering purposes".

Primary habitat of Mediterranean monk seal is remote and untouched coasts and in order to continue its generation, the species needs suitable habitats, untouched coasts as identified above. As they are relatively large marine mammals, they can't survive and breed in narrow sized habitats (e.g. coastal areas comprising one or two bays). This species can only breed safely in the case of existence of a coastline in optimum sizes. The species only safely breed and continue its survival in relatively large and suitable untouched coasts such as Foça and its vicinity, Karaburun Peninsula, Dilek Peninsula National Park, Datça Peninsula, Reşadiye Peninsula, Kalkan-Kaş-Kekova coasts, Olimpos Beydağları National Park, Cape of Gelidonya and Beşadalar region or the untouched coasts lying between Gazipaşa-Taşucu¹¹.

1.4. Feeding

Mediterranean monk seals are carnivorous and marine creatures such as octopus, fish and lobster are among their food. In Turkey, although opportunistic animals, monk seals seem to prefer sea bass, grey mullet, red mullet, turbot, common dentex, conger eel, squid and different octopus species based on our own observations in the field and 1st hand sighting information collected from local fishermen. It is determined that their foraging strategy can be categorized into two; mobile foraging following a certain route; spot foraging on the same reef¹². As the Mediterranean monk seals are mammals, they have to make respiration with air and usually dive for 5 to 10 minutes and get out to surface again breathing. According to the observation records along Turkish coasts obtained from the free ranging monk seals, the average dive time is 6 minutes 45 seconds and the maximum is 18 minutes¹³. Mediterranean monk seals are described as shallow water divers compared with other fin-footed species. Until very recently it was thought that the monk seals dive in shallow waters not exceeding 100 meters deep compared with other seal species. However, according to the latest data obtained from a young monk seal with a transmitter, the seal dived to 180

⁸ Kıraç and Savaş, 1996; Güçlüsoy et.al.2004

⁹ Kıraç, 2001

^{10 .}e.g. Veryeri et.al 2001, Güçlüsoy and Savaş 2003; Kıraç 2008

¹¹ Öztürk et. al. 1991; Kıraç et. al. 1998; Güçlüsoy et.al, 2004

¹² Güçlüsoy and Savaş, 2003

¹³ Kıraç et.al. 2002

meters deep water¹⁴.However, among the other seal species capable of diving into 1500 meters deep, the Mediterranean monk seals are still shallow water divers. It is known that from time to time, they are also known to take fish from the artisanal fishermen's nets. This situation causes competition, which may result in deliberate killing of monk seals by artisanal fishermen.



Figure 3. As a carnivorous marine mammal, Mediterranean monk seals forage mainly on fish and cephalapods. Photo: SAD-AFAG C.O.Kıraç

1.5. Morphology

Mediterranean monk seal is a huge marine mammal and its length varies between 2,1 ad 2,5 meters and average weight between 250-300 kg. Not longer than 0.5 cm, hairs densely cover skins of adult seals. When they are seen swimming, the most outstanding feature is the huge, glossy head without external ears, long whiskers and coal-like black eyes. There is no distinct difference in terms of weight and size between males and females but they have color pattern distinction (Figure-4). Their large bodies can easily be recognized when they are seen lying on the open beaches. There are fore fins on both sides of their body and at rear there are back fins in two parts. The newly born pups have all black hairs of approx. 1, 5 cm. while there is always a white patch on abdomen. When they get 6 months old, the long black hairs are replaced with short and glossy grey hairs¹⁵.



Male: There is a distinct white patch on abdomen while its overall color is nearly black or dark brown

¹⁴ Dendrinos et.al. 2007

¹⁵ Dendrinos et.al. 2000



Female: Top is light grey or dark grey and underpart from neck to tail is paler or nearly white colour. Moreover, on the waist there are scratches made by the males during copulation.





Pup: Pup starts to replace hairs when it is nearly for 4 weeks old and at the end of six weeks, short and glossy grey hairs replaces long and black hairs.

Newborn pup: Except the distinct birthmark in abdomen region, the body is covered with glossy and longer black hairs of 1–1.5 cm. The baby is born with whiskers as seen in adult seals. The birthmark in the abdomen is useful for the determination of the sex.

Figure 4. The morphology of female, male, young and pup of Mediterranean monk seals. (Drawings by: Eduardo Saiz)

1.6. Behaviour and Breeding

Mediterranean monk seals are timid, and when compared with other fin-footed species, they are less social animals. The monk seals in the eastern Mediterranean including the coasts of Türkiye live very scattered and they they are rarely seen together in relatively high numbers. The researchers in Türkiye mostly observe seals in single, sometimes 2-4 seals wandering together and hardly this number increases to 7-8 animals¹⁶. Although we have some basic knowledge, there isn't much information about their behaviour. There are some assumptions that, from time-to-time, Mediterranean monk seals come together and spread out again. Adult males sometimes keep a territory on remote and rocky and continue to live in selected local territory. Females are more wanderers than the males but in breeding period; they spend their time around breeding cave and vicinity. Young seals are long distance travellers in their juvenile period and can go to far distances.¹⁷

The female seals reach the sexual maturity at the age of 3-4 years ¹⁸. Copulation occurs in the sea¹⁹. After the period of 10-11 months of pregnancy, adult females give birth a pup every year or every two years.²⁰ Therefore, breeding rate of Mediterranean monk seals is naturally slow which affects its global population. Thanks to the observation data collected in Turkish coasts, birth takes place usually in October in autumns. Birth takes place along inhabited coasts and at the very end of a coastal cave in which there is a pebble beach or rocky platform that waves cannot wash completely under dark or dim light. The platform can be composed of sand, pebbles or rocks. The mother suckles the pup nearly for 4 months with her milk²¹. Then, the pup with the help of its mother starts to forage itself with live fish. Based on the data collected by SAD-AFAG in the field since 1987 until now, Mediterranean monk seals are surely in need of land to give birth to her pup and bring them up and especially they need *untouched coasts and coastal caves* for breeding and sheltering. Mediterranean monk seals are surely in need of land to give birth to her pup and bring they need coastal caves for breeding and sheltering. Mediterranean monk seals are surely in need of land to give birth to her pup and bring they need coastal caves for breeding. Conservation of the pristine coasts is of vital importance for breeding and hence survival of the species.

¹⁶ AFAG 2008

¹⁷ Güçlüsoy et.al 2004 Johnson 2 et.al 2006

¹⁸ Cebrian, 1993

¹⁹ Kiraç and Veryeri, 1996; Pastor et.al 1998

²⁰ Marchessaux and Pergent-Martini 1991, Pasto rand Aguilar 2003

²¹ Mursaloğlu 1986

2. Factors Contributing Decline of Species

Decline of Mediterrenean monk seal is not the result of only one problematic issue. Five main factors combined cause extinction of the species along Turkish coasts. This decline has reached the level of extinction in some regions such as Turkish Black Sea coasts where monk seals cannot be observed any more²².

2.1 Deterioration of Coastal Habitats

The habitats of the seals are untouched and remote coasts that keep their natural form. In Türkiye, such pristine areas have been gradually declining along certain regions. As new roads are opened, constructions of the summer houses or touristic development happens along the coasts natural characteristics and peculiarty of coasts are deteriorated and naturally monk seals leave such coastal areas²³.

Moreover; this negative factor not only affects the Mediterranean monk seal but also the arcaeologic sites that has a history of thousands years along Anatolian coasts. Besides, this factor causes the natural landscape to be deformed, also devastates the fertile agricultural areas and corrupts historical/cultural values. Deterioration of landscape is another result of unplanned construction.



The most important reason negatively acting upon endangered Mediterranean monk seal is the deterioration of Coastal habitats. The Coastal road that was opened along the southern coasts of Dilek Peninsula National Park in 1997 could be halted, which stopped for further deterioration by construction, by DG National Parks with the initiative taken by SAD-AFAG. Photo: SAD-AFAG C.O.Kıraç

²² Kıraç 2001

2.2 Overfishing and/or Illegal Fishing:

Fish, cephalopods and mollusks consist of foods of monk seals. The fish stock has been decreasing largely as a result of the chronic illegal and/or overfishing practices. The illegal fishing methods such as trawlers, tratas, purse-seiners, dynamite fishing, spear fishing with scuba dive or torch seriously harm the fish stocks. Until 2001, trata fishing was allowed in the legislation. As the trata fishing whether it is legal or illegal is occurred in 0-10 meters deep and in the coasts, it has had negative effects on the aquaproduct stocks.

As a result of the illegal and overfishing, both seals foraging in the shallow seas and the small scale (artisanal) fishermen are affected very negatively; the seals can not have enough food which shall have direct effect on the physology and breeding of the animals and the coastal fishermen suffer from lower incomes and decreased life standards ²⁴.

2.3 Deliberate Killing of the Monk Seals:

The Mediteranean monk seals that have difficulty in finding fish or other preys in sea and sometimes have to take fish from the fishing nets set by the fishermen at night. Due to the reason identified in the 2.2 topic (decrease of fish stocks), the competition between the seals and the small scale fishermen- as they are hunting/fishing in the same waters- has been ascending. At the end, the small fishermen may sometime show great reactions even in case of small losses because of monk seals as they are suffering from poor incomes.



24 Kompanje et.al. 2000

2.4 Disturbance in Monk Seal Caves:



Figure 5. A scuba diver penetrating into monk seal cave Photo: SAD-AFAG Zafer Kızılkaya

The places where the monk seals live (breed, rest or forage) are the coastal caves whose entrance is from the sea. In the recent years, the seal caves have been damaged under the tourism pressure and because of the disturbance by touristic diving activities, anchorage of ships nearby seal caves and use of caves as recreational activity by holiday makers etc./some caves are abondoned by monk seals.

Although it is banned according to the relevant legislation, every year lots of notice reach to SAD-AFAG about such activities giving disturbance in seal caves. Some diving companies let the tourists dive especially in Bodrum, Marmaris, Fethiye, Kemer, Kalkan, Kaş, Kekova and Alanya vicinity and some are under the guise of ecotourism let touristic diving in the western coasts of Mersin, Aydıncık and Bozyazı. The people who deliberately dive or wander around monk seal caves make use of gaps in patrolling. This is a threat factor for monk seals, which may cause abondonment of the caves as mentioned by Mursaloğlu²⁵.

2.5 Marine and Coastal Pollutions:

As a result of the marine pollution but in specifically the pollution in its habitat of the species, monk seals abandon polluted coasts. We rarely face with this problem that is not frequently observed in our seas yet it is potentially a threat. It is also suggested that there is heavy metal accumulation in Mediterranean monk seals, even at low levels.²⁶.

The followings can be given as the examples of the pollutio along Turkish coasts: The oil pollution happened in 1996, in Gümüşlük Çavuş Island, one of the important monk seal habitat; observation of the excess domestic waste pollution (nylon, rope etc.) in Sinop İnceburun Cape during the field research in 1997; observation of the diesel and oil dirts on the fur of "Yeşim" driven ashore in an ailing condition in İzmir Aliağa in 2004; the tightly curling of the rope around the head of the monk seal named "dişi korsan" lived until 1998, ghost net entangled on the back fins of the monk seal in Mersin Akkuyu in 2009 are concrete examples of pollution observed by SAD-AFAG. However, they aren't as common as the first three factors afore mentioned.

²⁵ Mursaloğlu 1988

²⁶ Yediler et.al 1993

3. Mediterranean Monk Seal at Karaburun Peninsula

3.1 Karaburun Peninsula

Karaburun Peninsula and nearby islands are located by the outer entrance of Izmir Bay, central Aegean coasts of Türkiye. Karaburun town is, in bird fly distance, 60 km. northwest far from the main centre of Izmir Metropolis. Studies do cover the whole peninsula coastlines. Overall surface area of Karaburun Peninsula is around 450 km². 13 villages, Mordoğan municipality, Karaburun Municipality borders and Balıklıova village of Urla town are located in the research area. Karaburun Peninsula mean average altitude is the highest one in Turkey. This means that, a one travelling the peninsula will experience a dynamic and challenging voyage, far different landscapes after every bend of road. The coastal lenght of the Karaburun Peninsula above Balıklıova line is approximately 120 km. (See Figure 6.).

Karaburun Peninsula, extending to the Aegean Sea, connected to the mainland by a narrow land piece, tends to represent a formation of an island. The peninsula region, enriched by its geomorphological structure, is a very unique and important BIO-RESERVE AREA. In current status, this eco-region is the largest preserved area along Turkish Aegean coasts. Besides, Karaburun Peninsula is apart from the tourism axes of Izmir-Ayvalık, Izmir-Cesme and Izmir-Kuşadası occupied by mass tourism. Alaçatı, Kokar and Sığacık sub-regions and Dilek National Park, similarly are far away from coastal development, construction and human pressure. These areas are among the last untouched coastal areas in the Turkish Aegean coasts but in smaller sizes compared to Karaburun Peninsula.

3.2 Study Method

Studies are performed under two main categories; 1- Analyse and compilation of previous scientific data, reports and raw data 2- Field research studies which are covered in three different groups; a- coastal habitats research and threats identification & observation, b- regular dives to coastal caves/caverns, checking the existence of seals and possible traces, c- collection of seal sighting data from local people and fishermen.

First, FokData data base was studied, which consists of sighting information and direct sighting data by SAD-AFAG collected and entered throughout regular studies or individual field expeditions studies covered in between years 1991-2004 (AFAG, 2009).

Seal cave research expeditions were done between Sarpıncık Cape at north and Ardıç (Mordoğan) at south, a coastline with mostly rock characteristics. Besides, the whole coastline f the peninsula is explored for habitat scanning and identification of threats.

Breeding and resting/sheltering caves are explored once in two weeks period, depending on convenient weather conditions. SAD-AFAG's 4.7m length fiber boat equipped with an out-board engine or fishermen boats of approx. 7 m. length.



Figure 6. Karaburun Peninsula indicated north of the red line, represents the research area of the project called "Conservation and Monitoring of the Mediterranean Monk Seal in Karaburun Peninsula" initiated by the Ministry of Environment and Forest in 2009.



Figure 7. Karaburun coasts Photo: SAD-AFAG N.O.Veryeri

3.3. Seal Sigthing Data Collection

Considering the period of 2005–2009 years, at least once in every week, interviews and conservations covered with local people, specifically the artisanal fishermen and local people were the source for collected data. The researchers of the project under the supervision of project coordinator experienced techniques to collect solely the "first hand data" from the direct observers for the creation of data-base. Data collection was made using standart sighting form developed and used by SAD-AFAG since 1987. Interviews were made in Karaburun town fishermen harbour as well as Eşendere, Mordoğan, Balıklıova, Yeniliman, Hamzabükü, Denizgiren, Eğriliman and Karareis districts. Small scale fishermen and artisanal fishermen were the main source of data. For complying the needs of descriptive optimal information: information on observers, location of sighted seal, date of sighting, possible clues on morphological identification of seal, day/month/year of observation, behaviour of seal, number of observants, activity of observant when encountered the seal, total time of observation, min/max. distance to seal and relevant data are put effort to be collected. Referring to collected data, number of individual seals using the research area, paterns of distribution, tendency of interaction within certain habitats are evaluated.

3.4. Seal Caves Monitoring

Mediterranean monk seal is a marine mammal dependent on coastal caves for resting and breeding. For this reason, the research team is focused on marine entrance caves/caverns at Karaburun Peninsula that are vital for the survival of the species. There are 13 cave/caverns in the research area convenient for monk seals to rest/shelter or breed.

13 cave and cavers are controlled totaly 92 times, 31 diving studies were held for research and monitoring between July and December of 2009 in Karaburun and Mordoğan area. In the same period 8 extra diving were held for the aim of underwater habitat observation and documentation. During these 92 cave/cavern surveys, the researchers encountered a monk seal (Nergiz) one time, and 15 times they found monk seal tracks. Seal tracks could only be found if when the platform in the cave is made up of pebbles. While a monk seal hauls out platform of pebbles, it leaves typical tracks behind. Exprienced monk seal researchers determine and record these tracks with their proffesional judgement. In the case of facing the monk seal, the researchers stay in the cave in the period which is the shortest time needed for determining the monk seal identification, as it is done always by AFAG. The survey that was held on 4.8.2009 in Mordoğan Ayıbalığı cave, was recorded continuously from the entrance to the cave till exit, extends almost 5 minutes. On the middle part of this record the researcher faced with juvenile monk seal 'Nergiz', after watching the monk seal 30 seconds and being sure about the ID of the seal, the researcher left the cave fast. The juvenile monk seal did not leave the cave after this meeting. Ayhan Akçura, the member of Karaburun National Seal Committee heard typical pup monk seal voices in the same cave in October 2008 and thus breeding had been decided at that time.

7 of the 13 caves/caverns placed on Karaburun have suitable pebble platforms that monk seals can rest, the other 6 caves/caverns have solid rocky platforms or pebbles that the waves can wash all the time (therefore it is not possible to rest and shelter on dry platfroms for monk seals).



Figure 8. Checking traces on an open pebble beach near Mordoğan Ayıbalığı caves. Photo: SAD-AFAG N. Akça



Figure 9. A researcher and a monk seal along Karaburun coasts. Photo: SAD-AFAG N.O.Veryeri



Figure 10. Locations of monk seal caves/caverns in Karaburun Peninsula which were monitored regularly.



Figure 11. Diver getting ready for a cave expedition, Sarpıncık coasts, Karaburun Peninsula Photo: SAD-AFAG C.O.Kıraç



Figure 12. Mordogan Ayıbalığı cave, the most important breeding cave known, preferred by mother seals for breeding in Karaburun Peninsula. Photo: SAD-AFAG N.O.Veryeri



Figure 13. Interview with a local fisherman in Badembükü for collecting first hand monk seal sigthing data, Karaburun Peninsula. Photo: SAD-AFAG N. Akça

Among all, Mordoğan Ayıbalığı cave in the east, Sarpıncık and Hamzabükü caves in the north side of Karaburun Peninsula, having similar qualifications profound by pebble beaches inside, are the breeding habitats for monk seals.

SURVEY Number:	1	2	3	4	5*	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DATES	10-Jul	11-Jul	3-Aug	4-Aug	26-Aug	4-Sep	5-Sep	9-Sep	13-Sep	14-Sep	15-Sep	18-Sep	23-Sep	26-Sep	29-Sep	20-0ct	26-0ct	14-Nov	18-Nov	20-Nov
CAVES:																				
AYIBALIĞI TUNNEL																				
AYI BALIĞI MAIN CAVE*				S										T						T
SARPINCIK*						T				T							T		T	
HAMZABÜKÜ*		T	T		T														T	
KUMBÜKÜ*													T							
YENİLİMAN																				
ÇAKMACIK*		T				T							T							
KÖPRÜ 1*																				
KÖPRÜ 2*						T														
KÖPRÜ 3																				
KANLIKAYA 1																				
KANLIKAYA 2																				
BÜYÜKADA																				

Table 1. Cave expeditions and seal observation/traces SEAL: S or TRACE:T

Caves/caverns indicated with (*) have pebble platforms which allow researchers to recognize possible seal tracks. Other caves/caverns have solid rock platforms hence preventing recognition of seal tracks by researchers.

3.5. Geographic Information System of Karaburun Peninsula Mediterranean Monk Seal and Its Habitats

Geographic Information System, comprising Karaburun Peninsula Mediterranean monk seal monitoring studies, is based on the evaluation of species monitoring data on a grid system. The main purpose of composing a grid system is quickly mapping and analyzing monk seal sightings determined in a specific location (punctual) and 1st hand reported sightings providing approximate location (non punctual) within one system. Grid system covers whole Karaburun Peninsula and is formed by 6338 cells in $15'' \times 15''$ scales (x and y scales are approximately equal to 360 m. and 460 m. respectively). Additionally GIS includes coastal line extracted from Quickbird satellite photos in 60 cm. resolution through screen digitalization.



3.5.1. The Structure of Geographical Information System

Figure 14. GIS structure of Karaburun Peninsula Mediterranean monk seal and its habitats

3.5.2. Data Transfer of Info on Monk Seal, Its Habitat and Threats to GIS

Monk seal layer in GIS is prepared through inputting data like "number of monk seal sighting, number of observed individual, location and date" from monk seal sightings collected on the studies between 2005–2009 and data from previous SAD-AFAG studies belonging to 1991–2004 period into related cells of the table associated with grid layers.

"Monk seal caves" layer is composed through inputting data of pre-determined Mediterranean monk seal caves and caverns on the related cells likewise. Related information on breeding and foraging areas of the species is digitalized as a polygon on "usage area" layer.

Finally, current and potential threats on the Mediterranean monk seal and its habitats within Karaburun Peninsula are examined; they are discussed under different categories like extreme / illegal fishing, trawl or dragnet fishing, threats on pups arise from left nets (ghost fishing), coastal housing and cave diving and they are marked spatially (on grid basis). Later on "1" for presence and "0" for absence of threats are entered to the each related grid cells for transferring different threats to the GIS.

Geographic Information System is constructed on Manifold software and GIS structure is physically configured as described in Figure 14.



Figure 15. Karaburun Peninsula in İzmir Gulf

3.6 Mediterranean Monk Seal Presence and Its Habitats Related Indicators

Karaburun Peninsula is not yet highly spotlighted by foreign researchers. Mostly Turkish and some foreign researchers have studied and/or published on the area. Long term studies are carried out by SAD-AFAG. Despite the presence of SAD-AFAG in the area since 1991 it can be seen that conducted systematic studies by SAD-AFAG covers only 8 years period between 1998 and 2005. The status of the species based on breeding, feeding, ranging, habitat quality and interactions with human being are examined considering results obtained from the previous long term or short term research and individual expeditions and the results are given in this publication even partially.

Within context of this study, monk seal observations (direct observations by the researchers and collected observation data as first hand as well) from 1 January 2005 to 18 December 2009 are transferred to Fok-Data database. 83 observation records are collected in the mentioned 5 years (2005-2009) period and 54 of them are from the last two years, 2008-2009. In 2005 and 2006, only 5 and 8 sightings were collected respectively. The less number of records from 4-5 years can be attributed to difficulty of getting older data from the memories.

3.6.1 The Situation of Mediterranean Monk Seal in Karaburun

According to the studies of SAD-AFAG, at least 16 monk seals are determined in Karaburun Peninsula that lived between 1999 and 2009. Short information and the observation date of these monk seals are given below;

- 1- Pup (died) Ayıbalığı 2000
- 2- Melih female pup (found dead in Mordoğan Kum Burnu Cape, necropsy was done) 2001
- 3- Ege Vira male pup Mordoğan Ayıbalığı (survived) 2002
- 4- Premature pup (died) 2003
- 5- Nergiz juvenile female (alive) 2008–2009
- 6- Dişi korsan juvanile female (died in Foça) 1999
- 7- Sultani juvenile female (mother of Ege Vira) 2002
- 8- Kumburun adult female (was killed deliberately, found on coast. The case was taken to court for the reason of suspicious of being killed by fish farms) Balıklıova 2003
- 9- Emine juvenile female (Mordoğan Ayıbalığı) 2000–2002
- 10- Juvenile female (The individual that can not determine but well known its presence, injured back, She was seen in the cave at the same time with the seals given in #10 and #12 in this list. Mordoğan Ayıbalığı) 2000–2001
- 11- Juvenile female (Not identified exactly, Mordoğan Ayıbalığı Tunnel cave) 2003
- 12- Juvenile female (Not identified exactly, large individual, Kanlıkaya) 2002
- 13- Zennube juvenile female (found dead in Çeşme, there were observations in Karaburun before her death) 2003
- 14- Juvenile male (Eşendere area. The individual that can not determine but well known its presence, large individual, was killed deliberately, considered that he was shot) 2002
- 15- Juvenile monk seal (The individual that can not be identified but well known its presence, gender is undefined quite big. Was found dead in Balıkova İnce Cape. Killed deliberately) December 2002
- 16- Koca Yusuf Juvenile male (Büyükada and Sarpıncık lighthouse area) 2004–2006

As it is seen, 6 of 16 monk seals defined in Karaburun Peninsula (within the boundary of project area) was dead and 10 monk seals (within project area) survive. Beside these monk seals, other female and juvenile individuals that use Karaburun coasts are observed. 4 other monk seals that probably differ from the above list but can not determine well are observed in the area. Hence 16 different individual was recorded till 1999, this number may be rise up to 20. In that case, the total amount of defined monk seals (till now) in the area is at least 16. It can be stated that this monk seal amount between 1999 and 2009 may be over 20 because there is a possibility that there had been other births apart from the determined birth amount and unforseen monk seals can use the area. This number is very important because 600 monk seals is assumed in global population and 100 is assummed for Turkiye population.

In the light of above mentioned information, observations belonging to the years 2008 and 2009 (last 2 years period) is accepted as actual and apart from total Mediterranean monk seal number in different individuals since 1999 to today at least 4, probably 5 Mediterranean monk seal individuals living and using the area around Karaburun Peninsula as of today. These are; adult female monk seal uses Eşendere and Karaburun area and juvenile female monk seal Nergiz was observed between Ayıbalığı cave and Karaburun (observed in the last surveys), juvenile or adult female observed between Yeniliman and Sarpıncık (covering Hamzabükü and Sarpıncık caves), female monk seal using Badembükü and Eğriliman area and female monk seal using Karaada (Eşek)-Toprak(Balta)-Bayrak Islands and Teke Peninsula. There is a possibility that 4th and the 5th monk seals can be the same.



Figure 16. "Koca Yusuf", an adult male monk seal, identified in 2004 in Büyükada coasts, Karaburun. January 2005. Photo: SAD-AFAG C.O.Kıraç



Figure 17. Distribution of cumulative monk seal sightings between 1991-2004 in the marine and coastal areas of Karaburun Peninsula.



Figure 18. Distribution of cumulative monk seal sightings between 2005-2009 in the marine and coastal areas of Karaburun Peninsula.



Figure 19. The locations of breeding, resting and sheltering seal caves/caverns in Karaburun Peninsula.

3.6.2. Mediterranean Monk Seal Breeding in Karaburun Peninsula

There are 3 proper breeding caves in Karaburun Peninsula. These are; Mordoğan Ayıbalığı main cave, Hamzabükü cave and Sarpıncık cave. Monk seals breed 5 times between 2000 and 2008 within the study area. This number has been figured out conceretly as a minimum with the limited research conditions and resources available and it is possible that monk seals may have bred more especially in Hamzabükü and Sarpıncık caves in the past years. Some of these 5 monk seals are observed alive in the study area while rest died. The main reason of death is drowning caused by entanglement to fishing nets of fishermen.

The pups that were born after 2000 along the Karaburn Peninsula coast mentioned above are as follows;

- 1- Pup. 2,5-3 months old, born in Mordoğan Ayıbalığı cave. Found dead in 2000 after entagleged fishing nets and stranded on the shore.
- 2- Melih. Female pup. Born in Mordoğan Ayıbalığı cave. Found dead in 2001 in Kumburun cape.
- 3- Ege Vira. Male Pup. Born in 2002 in Mordoğan Ayıbalığı cave. Survived.
- 4- Premature pup. Found dead stranded on the shore on Arslan Cape near Karaburun in 2003. There is a possibility of trauvma after birth by the waves.
- 5- Nergis. Born in Mordoğan Ayıbalığı Cave in 2008 autumn. Observed and filmed in its cave when the young seal is approximately 9-10 months old. Survived.



Pristine coasts that still maintain their original chracteristics in Sarpıncık village near Hamzabükü, Karaburun Peninsula. Photo: SAD-AFAG C.O.Kıraç

4. Threaths Upon the Monk Seals in the Study Area and Habitats

In Karaburun Penisula, the threaths upon the monk seals and habitats can be categorised in four main headings;

- 1- The detoriation of the coastal habitats' characteristics: the constructions and actual & potential approvals of development plans along pristine coasts.
- 2- Overfishing and illegal fishing: Fishing in the closed areas for trawlers and purse-seiners gave rise to both artisanal fishermen and seals with less catch and prey respectively
- 3- Drawning due to entenglement in the fishermen nets: especially seen among the juveniles and young seals less than 1 year old which entangle to the set-nets and can not surface and finally drawn.
- 4- Disturbance to monk seals in their caves: disturbance by the penetrating divers and swimmers, entering into monk seals caves, the last refuges for breeding and resting.



Figure 20. Pup monk seal Melih was drawned due to entanglement to a bottom set-net in 2001. Photo: SAD-AFAG N.O.Veryeri



Figure 21. Adult female monk seal Kumburun. She was killed deliberately, tied up with a concreted box from her tail and thrown into the sea. Her body stranded ashore near Balıklıova. Although the case was taken to the court by SAD-AFAG, no punishment given due to the lack of evidence. 2003. Photo: SAD-AFAG N.O.Veryeri



Figure 22. A bottom set-net, lied off in nights and collected in early mornings, near Karaburun. Such set-nets are very much dense between Balıklıova and Mordoğan coasts. Photo: SAD-AFAG N.O.Veryeri



Figure 23. The pup born premature in 2003 and found dead stranded on Arslan Cape near Karaburun. Photo: SAD-AFAG N.O.Veryeri





Figure 24. People fishing over Mordoğan Aybalığı main breeding cave! July 2009. Photo: SAD-AFAG N.O. Veryeri





Figure 26. Habitat destruction due to summer house development together with road construction along Küçükbahçe coasts on the western side of Karaburun Peninsula. Photo: SAD-AFAG C.O.Kıraç



Figure 27. The information boards and warning signs that were relocated in 2008 summer to a low profile place after established in its original place in a recreational site near Mordoğan Ayıbalığı main breeding cave in 2007. July 2009. Photo: SAD-AFAG



Figure 28. The illegal speargun fishing is frequently observed along the coasts of Karaburun Peninsula coasts. Though it is illegal, a harpooned dusky grouper (*Ephinephelus marginatus*) and its hunter. July 2009. Photo: SAD-AFAG



Figure 29. The marine and coastal areas where monk seals are affected by illegal bottom trawling.



Figure 30. The marine and coastal areas where monk seals are affected by the illegal purse-seine fishing.



Figure 31. The marine and coastal areas where monk seals are affected by all types of illegal trawling (bottom+mid-water) based on fishery ban zones.



Figure 32. The areas where monk seals may have interaction with fish farms. (The locations of the fish farms are indicated approximately)



Figure 33. The marine and coastal areas where monk seals local to Karaburun Peninsula can range within a day.

5. The Legal Situation About the Conservation of Merditerranean Monk Seal

The Mediterranean monk seal (*Monachus monachus*) has not been officially under protection until recently. However, since 1977 Turkey has taken Mediterranean monk seal under protection and in the following years the species have had and extended protection status with both the national legislation and the international conventions. According to our national legislation and the international conventions ratified by Türkiye, the species, its habitat, namely the natural and untouched coastal areas are committed to be protected.

5.1. National Legislation

National Legislation: According to the Act on Hunting No. 4915 and related decisions of Central Hunting Commission, since 1977 and Act on Aquaproducts Fishing 1380, since 1978 and related Aquaproducts Circular hunting and killing of the endangered monk seal is definitely prohibited. And in the event of such a case, the guilties are charged with heavy fines. It is also forbidden to enter into monk seal caves with any kind of gears and lights so as to conserve monk seal's habitats according to the Aquaproducts Circular²⁷. Moreover, as per article 13 Area prohibitions in the same circular, between Deveboynu Cape in Foça and Aslan Cape within the monk seal conservation areas, from 1992-93 season in Bodrum Peninsula "between Kızılyar and Karabakla Headlands", from 1993-94 seasons all kinds of purse seining and dredging techniques are prohibited 2 miles off from the coast. In January 1991, with the participation of concerned bodies, expert non governmental organizations and universities, National Seal Committee was established and started its initial studies. The committee accepted "National Strategy for the Conservation of Mediteranean Monk Seal" originally developed and proposed by AFAG.

5.2. International Conventions

The conventions that Türkiye ratified to for the conservation of Meditrranean monk seal and its habitat and their approval dates are as below:

- * Conservation of Mediterranean against Pollution (Barselona) Convention (1981)
- * The Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (Barcelona Convention); (2000)
- * The Conservation Of European Wildlife And Natural Habitats Convention (Bern) (1984)
- * Protocol on Special Protection Areas and Biodiversity in Mediterranean (2000)
- * Convention on International Trade in Endangered Species of Wild Fauna and Flora. (Washington) (1996)
- * Biodiversity Convention (1996)

²⁷ Kıraç et. al.. 2004

6. Results and Conclusions

In this book, the results of the studies for seal sightings and seal habitats that were done in 1990-2009 are reported. During this time span, effort in 2005-2009 was not the same as it was in 1990-2004 and consequently the results of these two research periods are not comparable to each other. In the period of 1990-2004 SAD-AFAG had research personnel based in the area and seal sighting data were collected in a regular base. During the later period of 2005-2009, research studies performed in the area were more concentrated on cave surveys and sighting information was not collected up-to-date and regularly. Instead, local people were questioned from time to time to bring back their sighting memories of 1-5 years old. Naturally, fresh witnesses are recalled more easily compared to memories of the past.

Moreover, when monk seal distribution maps are studied, one may think that the monk seals prefer to live more on the Eastern coast of Karaburun Peninsula and they do not prefer much the Northern and the Western coasts. It should be said that this would be a false conclusion. The monk seal concentration on the maps is actually parallel to the human population concentration which is the main source of seal sighting data. Therefore, monk seal sightings are concentrated on the Eastern coast of the peninsula. Rarity of the sightings on the North and West coasts does not mean the rarity of the seals along these coasts but directly means the limited number of sighting information due to less human existence. In contrast, all around the peninsula shows good geomorphologic characteristics of the monk seal habitat. Yet, the Western coast is considered more suitable for the seals' preference because of less human presence. Actually, the existence of monk seals at present and for recent times along the northwestern and western coasts of the peninsula have been accredited through the reliable 1st hand sighting data obtained by the local people and fishermen who live in the small and scattered agriculture villages or from the remote fish farmers.

The monk seal habitats around the Karaburun Peninsula still maintain its original characteristics except some localized coastal developments and limited summer house construction pressure. The main threats on the monk seals and habitats can be categorized into four as given below, which may also be attributed to the relative decline of breeding rate of the species in the recent years (between 2005 and 2009) as compared to previous years (before 2004);

- 1. Habitat deterioration due to coastal development including summer houses and tourism facilities construction and path opening for road construction, although happening limited in certain localities,
- 2. Decline in fish stocks due to intense and illegal fishery in İzmir Bay,
- 3. Death of pup or juvenile monk seals due to drawning resulting from entanglement of bottom set-net fishing gears,
- 4. Disturbance given to monk seals inside the caves directly given by tourists through penetration into the certain caves and other recreational activities (especially in Mordoğan Ayıbalığı caves zone).

If we evaluate current indicators;

- 1. As briefly explained in 1.Part of the book, a Monk seal can only give birth to and take care of her pup in suitable caves. That is the natural biology of the species and can not be changed. Thus, current legal and formal city development plans, previous and ongoing construction paterns indicate a negative interaction with the habitats of the species. The most important coastal developments that need attention are as follows:
 - a. Increasing demand and pressure for construcion at Mordogan coastlines
 - b. Increasing intensity of secondary house constructions, in between Karaburun-Kanlıkaya
 - c. Completed secondary house construction just above the Hamzabuku breeding cave and possible ongoing coastline restoration activites. This illegal activity has caused natural rocks to be fallen down to sea level; some block the entance of very valuabe caverns and some of which accumulating at the entrance of the breeding cave.
 - d. Construction of secondary house cooperatives by Karareis and Gerence Bay south, southwest and northeast coastlines
 - e. Secondary house construction pressure by Egriliman.
 - f. Secondary house construction pressure by Denizgiren
 - g. Secondary house construction pressure by Badembuku.
 - h. Secondary house cooperatives and ongoing samples located just by 1.Degree Status Natural Site coastlines, Komur Burnu, Yeniliman,
- 2. Diminishing fish stocks caused decreasing income of small scale fishermen, drived the researchers to make think that this situaion is in direct interaction with illegal and overfishing activites of industrial fishing boats, trawlers and purse seiners, enhanced with insufficient patrolling system. The patrol boat of Karaburun Town MoA District Directorate does not function nd go out of sea properly. In case the efficiency of the patrol boat of MoA increases, it will help enhancement of both sustainability of fishery and conservation of marine and coastal ecosystems. We repeat our advice that Coast Guard boats amd MoA patrol boat patrolling frequency could be increased more.
- 3. Pups and young seals may entangle to set nets of fishermen. The probability of this risk is high especially nearby Mordogan region.
- 4. Formally declared and announced conservation measures for Mordogan Ayı Balığı core region must be realised and the management plan be applied by relevant bodies including Municipality, Sub-governorship, MARA and MoEF.

Beside above evaluations, precautions to be taken by relevant govermental and responsible bodies shall be listed as below;

- 1. Regular annual monitoring of Monk seals habitat and threats,
- 2. Maintaining efficiency and consistency on marine patrolling system.
- 3. Considering more effective patrolling techniques and punishment regulations for over and illegal industrial fishing.
- 4. Considering defining a quota for professional small scale fishermen, while increasing the pressure of control mechanism and punishment measures on amateur fishermen who insist to use professional

fishing techniques. Amateur fishermen are observed to use set-nets and long lines where at this point they do not have any right to do so. The rival for fish in between fishermen and monk seals can be lessened by determined actions deriving amateur fishermen from the scene as per the existing regulations.

- 5. Controlling illegal speargun fishing, producing deterrent actions and precautions.
- 6. Producing leaflets, documents, posters to inform and guide people on conservation regulations dealing breeding caves, located at Sarpıncık, Hamzabükü and Ardıç. Enhancing this guidance by informative boards placed at main centres of tourism activity, Balıklıova village, Karaburun and Mordoğan.
- 7. Producing regulations and monitoring acitons for prohibiting human activity on islets and islands at breeding seasons of marine birds May-June -, Buyukada, Egriliman, Karada, Bayrak and Toprak islands in priority.
- 8. Creating no-take zones at marine ecosystems in cooperation with relevant stake holders, and declare, commit the regulations on formal plans decisions.
- 9. Taking into consideration to adopt a regional -small scale- Vessel Traffic Management and Information System (VTMIS). Actually Turkish Maritime Administration already started such an initiative including İzmir Bay. It is foreseen that the system will effectively serve for managing marine traffic, accidents and patrolling and other beneficiary organizations such as MARA and MoEF shall make use of advantages of this project.

If analyzed carefully, one will see that the above mentioned threat factors are not irreversible, except coastal constructions and approval of development plans happened along pristine coasts, and can be reversed in case the problems are studied well and solutions are found based on scientific & true knowledge and information. Illegal fishery, decline in fish stocks, marine litter pollution, human penetration into monk seal caves or monk seal entanglements to fishing gear. It will not be difficult to state that monk seal sighting frequency and pupping rate to increase as compared to recent years when the above mentioned site-specific problems are solved and area management plans are implemented successfully.

The most crucial subject for the protection of wild life –including Mediterranean monk seal for sure- is habitat protection. Habitat deterioration can be avoided by controlling the coastal developments along monk seal habitats especially monk seal caves and vicinity. If the habitat is deteriorated by constructions and road opening to the remote bays along Karaburun Peninsula coasts, it would be an irreversible process and become impossible to bring solutions to bring back the habitat! The concrete measures to be taken to protect environment in Karaburun Peninsula will help not only protection of endangered monk seals but also other marine and coastal flora & fauna as well as will help providing better life conditions for future generations. Therefore, "species oriented protection" should not be considered as a main strategy for nature conservation. Instead "habitat protection" should be adopted considering a holistic approach. In this way, all the marine and coastal flora & fauna shall be protected including Mediterranean monk seal.

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