



AGREEMENT WITH THE MONSTER

Lessons We Learned from the
Great White Shark in Turkish Waters

Hakan Kabasakal

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Hakan KABASAKAL

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Cover photo: ©Alessandro De Maddalena. A great white shark, leaping out the water, off South African coast.

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Preface

As a youngster, growing up in Beykoz, İstanbul, near the sea, I was always wondering if I can see one of the world's most magnificent and biologically sophisticated animals one day around the İstanbul Strait because there are few marine creatures in the world which are more feared, more talked about and less known than the great white shark. But, unfortunately, my expectation has not been met.

This makes me feel lucky to be able to write a preface for the book by one of the former brilliant students of mine at the Fisheries Faculty. Great white shark is one of the oldest and interesting species among other sharks and deserves special protection. Mr. Hakan KABASAKAL has dedicated his life to the protection of shark biodiversity and research. His enthusiasm is huge and he has been collecting samples in fish markets or photographing sharks for many years. I sincerely congratulate him.

It is a real pleasure to publish this book from Turkish Marine Research Foundation. Despite its notorious reputation, many divers desire to see great white sharks underwater, not from the cages like in touristic diving. When you look at the video of that species, you find that it is an amazing creature and its protection, mainly against by-catch and discards, really matters.

I hope this book along with the other book on sharks by Mr. KABASAKAL, which has been already published by our foundation recently, will encourage more people to study sharks in Turkish waters. Indeed, knowledge of these amazing animals is seriously lacking in our waters and the management of the shark species is strongly related to intensive research effort.

I believe that this book is unique in many ways due to its contents based on the wide range of new information and original outputs of many anecdotal and historical information about the great white shark.

Surely, this book will contribute to the protection of the shark biodiversity in Turkey as well as in other areas of the Mediterranean Sea. We have to protect this formidable ocean dweller, this is our responsibility for the next generation.

Bayram ÖZTÜRK
Director
Turkish Marine Research Foundation
Beykoz, İstanbul – November, 2020

Acknowledgments

I am very grateful to whom contributed to the publication of *Agreement with the Monster*, and who shared my joy during my long journey in the wake of great white shark, for the last 30 years. The leading great white shark expert of the Mediterranean, my dear friend, Dr. Alessandro De Maddalena has generously shared his many years of knowledge and wonderful photographs with me. Dr. Lovrenc Lipej, Dr. Martina Orlando and Dr. Patricija Mozetic of Marine Biology Station, Piran, have always been supported my publication efforts with friendly comments. Mr. Agop Savul, a keen archivist and a naturalist, has opened the gate to the past of the great white sharks, once upon a time occurred in Turkish waters. Mr. İrfan Yürür, Mr. Ayhan Şentürk, Mr. Gökhan Karakaş, Mr. Halil Ataç, Mr. Cenk Balkan, Dr. Evrim Kalkan, Dr. Aylin Yarmaz Türkeğilmez, Mr. S. Özgür Gedikoğlu, Dr. S. Ünsal Karhan, Dr. Raşit Bilgin, Mr. Emrah Evsen, Mr. Erdi Bayrı, Mr. Serço Ekşiyan, Mrs. Maria Pilitsoğlu, Mr. Nasuhi Albulak and Mrs. Eylül Ataç, have joined to my long journey from time to time. I will always remember their accompany with joy and compassion. Prof. Dr. Bayram Öztürk, founding president of Turkish Marine Research Foundation, TUDAV, has given any possible support for the publication of this book, and I will always remember his support with gratitude, as well. Dr. Ayaka Amaha Öztürk, a cetacean expert, spent long hours for the proofreading, which remarkably improved the linguistic quality of the book. Dr. Arda M. Tonay, a long lasting friend and a colleague, and Ms. Zeynep Gülenç, have handled almost all of the bothering paperwork during the publication process with a great patience. Last but not least, very special thanks go to my wife, Özgür, and my son, Derin, for their endless love, support and patience to my incorrigible passion of research and adventure. I love you both with all my heart. Dear reader, *Agreement with the Monster*, was written in the light of current knowledge to summarise the lessons we have learned from the great white shark, whose existence was denied for many years in Turkish waters. When you finished reading the text, I hope you could try to find a way to reach an agreement with the monster in your personal ocean.

Hakan KABASAKAL
Shark Researcher
Ichthyological Research Society
İstanbul – November, 2020

Prologue

One of the days of February in the year of 1881 was definitely different than the others. That day has been started as the other days of February. It was a cold winter day; it might be snowing, or the surface of the İstanbul Strait might be choppy because of the reputed northern storms.

Residents of Beylerbeyi, who were walking by the seaside in the early hours of that amazing day, have been presumably staggered, even in panic, because of the scenery they have witnessed. It was quite enough to recognize the stranded carcass at a glance. Triangular teeth with serrated edges revealed that the stranded monster was a dead great white shark (*Carcharodon carcharias*), which is locally known as “*harharyas*”. Apparently, the monster was accidentally caught by a bluefin tuna hand-liner, and the fisherman was desperately towed the monster to the coast to extract the hand-forged precious hook that got in stuck in monster’s jaws. The fisherman got his hook and just thrown away the dead monster on the beach. Thanks to God, it was a cold winter day, otherwise the village could have been reeked for several days because of the rotten shark.

British shark expert Ian Fergusson was briefly mentioned the stranding of a great white shark on Beylerbeyi shore, in his remarkable study on the distribution and autecology of *C. carcharias* in north Atlantic and Mediterranean Sea (Fergusson 1996). Since Fergusson (1996) has not told this story in detail, the above paragraphs are the expressions of my imagination on that wondrous morning in February 1881.

In *The Log from the Sea of Cortez*¹ John Steinbeck says “*man really needs sea monsters in their personal oceans...*” This short sentence is a very clear and irrefutable description of the mankind’s fearful curiosity, chasing in the wake of sea monsters. Mankind’s unleashed curiosity of sea monsters has always been the driver of illustrations of bizarre sea creatures, inhabiting the imagination of medieval age people. For the sake of example, the exaggerated sea creatures illustrated in the books by medieval age scientists, were the fantastic expressions of medieval age people’s monster obsession (Hendrix 2018). In one of the Jules Verne’s classics, *The Sea Serpent*², cruel chase of Captain Boucart, the commander of the whaling ship Saint-Enoch, in the wake of sea serpent, has been transformed into a breathless adventure by the mastermind of author. However, in the age of brilliant advancements in science and technology, today we can dive the deepest points of the oceans. In the age of technology, a monster can run but not hide! With the aid of scientific advancements, sea monsters of the past have been transforming into ordinary elements of the marine fauna. Since the oceans

¹ John Steinbeck, *The Log from the Sea of Cortez*, Penguin Books, 1995, page 27.

² Jules Verne, *The Sea Serpent*, İnkilap ve Aka Publishers, 1981, 4. edition, in Turkish.

missing out of their monsters and becoming more calm and secure with every scientific discovery, we have been searching for new candidates of monsters to replace the old ones.

Whenever a conversation starts on the great white shark (Figure 1), the term “*monster*” has always been the most frequently used statement to describe this magnificent but misunderstood predatory fish. Scientific discoveries destroyed the fantastic sea monsters of our imagination, and eventually they resurrected in the body and spirit of the great white shark. Being identified with the imagination of the monster is the destiny of the great white shark, would not be an erroneous expression.



Figure 1. The fearless predator of the silent depths, the great white shark, *Carcharodon carcharias*. (Photo: Alessandro De Maddalena).

The masters of the literature have been strikingly collaborated in the transformation of an ordinary apex predator, the great white shark, to a bloodthirsty sea monster in mankind’s imagery. Although, the above quotation from John Steinbeck, is quite enough to emphasize our incurable obsession for the sea monsters, insisting to inhabit our sub consciousness forever, Steinbeck has never termed the great white shark as a monster. Peter Benchley and his masterpiece novel, *Jaws*³, seemed the main responsables for the metamorphosis of the great white shark from an ordinary fish to a supernatural monster; however, this metamorphosis has been started by another master of the literature, Ernest Hemingway, before the publication of *Jaws*. But before mentioning *Jaws*, it would better to talk about the monster of Hemingway, briefly...

A small fishing village on the north coast of Cuba, Cojímar, has a privileged place among many other Caribbean fishing villages, by virtue of the largest accurately

³ Peter Benchley, *Jaws*, Altın Kitaplar Publishers, 1974, 1st edition, in Turkish.

measured great white shark has been caught by two local fishermen (Beegel 2015). As the year 1945 began, the fishermen of Cojímar became aware that an enormous predator was patrolling in their native waters, the cradle of billfishes – the marlins and swordfishes- and large sharks. Whole sets of floating fishing rigs were lost, and the hooked head of large sharks and marlins, the fishermen pulled in, were the signs of an invisible monster hiding in the deep dark waters.

And the deep dwelling monster has been caught by the fishermen José Hernández and Juan Yuca, of Cojímar (Beegel 2015). On that day of 1945, Hernández and Yuca set sail on the *Adolfina*, a 12 m schooner with a gasoline powered winch. Patrolling their lines, the men onboard *Adolfina* saw the oil drum bounce, sink and shake repeatedly and they were aware that they had hooked something huge. Then they began to struggle with the invisible shark, which was later called as “the Monster of Cojímar” (Beegel 2015). When eventually captured and landed on Cojímar shore, the great white shark measured accurately 640 cm in lengths, and because of the lack of a suitable scales, the weight of the shark has estimated nearly 3000 kg. According to US ichthyologists Bigelow and Schroeder (1948), the monster of Cojímar was considered the largest reliably measured specimen of *C. carcharias* in the world.⁴ The great white shark of Cojímar is a size record holding predator for ichthyologists and fisheries scientists; however, for Ernest Hemingway, this specimen is representing more than a simple shark tale. In his famous “Monster Letter” sent to Ms. Mary Welsh -his fourth wife-, Hemingway has not been given the simple description of an enormous shark, but he began experiments writing on sharks and imagined the conceptual fundamentals of his masterwork, *The Old Man and the Sea*. Although, he came to Cojímar on or about 15 March 1945⁵, several weeks later following the capture of the great white shark, the story of the enormous shark that was going around was quite enough for Hemingway, portraying the sharks as the monsters, of which we should slaughter.

Sharks are bloodthirsty man-eaters! Since the ancient times, this prejudgment has been strongly rooted in our consciousness and succeeded reaching modern times. Iconography and literature have always been embodied the required monster in the entity of the shark, representing them as ferocious animals, man-eaters and voracious predators. The mass media, in pursuit of shocking headlines, one of the main drivers in the ‘criminalization’ of shark attacks, by depicting ‘brutal’ sharks patrolling beneath the waves and aspiring killing people (see e.g. Mazzoldi *et al.* 2019; Figure 2). A huge and dead shark washed ashore, our imaginary sea monster, had become a bankable commodity for the mass media that was guaranteed to attract the public interest and ratings (Francis 2012; Kabasakal 2010; Kabasakal and Bilecenoğlu 2020). No doubt, the headline maker great white shark, has always been one of our most popular sea monsters, providing

⁴ Bigelow and Schroeder (1948), page 138.

⁵ Beegel (2015), page 12.

fresh blood to the iconography, literature and media. *Carcharodon carcharias* is probably the most popular and most iconic shark species worldwide, well known through several books, movies and documentaries, *Jaws* being the most popular among them. Speaking honestly, *Jaws* was the milestone of sentencing the great white shark and other sharks to death! In this masterpiece novel by Peter Benchley (RIP) and the subsequent film, a great white shark circling around Amity Island and finally killed a reputed shark hunter, Captain Quint, was portrayed as a merciless man-eater. With the aid of an exacerbated fear, the great white shark –and other sharks- had metamorphosised to carbon copy blood thirsty monsters. In fact, the great white shark was just a big fish; a charismatic hunter, which has unfairly stigmatized as a monster, but playing a vital role in marine megafauna (Mazzoldi *et al.* 2019).

The great white shark, which has been stigmatized and criminalized as a “blood thirsty sea monster” until quite recently, is just a carnivorous fish in the natural advance of food chain. In fact, *C. carcharias* is an apex predator, playing essential roles through the ecological process and natural selection in the ocean environment (Camhi *et al.* 1998; De Maddalena and Heim 2012). It is a well-known fact that the great white shark preys upon the large bony fishes, like the bluefin tuna and the sword fish; marine mammals, like seals and dolphins; as well as, its relatives, the other shark species (Compagno 2001; De Maddalena and Heim 2012). Because of its nature, predatory capacity of a hungry great white shark has no limits.

Probably we started to like it as we get more and more information about the great white shark! Global research with remarkable efforts for creating awareness on the ecological role of *C. carcharias*, makes us admire this apex predator. No doubt, a considerable amount of people still stigmatize it as a monster; however, it is an irrefutable fact that some of us have been searching a way to come an agreement with it.

Today, most megafauna species are considered as charismatic animals and flagship species, e.g. species that have “the ability to capture the imagination of the public and induce people to support conservation action and/or to donate funds (Mazzoldi *et al.* 2019). An enormous female great white shark, which named as Deep Blue or gentle grandma, supposed to be as large as the Cojimar specimen, attracts divers’ attention, whom aspiring swim by with it. Almost every year, charter boats with divers and swimmers onboard, chasing Deep Blue in waters of Guadalupe and Hawaii islands. Similar encounters with monster occurred in waters of Australia and South Africa. In the secure environment of a shark cage, while divers having unforgettable moments with a great white shark, they may personally come to an agreement with the circling monster. I wonder if we can come to a global agreement with the monster, one day? Why not?

Ada açıklarında bir deniz canavarı yakalandı

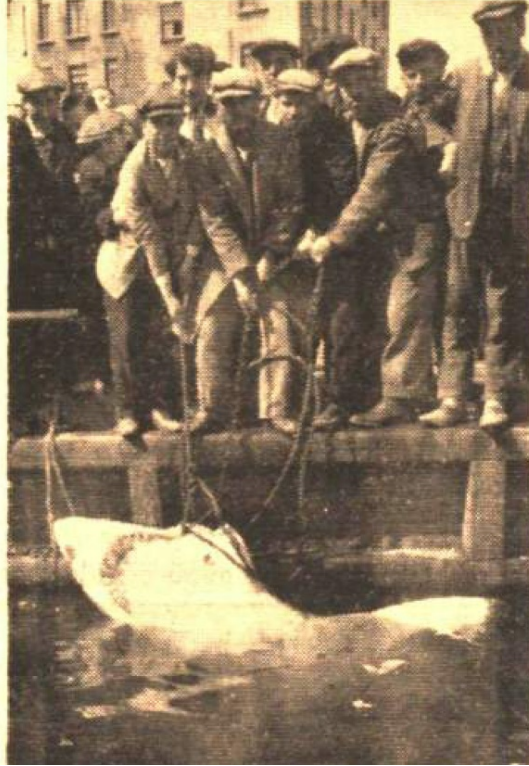


Figure 2. “A sea monster was hooked off the island!” Newspaper clip, dated March 21st, 1937, reporting the capture of a great white shark off Prince Islands (Marmara Sea). The accompanying report reads: a sea monster weighing 1700 kg was harpooned by two fishermen, set sail for catching swordfish off Büyükada, the main island of Prince archipelago. (Hakan Kabasakal’s archive).

Carcharodon carcharias is one of the well-known and well-studied species of Mediterranean sharks. Curious readers can find a vast bibliography in Lipej *et al.* (2004), Bradaï *et al.* (2012), De Maddalena and Heim (2012) and Kabasakal (2015). Several recent articles on Mediterranean great whites show that the number of the records of *C. carcharias* in the Mediterranean Sea has been rising since medieval age. In their outstanding review, De Maddalena and Heim (2012) reported on the occurrence of 596 specimens of *C. carcharias* in the

Mediterranean Sea.⁶ Boldrocchi *et al.* (2017) reported on the capture of 628 great white sharks in the Mediterranean Sea, through a 1539 years interval between 476 and 2015.⁷ According to Moro *et al.* (2019), between 1860 and 2016, 773 great white sharks were recorded in the Mediterranean Sea.⁸ Different researchers, different time periods and changing numbers... Regardless the changing numbers, there is only one thing that not changed through the centuries: the great white shark –our imaginary sea monster- has always occurred in the Mediterranean Sea, and its survival in the future solely depends on whether we accepted to come an agreement for coexisting with the monster in this sea.

For some reason, the occurrence of the great white shark in the seas of Turkey has been neglected for many years. Unreasonable efforts have been spent to whitewash the existence of *C. carcharias* from Turkish waters. I am just wondering to understand the reasons, which stay behind this unreasonable ignorance to keep the monster away from us. I don't want to speculate on this topic, so I won't go further. However, when I was a student in the Faculty of Aquatic Sciences (former Fisheries Faculty) of İstanbul University, during late 1980's and early 1990's, I remember that the occurrence of *C. carcharias* in Turkish waters has been mentioned in Turkish Marine Fishes lectures. Furthermore, one of the many marine fishes landed at İstanbul Fish Market and mentioned in the book titled *Fish and Fisheries of Turkey*, was the great white shark (Deveciyan 1926).⁹ In one of the earliest ichthyological inventories of the seas of Turkey, Akşiray (1987) also reported on the occurrence of *C. carcharias* in the mentioned waters.¹⁰ As time goes by, evidences pointing out the occurrence of *C. carcharias* in Turkish waters increasing (Kabasakal 2015); however, this unreasonable ignorance still persisting for some people.

Since the early 2000's, a remarkable increase is obvious in the number of researches on the great white shark occurring in Turkish waters (Kabasakal 2019). As a result of long-lasting research efforts, lessons we have learned from 62 great white sharks recorded in Turkish waters since 1881 to date, are summarised in the present book. Following many deep dives in the archives of daily newspapers published in former Ottoman Empire and the successor Republic of Turkey, since the early 1990's, now we know that once *C. carcharias* seasonally occurred in the Marmara Sea and İstanbul Strait (Kabasakal 2003, 2014), in pursuit of migrating bluefin tuna (Kabasakal 2016). Further research performed in the northern Aegean Sea revealed that mature females occurred seasonally in Turkish coastal waters (Kabasakal 2014), and a possible nursery ground of *C. carcharias* may be present in Edremit Bay (Kabasakal 2020a). Recent capture of a young-

⁶ De Maddalena and Heim (2012), page 3.

⁷ Boldrocchi *et al.* (2017), see abstract, lines 7 and 8.

⁸ Moro *et al.* (2019), see abstract, lines 7-10.

⁹ Deveciyan (1926), pages 194 and 195.

¹⁰ Akşiray (1987), page 144.

of-the-year great white shark off Kumkale coast (southern Çanakkale Strait), suggests the possibility that *C. carcharias* is beginning to recolonise its former habitat in the vicinity of the Marmara Sea (Kabasakal and Bayrı 2020).

Regardless our unreasonable efforts neglecting its occurrence, the great white shark continues patrolling off our shores. We should understand that the survival of the critically endangered great white shark in the Mediterranean Sea, obviously depends on our agreement with our imaginary monster. As a professional diver and a shark nerd, I nurtured the fear of shark in my mind for long years; however, eventually, I think I could find the ethical and scientific reasons to come an agreement with the monster. I hope, when you finished reading this book, you could also have found a way to come an agreement with the monster, as well.

Distribution of *Carcharodon carcharias* in Turkish Waters

Spatial and temporal distribution of 62 specimens of *C. carcharias*, recorded in Turkish Great White Shark Data Archive (TGWSDA; Appendix I), show that historical records of the great white shark in Turkish waters occurred in the Marmara Sea and İstanbul Strait; while the contemporary occurrence of the species was recorded in Turkish Aegean waters. As I mentioned in the prologue with a fictional story, historical records of *C. carcharias* in the İstanbul Strait began with the stranding of a huge specimen on Beylerbeyi shore in February 1881, and the last occurrence of the species (a specimen of ca. 500 cm TL) in the Marmara Sea was recorded in May 1985, off Kapıdağ Peninsula (Kabasakal 2003; Figure 3). The seasonal occurrence of the great white shark in the Marmara Sea and İstanbul Strait has been previously documented by Deveciyan (1926), Ayaşlı (1937) and Akşiray (1987). Based on the rare occurrences of the species in prebosphoric waters, Russian ichthyologist Emile Slastenenko added *C. carcharias* to the Black Sea ichthyofauna (Slastenenko 1955-56; cited in Akşiray 1987); however, no occurrences of the great white shark in the mentioned region have been recorded at least for the last 70 years. Although two huge specimens of *C. carcharias* have been caught in the İstanbul Strait in the late 1930's and headlined in daily newspapers (Kabasakal 2016), for some reason, Rhasis Erazi (1942) has not added *C. carcharias* in the ichthyological inventory of the Marmara Sea and İstanbul Strait. The reason why Rhasis Erazi (1942) did not include *C. carcharias*, a very well known seasonal visitor of the region and a bycatch of bluefin tuna handliners fishing in the İstanbul Strait, in the ichthyological list of the Marmara Sea and İstanbul Strait, is still questionable. Interestingly, in a recent review of the ichthyofauna of the Marmara Sea, Eryılmaz and Meriç (2005) considered *C. carcharias* as a rarely occurring species in the region; however, there's a 21- year gap between the last occurrence of the great white shark in the Marmara Sea, in May 1985, and the publication date of the review by Eryılmaz and Meriç (2005). Exclusion of the great white shark, a well-known member of the fish fauna of the 1940's of the Marmara Sea, in the ichthyological inventory by Rhasis Erazi (1942), as well as the inclusion of the species in an early 2000's review (Eryılmaz and Meriç 2005), which was totally based on historical records of the Marmara Sea and İstanbul Strait on *C. carcharias*, are equally confusing.

To summarise above, the occurrence of *C. carcharias* in the Marmara Sea and İstanbul Strait is based on historical records of 40 specimens, which have been captured in bluefin tuna fisheries, between 1881 and 1985 (Kabasakal 2003, 2008, 2011, 2014, 2016, 2020b, d). As it is depicted in the map (Figure 3), locality of captures of the great white sharks in the Marmara Sea and İstanbul Strait, were concentrated in İstanbul Strait and in the prebosphoric waters of the Marmara Sea, which was associated with the bluefin tuna fishery, actively operated in the

same marine area since Byzantine era (4th century C.E.) to the mid 1980's (Kabasakal 2016; Karakulak and Oray 1994; Puncner *et al.* 2015).

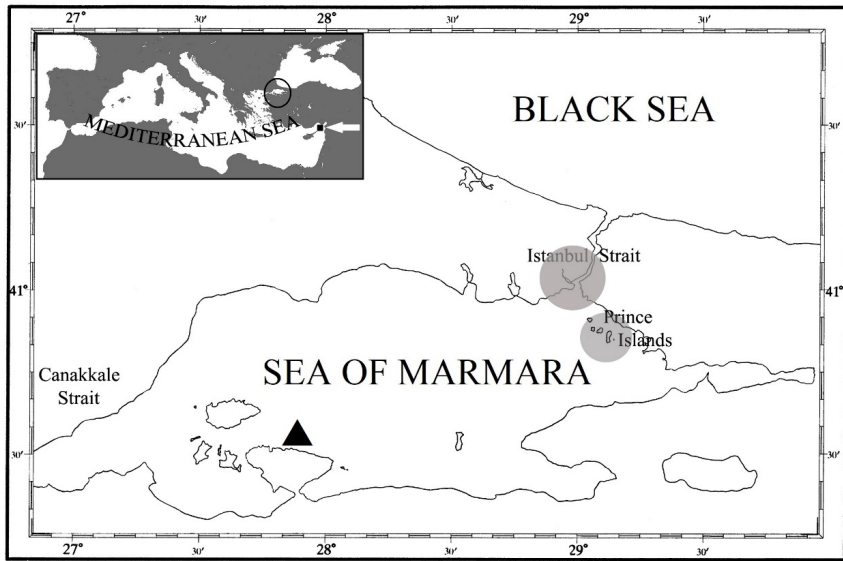


Figure 3. Light gray shaded circles indicate the localities of historical records (TGWSDA specimen Nos 1-17 and 19-40; Appendix I) of *C. carcharias* in the Marmara Sea and İstanbul Strait; dark triangle (▲) indicates the single record (TGWSDA specimen No 41; Appendix I) of the great white shark off Kapıdağ Peninsula. Dark square (■) in the small map indicates the single historical record (TGWSDA specimen No 18; Appendix I) of *C. carcharias* in İskenderun Bay, in 1950's.

Let's talk about the contemporary records of the great white shark in Turkish waters. The story of the confirmed records of *C. carcharias* in Turkish Aegean waters has begun with the capture of a huge female (ca. 500 cm TL) on March 18th, 1991, off Foça coast (Kabasakal 2014; Figure 4). Registered as the specimen 42 in TGWSDA, the great white shark caught off Foça (Figure 5), is one of the largest specimens of *C. carcharias* recorded in the Aegean Sea, ever. The most recent occurrence of *C. carcharias* in Turkish Aegean waters, was recorded on June 14th, 2020, off Enez coast (Kabasakal 2020c). Locality of captures of the great white shark in Turkish Aegean waters exhibits a sporadic distribution from north to south of the region; while, the captures of the newborn and young-of-the-year (YOY) specimens concentrate in Edremit Bay, suggesting a possible nursery ground. The possibility of a nursery ground in Edremit Bay will be discussed in detail in another chapter. Based on the occurrence data recorded in TGWSDA, 20 specimens of *C. carcharias* have been caught or sighted in Turkish Aegean waters, between 1991 and 2020 (see Appendix I). Similarly, great white sharks have been incidentally caught in different types of commercial fishing gears, mainly trammel- or gill-nets, as well as purse-seiners in a few instances (Kabasakal 2014; Kabasakal and Bayrı 2020; Kabasakal *et al.* 2018). The recent

capture of a YOY specimen caught in the southern entrance of the Çanakkale Strait suggests whether *C. carcharias* began recolonizing its historical feeding ground, the Marmara Sea (Kabasakal and Bayrı 2020).

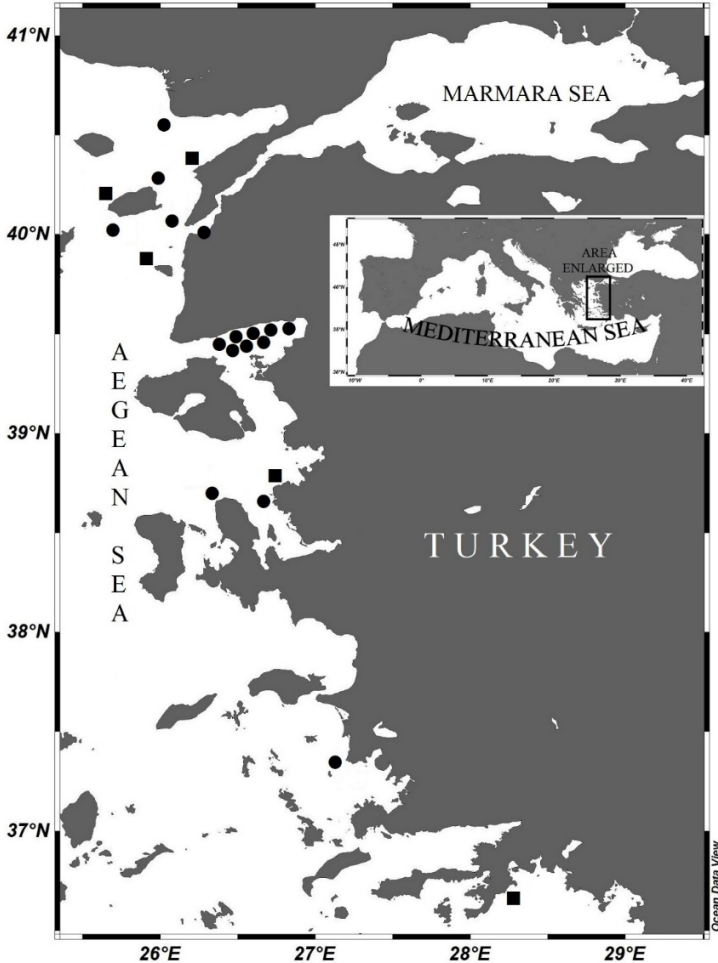


Figure 4. Locality of contemporary records of *C. carcharias* in the Turkish Aegean Sea (TGWSDA specimen Nos 42-62; Appendix I).

Black dots (●) indicate localities of captures of young-of-the-year and/or juveniles and black squares (■) indicate adult specimens.

Carcharodon carcharias was recorded in İskenderun Bay in the 1950's (Kabasakal 2014), and while Golani *et al.* (2006) mentioned the occurrence of the species in the eastern Mediterranean, Bariche (2012) considers *C. carcharias* as a rare species in the area. In a 1990's study on the cartilaginous fishes of İskenderun Bay, *C. carcharias* has not been included in the species list (Başusta

et al. 1998). The rarity of *C. carcharias* in the Levantine Sea is also emphasized by the scarcity of captures in the region, where only 5 confirmed captures or sightings were recorded since the 1930's. The story of *C. carcharias* in eastern Levant during modern times begun in 1934, with the capture of a female (425 cm TL) off Alexandria, Egypt (Fergusson 1996), and this record was followed by the capture of the İskenderun specimen (Akyüz 1957), but no part –teeth, jaws, etc.- of this specimen has been preserved. Subsequent to the capture of juvenile great white shark (200 cm TL) off Akko, Israel (Ben-Tuvia 1971), a huge specimen (ca. 500 cm TL) was sighted off Paphos, Cyprus (Fergusson 1996). A great white shark (429 cm TL) was captured by means of commercial pelagic long-lines, off Libian coast in April 2000 (Damalas and Megalofonou 2012), this was the last confirmed catch of *C. carcharias* in the eastern Mediterranean Sea.



Figure 5. Great white shark (ca. 500 cm TL; TGWSDA specimen No 42; Appendix I), incidentally caught by a commercial purse-seiner off Foça, on March 18th, 1991. (Hakan Kabasakal's archive).

Individual details (date and locality of captures; length (TL, cm) and weight (W, kg); sex, remarks and relevant references) of 62 great white sharks recorded in TGWSDA are presented in the table in Appendix I, and photographs of several specimens are shown in Appendix II.

Size of the Great White Shark

Maximum length and weight of the great white shark have always been a trigger of adrenalized debates among shark experts. In the prologue, I briefly mentioned the story of the enormous great white shark caught in 1945 off Cojímar. Although, the Cojímar specimen is approved as the largest great white shark, of which the total length has been measured accurately, there are stories about gigantic specimens of *C. carcharias*, which have been claimed as large as 800 cm or even 1100 cm (Randall 1973; De Maddalena *et al.* 2001). Complete set of jaws of a gigantic specimen, which has been captured in Australian waters and length measured 1100 cm (!), was examined in British Museum by a reputed ichthyologist John Randall (RIP). Examination of the jaws and teeth, now stored in British Museum, and comparison with the jaws of great white sharks of known length revealed a length about 500 cm (Randall 1973). However, regarding the bites on whale carcasses found off southern Australia, Randall (1973) also suggested that great white sharks as long as 750 or 800 cm exist today.

Well, what can we tell about the size of largest great white sharks caught in Turkish waters? Lengths of 49 specimens registered in TGWSDA ranged from 85 to 800 cm. The smallest specimen (85 cm TL; TGWSDA specimen No 53; Appendix I) was caught in Edremit Bay (northern Aegean Sea), on July 6th, 2011, and the largest specimens of *C. carcharias* (800 cm TL; TGWSDA specimen Nos 8 and 22; Appendix I) were hooked by bluefin tuna hand-liners in the İstanbul Strait (Kabasakal 2014). Boldrocchi *et al.* (2017) assessed age distribution of *C. carcharias* using four length categories: young-of-the-year (YOY) (≤ 175 cm TL), juvenile (>175 -300 cm TL), subadult (>300 -360 cm TL for males and >300 -450 cm TL for females) and adult (>360 cm TL for males and >450 cm TL for females). Regarding the age distribution of *C. carcharias* proposed by Boldrocchi *et al.* (2017), 28 out of 49 great white sharks caught in Turkish waters with known lengths were adults, and followed by 8 subadults, 7 juveniles and 6 YOY specimens. Weight data were also recorded for 21 out of 49 specimens. Graphic presentation of length and weight relationship of these 21 great white sharks is depicted in Figure 6.

De Maddalena *et al.* (2001) analysed the photographic evidences of the largest great white sharks caught in the Mediterranean Sea, and concluded that *C. carcharias* can reach at least 640 to 660 cm TL and very probably even more. Despite their conclusion, they also added that some of the huge Mediterranean great white sharks, exceeding 600 cm mark, could have been inaccurately measured or their sizes could have been exaggerated. For example, based on the photographic analysis of a great white shark caught off Filfa, Malta (central Mediterranean Sea), which has been measured as 714 cm TL, De Maddalena *et al.* (2001) estimated its length can range from 520 to 550 cm. Another great white shark caught off Malindi, Kenya (Indian Ocean) was measured as 640 cm TL; however, its total length reestimated by De Maddalena *et al.* (2001) as 570 cm.

Relevant references of great white sharks caught off Filfa and Malindi are given in De Maddalena *et al.* (2001). Regarding size estimations of great white sharks caught in Turkish waters, a similar situation is existing.

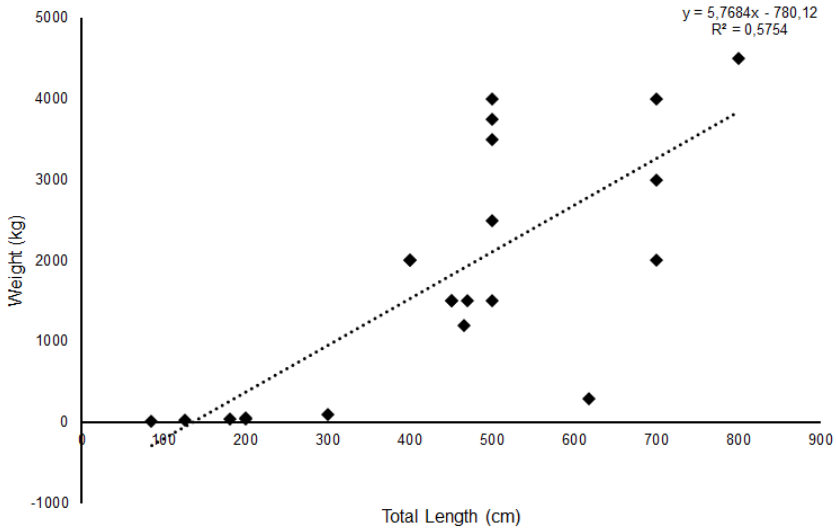
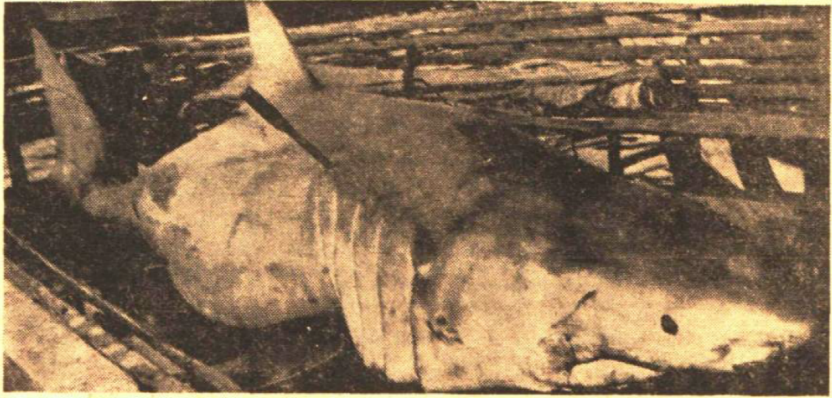


Figure 6. Length-weight relationship of the great white sharks (n=21) caught in Turkish waters.

Reported total lengths of several great white sharks caught in the Marmara Sea and İstanbul Strait, which are exceeding 600 cm mark (see TGWSDA table in Appendix I for those specimens), can drive some of the shark experts act with suspicion towards these data, since no evidence is available on how they were measured or weighed. Size data of these historical great white shark records mentioned in TGWSDA, were collected from the catch records or daily newspapers of the relevant years. For example, weight of the great white shark depicted in the newspaper clip in Figure 7, has been reported as 3000 kg in the subheading. Similarly, Ayaşlı (1937) reported on the capture of an enormous great white shark (800 cm TL and 4500 kg of weight) in the İstanbul Strait before 1926. This alleged 800 cm great white shark, weighing 4500 kg, appeared to be the largest specimen of *C. carcharias* caught in Turkish waters ever. However, for the sake of accuracy, female great white shark (550 cm TL), which was caught off Bozcaada in March 1996, was the largest accurately measured specimen of *C. carcharias* occurred in the same region. Size data of great white sharks caught in Turkish waters are presented in TGWSDA (Appendix I).



Üç Ton Ağırlığında – Ortaköy açıklarında, dün sabah Hayri Kuloğlu ve Ziya Zeki Zayni adlarındaki iki balıkçı, 9 saatlik bir mücadeleden sonra 3 ton ağırlığında bir köpek balığını yakalamaya muvaffak olmuşlardır. İki motorun yedeğine bağlanarak Karaköy açıklarına getirilen bu balık bilâhare halka teşhir edilmiştir. Resimde, yakalanan köpek balığı görülmektedir.

Figure 7. Great white shark caught off Ortaköy (İstanbul Strait) on February 19th, 1962. Subheading reads: **Weighing Three Tons** - After struggling for 9 hours, fishermen Mr. Hayri Kuloğlu and Mr. Ziya Zeki Zayni, were caught a shark weighing 3 tons. Shark was towed by means of two gasoline powered fishing boats and displayed to public on Karaköy coast. (Hakan Kabasakal's archive).

Morphological Aspects of *Carcharodon carcharias* Recorded in Turkish Waters

As I mentioned in the previous chapter, maximum lengths and weights of the great white sharks caught in Turkish waters could have been exaggerated. Furthermore, the lack of accurate and detailed morphological measurements of these huge specimens creates another remarkable gap in our understanding on *C. carcharias*. Unfortunately, accurately measured morphological datasets, expanding through a broad size range of the great white sharks caught in Turkish waters are not available. However, morphological measurements of 3 newborns, recently captured in the northern Aegean Sea (Kabasakal and Gedikoğlu 2008; Kabasakal and Bayrı 2020), provides us initial morphometric data of YOY great white sharks occurring in Turkish waters.

Contrary to relative species of *Isurus* and *Lamna* genera, eye diameter of *C. carcharias* is smaller than those of relative lamnid sharks –mako and porbeagle sharks-, and its eye diameter ranges from 0.7 to 1.8 percent of the total length (Ebert and Stehmann 2013). In the examined newborns of *C. carcharias*, eye diameter ranged from 1 to 1.58 percent of total length (Table 1). Examination of the eye morphometry of embryos and newborns of *C. carcharias* on a worldwide scale revealed that eye diameter ranged from 1 to 1.9 percent of total length, and this proportion gradually diminishes in the growing specimen (Table 1). Based on the morphometric data presented in Table 1, eye of smaller (≤ 125.5 cm TL) newborns is quite oval in shape with horizontal diameter of eye is quite longer than the vertical diameter and as the newborn grown (≥ 155 cm TL) the eye takes its characteristic circular shape (Francis 1996; Uchida *et al.* 1996; Saïdi *et al.* 2005; Kabasakal and Gedikoğlu 2008; Kabasakal and Bayrı 2020; Santana-Morales *et al.* 2020).

Table 1. External and proportional morphometric measurements (% of total length) of the individual newborn shark, compared to embryos (*) and free-swimming great white sharks reported by different authors.
Mediterranean specimens are typed bold.

References	Kabasakal and Gedikoglu (2008)	Kabasakal and Bayrı (2020)	Santana-Morales <i>et al.</i> (2020)	Saïdi <i>et al.</i> (2005)	Francis (1996)*	Uchida <i>et al.</i> (1996)*				
Total length (TL, mm)	1255	1450	1550	1066	1340	1430	1449	1350	1500	1400
Measurements	% of TL of mean (mean TL 1352 mm)		%TL	%TL	%TL	%TL	%TL	%TL	%TL	%TL
Precaudal length	78		78	76.6	77.4	76.6	78.1	-	-	-
Fork length	-		86	86.3	85.6	88.1	88.1	-	-	-
Pre-first dorsal length	37.26		-	35.9	32.2	34.5	35.9	35	34	34.6
Pre-second dorsal length	66.4		65	66.3	63.5	66.5	66.8	-	-	-
Prepectoral length	27.57		-	25.4	22.8	24.5	24.2	24.6	22.7	22.9
Head length	27.91		24	28.1	25	24.8	26.6	-	-	-
Prebranchial length	22.14		18	20.8	17.8	19.7	20.6	20.4	17.7	18.6
Preoral length	6.76		6	6.0	4.8	-	6.3	-	-	-
Interdorsal space	20.36		22	21.6	21.6	21.3	22.1	21.8	21.7	22.9
Pelvic fin length	8.2		-	9.2	8.3	-	-	-	-	-
Prepelvic length	54.04		52	51.2	51.6	54.5	55.9	53.1	53.3	55
Preanal length	69.09		68	66.8	66	69.3	68.4	-	-	-
Pelvic-anal length	10.27		11	10.7	10.5	-	9	-	-	-
Pelvic-caudal length	-		19	19.7	19	18.5	19	17.3	16.3	15
Snout-ventral length	56		55	54.4	53.4	55.9	57	-	-	-
Prenasal length	4.25		4	3.8	3.3	3.6	3.7	3.4	3.8	3.6
Intergill length	6.28		8	6.2	7.2	6.2	6.3	-	-	-
Eye width	1.25		1	1.9	1.2	1.5	1.4	1.5	1.5	1.5
Eye height	1.58		1	1.6	1.1	1.5	1.6	-	-	-
Internasal length	3.99		-	4.5	3.4	4	4.1	4	4	4
Mouth width	8.46		-	10.1	9.7	-	10.7	7.9	9.7	8.3

Table 1. Continued

First dorsal height	8.17	-	8.7	8.3	9.3	9.3	9.5	9.1	9
First dorsal inner margin	2.18	-	2.7	1.8	2.7	2.5	-	-	-
First dorsal anterior margin	11.75	-	13.7	12.8	13.6	13.6	-	-	-
Second dorsal base	1.36	-	1.5	1.6	1.5	1.6	-	-	-
Second dorsal inner margin	1.51	-	2.2	1.4	1.4	2.1	-	-	-
Second dorsal anterior margin	2.47	-	2.8	2.5	2.9	2.6	-	-	-
Pectoral inner margin	5.5	-	4.9	3.8	-	4.1	5.7	5.7	5
Pectoral anterior margin	20.55	19	20.5	19.1	-	22.2	-	21.9	22.1
Caudal anterior margin	22.29	-	23.1	23.8	-	-	-	-	-
Caudal terminal lobe	5.06	-	5.2	4.5	4.7	5.1	-	-	-

Analyses on colour photographs of great white sharks, representing a broad size range (125.5 to 550 cm TL), revealed that dorsal coloration of *C. carcharias* occurred in Turkish waters, is uniform leaden grey and the vertical coloration is whitish (Figure 8). The redness or bruises seen on the belly of some specimens (Figure 8a), are caused by fishing gear abrasions or harsh handling. Apex of pectoral fins with distinct black blotches ventrally and a narrow but distinct black band is visible on the front edges of the pectoral fins on their ventral surfaces (Figure 8b). Tip of pelvic fins slightly darkening on ventral surfaces. A distinct black spot is on the tip of the snout ventrally (Figure 8b).

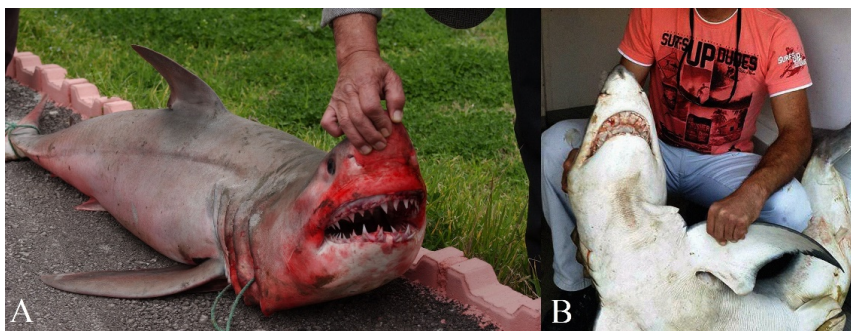


Figure 8. Dorsal and ventral coloration of the great white sharks caught in Turkish waters. Photos (A), Aylin Yarmaz Türkeğilmez, and (B) Ceyhun Gamze Ekinci, SAD.

Aberrant coloration is rarely occurred in *C. carcharias* (De Maddalena and Heim 2012). A true albino great white shark, with unpigmented red eyes and a completely unpigmented white body, has been recorded only one time in South African waters (Smale and Heemstra 1997; cited in De Maddalena and Heim 2012). Anomalous coloration of the juvenile specimen of *C. carcharias* (ca. 200 cm TL), sighted off Enez coast (northern Aegean Sea), on June 14th, 2020, is worth mentioning (Kabasakal 2020c). The apex of the sighted great white shark was narrowly rounded and a broad unpigmented white area was seen from the base of the first dorsal fin to the belly. A whitish patch, covering a large part on the apex of the first dorsal fin was also present (Figure 9). Since one of the main discrepancies between leucism and true albinism is the red or pinkish coloration of eyes in albinos, and dark pigmented eyes in leucistic animals (Clark 2002; van Grouw 2006), the sighted specimen was considered as a ‘leucistic’ great white shark, because of the presence of dark pigmented eyes. This was the first case of leucism reported for *C. carcharias* (Kabasakal 2020c).

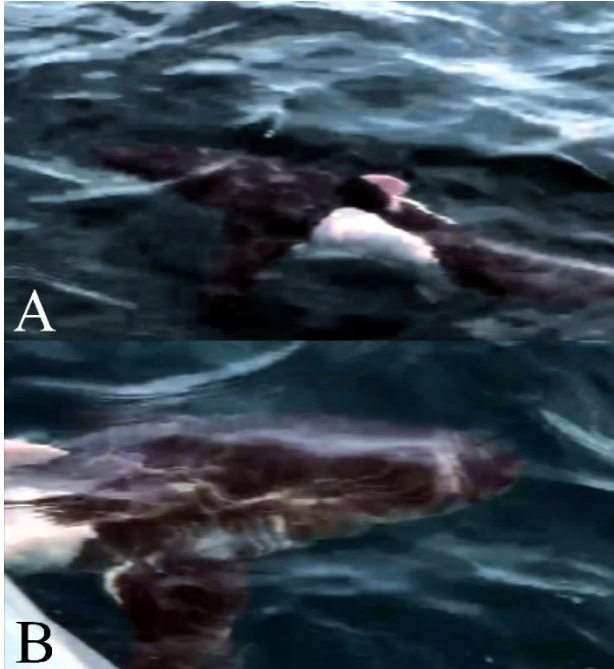


Figure 9. The leucistic great white shark, sighted off Enez coast (northern Aegean Sea).
(Hakan Kabasakal's archive).

Reproduction: New Generations of Mediterranean Great White Sharks

To date, no one could record footage of courtship, mating or delivery of the great white shark in the wilderness. Courtship rituals and parturition are unresolved mysteries of the life story of *C. carcharias*. We have predictions more than solid evidences on these mysteries. One day a lucky researcher will witness these amazing moments in the wild. Wish I will have been that lucky researcher...

Regarding the estimations based on the total length of the great white sharks, males >300-360 cm and females >300-450 cm are considered as matured (Boldrocchi *et al.* 2017). Therefore, males >360 cm TL and females >450 cm TL will be totally matured specimens. According to Boldrocchi *et al.* (2017), regardless the sex, any great white shark >450 cm TL can be considered as a matured specimen. In a recent study on age and growth of the great white shark in the western North Atlantic Ocean (Natanson and Skomal 2015), age at maturity for male and female sharks was estimated as 26 and 33 years, respectively.

Rarity of pregnant great white sharks, particularly in the Mediterranean Sea, is a well-known fact (De Maddalena and Heim 2012). One of these rare occurrences happened in 1992, off Cape Bon, where a pregnant female great white shark (>500 cm TL), carrying two embryos, was captured (Fergusson 1996). Twelve years later, another pregnant female (>587 cm TL) carrying four embryos, was captured on February 26th, 2004, in the Gulf of Gabès (Saïdi *et al.* 2005). Both females were at least 30 years old and slaughtered as the bycatches of commercial fishery. Six embryos have been wiped away from the future population of Mediterranean great white sharks.

Although no pregnant females have been recorded in Turkish waters to date, several historical and contemporary records of huge specimens (>450 cm TL), which are presented in TGWSDA (Appendix I), show that mature specimens of *C. carcharias* are seasonally occurring in Turkish waters. Regarding the occurrence data of great white sharks during the last 30 years, 5 mature specimens (>450 cm TL) were either captured or sighted in Turkish Aegean Sea, between 1991 and 2011 (Kabasakal 2014; TGWSDA, Appendix I). Two out of 5 specimens were mature females (500 and 550 cm TL; TGWSDA specimen Nos 42 and 43, respectively; Appendix I). These two mature females have been incidentally captured by commercial purse-seine fishery, in the vicinity of a possible nursery ground (Edremit Bay) of *C. carcharias*.

Nursery grounds are essential habitats for the survival of shark in general (Heithaus 2007). Due to the occurrence of young-of-the-year (YOY) and pregnant female great white sharks, Tunisian and Sicilian neritic waters have been historically and contemporarily considered as the main nursery area of *C. carcharias* in the Mediterranean Sea (Boldrocchi *et al.* 2017; Bradai *et al.* 2012;

De Maddalena and Heim 2012; Fergusson 1996; Saïdi *et al.* 2005). According to Boldrocchi *et al.* (2017), between the second half of the 19th and the beginning of the 20th century, Sibenik Bay and the nearby Kvarner Gulf area might also serve as a nursery ground for *C. carcharias*. Since *C. carcharias* is a vulnerable shark globally (Rigby *et al.* 2019), and it is a critically endangered shark in the Mediterranean Sea (Dulvy *et al.* 2016; Otero *et al.* 2019), effective management of its nursery grounds is crucial for the survival of the species in the Mediterranean Sea, where it has little or no contemporary immigration from the nearby Atlantic (Gubili *et al.* 2010).

Now, let's talk about the possibility of a nursery ground of *C. carcharias*, off Turkish coasts. Could this be possible? Since the presence of the great white shark in Turkish waters has long been neglected and even the evidences pointing out its occurrence in the area have been spoliated to a certain degree –claimed as misidentification etc.- the answer is, yes! I am sure that this short answer is well enough to horrify some people; however, the truth cannot be hidden.

The amazing story of the baby great white sharks, which I am gonna tell you briefly, started in 2008. It was July and I was making my monthly phone calls with my fishermen friends, living along the Turkish Aegean and Mediterranean coasts, to receive the latest news on shark incidents, capture or sighting of great whites in particular. My long-lasting and friendly relations with my fishermen friends make it possible to become aware of the capture or sighting of a large shark just in a couple of days. Today, with the widespread use of smart phones and social media, accessing such information has become easier. While we were chatting on the phone, Mr. Halil Ataç, a keen fisherman from Altınoluk Province (Edremit Bay, north Aegean Sea) informed me about the incidental capture of two newborn great white sharks in the vicinity. Two great white sharks hooked in Edremit Bay! I couldn't believe my ears and the next twenty four hours was an incredible rush! As soon as I've learned the incidence, I started to organize the delivery of the newborns from Altınoluk to İstanbul Wholesales Fish Market, where they've been preserved in the freezer overnight before I received them to examine with my shark nerd friend, Mr. Sait Özgür Gedikoğlu. A full six hours of measuring, filming, photographing and dissecting the newborns in my little balcony with Mr. Gedikoğlu, was an exhausting but unforgettable experience in our lives.

Speaking honestly, the newborns (125.5 and 145 cm TL; TGWSDA specimen Nos 46 and 47; Appendix I) incidentally caught off Altınoluk coast, on July 1st and 4th, 2008, respectively (Kabasakal and Gedikoğlu 2008), were not the first documented baby great whites in the northern Aegean Sea. Fergusson (1996) reported on the capture of two juveniles (180 and 230 cm TL) off Tasos Island and Kavala coasts (Greece), in the 1940's. However, the key point that makes our newborns extremely important for the Mediterranean as a whole, was the

presence of a birth mark (umbilical scar), seen on the belly between their pectoral fins (Figure 10).



Figure 10. Arrow denotes the birth mark (umbilical scar) of the newborn great white shark (125.5 cm TL; TGWSDA specimen No 46), incidentally caught on July 1st, 2008. (Photo: Hakan Kabasakal).

In the next years, six more newborns, as well as a few juveniles have been caught in Edremit Bay (Kabasakal 2020a). Ongoing research revealed that, despite the occurrences of newborns are concentrated in the bay area, juveniles exhibit a more sporadic distribution from north to south off Turkish Aegean coast (Figure 11). Thus, the presence of a nursery ground of *C. carcharias* in Edremit Bay, is a nonignorable possibility, which is becoming stronger with every new evidence (Kabasakal 2014, 2020a; Kabasakal and Gedikoğlu 2008; Kabasakal *et al.* 2018). Recently, a newborn great white shark was entangled in a commercial gill-net on June 8th, 2020, off Kumkale coast (southern Çanakkale Strait), suggesting that the limits of this nursery ground can be expanded northwardly (Kabasakal and Bayrı 2020). The size range of the newborns caught in Turkish waters (85-160 cm TL; Table 2), is coincided with the size range of newborn great white sharks caught in different regions of the world (91-145 cm TL; Gilmore 1993).

Although juvenile great white sharks are known to frequent inshore water (Harasti *et al.* 2017), they are also known to travel for relatively long distances beyond the perimeters of their nurseries (Bruce *et al.* 2019; Weng *et al.* 2007). Despite the uncertainties about the provenance of specimen 11, it had enough potential for travelling from Edremit Bay to Didim, as suggested by the movement data of juveniles given by Bruce *et al.* (2019) and Weng *et al.* (2007). Offshore and coastal islands appear to offer several advantages to YOYs and juveniles for learning lessons of survival, as revealed, for example, by the studies of Curtis *et al.* (2018), Hoyos-Padilla *et al.* (2016) and Klimley (1985). From this perspective, Edremit Bay nursery ground, which is surrounded by offshore and coastal islands, provides a habitat for growing juveniles to gain experience of

movement between offshore islands and nearshore before departing for long-distance migrations. Furthermore, the seasonality of occurrence of YOYs and juveniles in the Turkish Aegean Sea (from April to mid July) well coincides with the seasonality data presented by Boldrocchi *et al.* (2017), De Maddalena and Heim (2012), Gilmore (1993), Santana-Morales *et al.* (2012) and White *et al.* (2019), who reported a close affinity of the high numbers of occurrences with the warmer months of the year. Regarding the entire Mediterranean records of newborn great white sharks (Boldrocchi *et al.* 2017), 8 out of 29 newborns of *C. carcharias* have been caught in Edremit Bay (Kabasakal 2020a). Therefore, effective management of Edremit Bay as a possible nursery ground of *C. carcharias*, is crucial regarding the overall survival of Mediterranean great white sharks.

Table 2. Data and relevant references of young-of-the-year (YOY) and juvenile great white sharks, occurred in the Turkish Aegean Sea between 2008 and 2020.

No*	Date	Locality	TL (cm)	W (kg)	Gear	References
1	1 Jul 2008	Altınoluk	125.5	-	Gill-net	Kabasakal and Gedikoğlu (2008)
2	4 Jul 2008	Altınoluk	145	-	Gill-net	Kabasakal and Gedikoğlu (2008)
3	21 Feb 2009	Gökçeada	180	47.5	Bottom-trawl	Kabasakal <i>et al.</i> (2009)
4	15 Apr 2009	Çanakkale	300	102	Purse-seine	Kabasakal <i>et al.</i> (2009)
5-7	2010; late Jun, early Jul	Altınoluk	ca. 80-100	?	Trammel-net	Kabasakal (2014)
8	6 Jul 2011	Altınoluk	85		Trammel-net	Kabasakal (2014)
9	19 Sep 2014	Yeni Foça	200	40	Stationary-net	Kabasakal and Kabasakal (2015)
10	2 Jan 2016	Altınoluk	175	-	Stationary-net	Kabasakal <i>et al.</i> (2018)
11	Jan 2017	Gökçeada	180	-	Stationary-net	Kabasakal (2020a)
12	Apr 2017	Altınoluk	160	-	Gill-net	Kabasakal (2020a)
13	4 Jun 2017	Didim	200	60	Purse-seiner	Kabasakal <i>et al.</i> (2018)
14	14 Apr 2018	Karaburun	180	-	Stationary-net	Kabasakal <i>et al.</i> (2018)
15	8 Jun 2020	Kumkale	155	-	Gill-net	Kabasakal and Bayrı (2020, in press)
16	14 Jun 2020	Enez	ca. 200	-	Sighting	Kabasakal (2020c, in press)

*Numbers seen in 'No' column are same with the numbers in Figure 11.

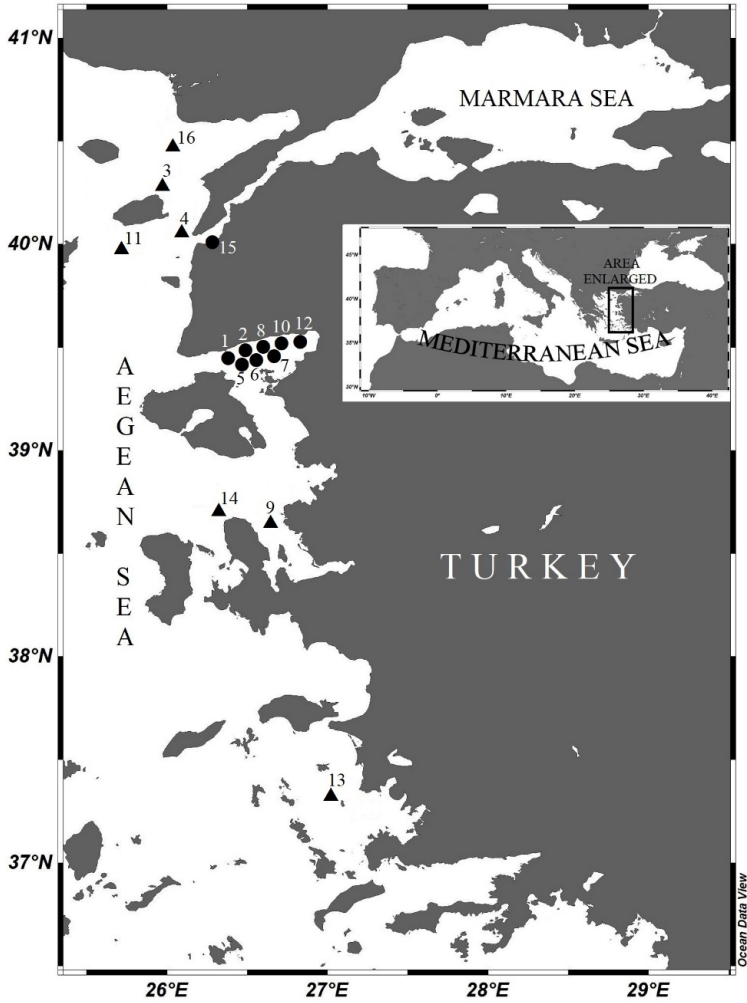


Figure 11. Capture localities of newborn and/or young-of-the-year (YOY), or juvenile specimens of *C. carcharias* in Turkish Aegean Sea. Black dots (●) representing a newborn and/or YOY, and black triangles (▲) representing a juvenile great white shark.

Food of the Great White Shark

Great white shark is the largest predatory fish inhabiting the oceans and known to be an aggressive hunter, while in pursuit of its prey (Tricas and McCosker 1984). Due to its charismatic nature and stigmatized as “man-eater”, hunting strategies and feeding behaviour of *C. carcharias* have been extensively investigated. In the past, our understanding on the feeding behaviour of the great white sharks have been mostly consisted of speculations, which based on its stomach contents; however, with the invention of scuba diving and advanced underwater imagery, now we can have a deep insight on hunting and feeding of *C. carcharias* (see e.g. Gabriotti and De Maddalena 2004; Tricas and McCosker 1984). Generally speaking, great white shark is a voracious predator preying on bony fishes, marine mammals, sea turtles and other sharks (Fergusson 1996; Fergusson *et al.* 2000; Dudley *et al.* 2000; Compagno 2001; Celona *et al.* 2006; Johnson *et al.* 2006; De Maddalena and Heim 2012).

There are 111 records on the feeding of Mediterranean great white sharks (De Maddalena and Heim 2012). Although, different species of fishes and marine mammals form the main food of Mediterranean great white sharks, remains of terrestrial animals and even human, were found in the stomach contents (Fergusson 1996; Fergusson *et al.* 2000; Celona *et al.* 2006; De Maddalena and Heim 2012). Great white sharks have also been seen while they were scavenging floating rotten carcasses of whales (see e.g. Fergusson 1996; Dudley *et al.* 2000). Remains of goat (*Capra hircus*) were found in the stomach contents of a great white shark (530 cm TL), caught off Favigna (Italy) in 1974 (Fergusson 1996). In several other incidents, remains of domestic cats (*Felis silvestris*), dogs (*Canis lupus*), pigs (*Sus domesticus*) and horses (*Equus caballus*) were also found in the stomach contents of *C. carcharias* (De Maddalena and Heim 2012). In most of these cases, it is assumed that great white sharks fed on carcasses of these animals, driven to sea, or these animals had been attacked while they were swimming at the surface. Apparently, great white shark is a voracious predator preying upon big and faster marine animals, as well as an opportunistic scavenger.

The menu of the Mediterranean great white sharks includes big bony fishes, such as Atlantic bluefin tuna (*Thunnus thynnus*), bonito (*Sarda sarda*), swordfish (*Xiphias gladius*), common dentex (*Dentex dentex*), sunfish (*Mola mola*), and small schooling teleosts like sardine (*Sardina pilchardus*) and mackerel (*Scomber scombrus*); several dolphin species (e.g. *Tursiops truncatus*, *Stenella coeruleoalba*, *Delphinus delphis*, *Phocoena phocoena*), and whales (e.g. *Physeter macrocephalus*, *Balaenoptera physalus*); sea turtles (*Caretta caretta*, *Chelonia mydas*), and several sharks (e.g. *Alopias* sp., *Isurus oxyrinchus*, *Prionace glauca*) (Celona *et al.* 2006; De Maddalena and Heim 2012; Fergusson 1996; Fergusson *et al.* 2000); however, depending on the available food items in the marine environment this list can be longer at any time (Compagno 2001). Great white sharks are known patrolling in insular waters, densely inhabited by pinnipeds (e.g.

Dyer Island, South Africa; Johnson *et al.* 2006). However, the paucity (even the absence) of remains of Mediterranean monk seals (*Monachus monachus*) in the stomach contents of great white sharks, can be due to the scarcity of this seal species in the Mediterranean Sea (Fergusson 1996). Curious readers can find detailed information on the global or Mediterranean specific diet of *C. carcharias* in De Maddalena and Heim (2012), Fergusson (1996) and Compagno (2001). Diversity of the stomach contents of *C. carcharias*, described by these authors, is astonishing.

Unfortunately, very limited information on the diet of great white sharks caught in Turkish waters, is available. Stomach contents presented in Table 3 suggest that the diet of *C. carcharias* caught in the mentioned marine area, is not different from those of the Mediterranean Sea. Small specimens (125.5-180 cm TL) fed on small bony fishes, while the large specimens (≥ 400 cm TL) preyed on large bony fishes and marine mammals (Table 3). This data coincided with the analysis that small specimens of *C. carcharias* (<300 cm TL) feed primarily on fish prey, while larger sharks feed on energetic preys, like large bony fishes and marine mammals (Tricas and McCosker 1984).

Table 3. Stomach contents of great white sharks captured in Turkish waters.

Date	TL (cm)	Stomach contents
May 1920	465	A bluefin tuna (<i>Thunnus thynnus</i>) ca. 200 kg, remains of a sword fish (<i>Xiphias gladius</i>), and a small stone
Before 1926	ca. 400	8 large bonitos (<i>Sarda sarda</i>)
Before 1926	ca. 800	2 large bluefin tunas per weighing 200 kg, 1 large dolphin (species unidentified)
1 Feb 1955	?	ca. 50 kg of bonitos
1 Jul 2008	125.5	Many embryonic teeth and mucus like substances
4 Jul 2008	145	Remains of unidentified bony fish, probably the bait
21 Feb 2009	180	2 angler fish (<i>Lophius</i> sp.), 1 gar fish (<i>Belone belone</i>), and 1 hake (<i>Merluccius merluccius</i>)

Embryonic teeth (Figure 12) found in the stomach content of a newborn great white shark (125.5 cm TL; TGWSDA specimen No 46; Appendix I), show that replacement of teeth continuing *in utero*, which has been described in detail by Shimada (2002), prepares the baby monster to the conditions of a harsh and unpredictable world with its armaments. Smaller sharks have a relatively long, narrow tooth shape that is better adapted for grasping prey like small fishes; while, the teeth broaden at the base and take on the diagnostic triangular serrated form, to cut pieces from a prey too large to swallow as a whole (Figure 13). Before ending this chapter I would like to ask some questions: Does the menu of *C. carcharias*, a fish that stigmatized as “man-eater”, really include man? Does the man a natural food item or does it just the matter of bad luck? I will try to answer this question in the next chapter.

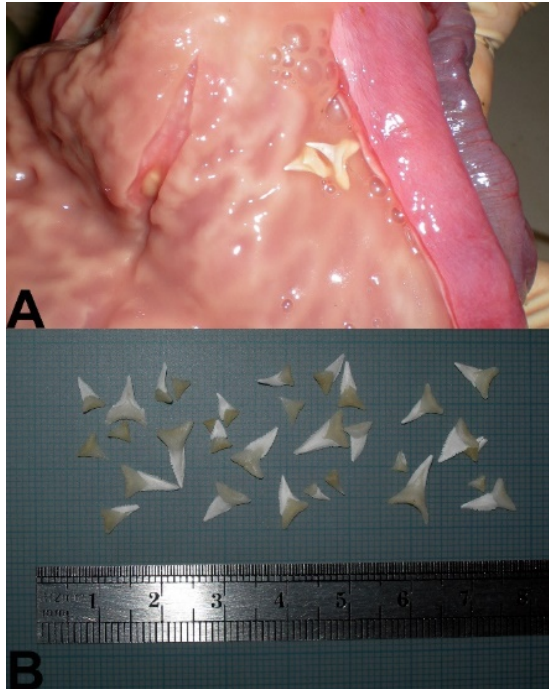


Figure 12. Embryonic teeth found in the stomach content of the newborn (125.5 cm TL).
(Photo: Hakan Kabasakal).

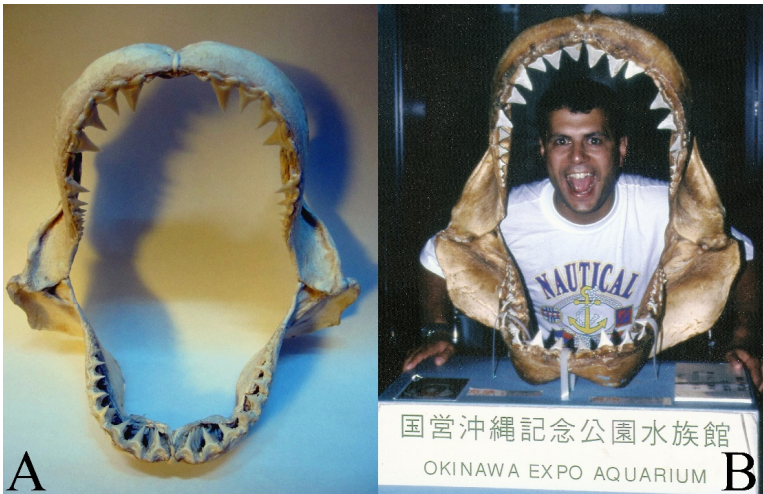


Figure 13. (A) long and narrow teeth on the jaws of the newborn (125.5 cm TL; TGWSDA specimen No 46; preserved in Hakan Kabasakal's collection), and (B) broad triangular teeth of large specimen (555 cm TL), and the author, when he was 27 years old in 1998, impishly smiles in the monster's jaws. (Photo: Hakan Kabasakal's archive).

Man and the Man-Eater

Tens, even hundreds of great white sharks have been slaughtered in response to every man allegedly killed by the monster. The desire for the killing of the monster has always been driven by fantastic stories and fear. Almost every bloody story in the ocean world has been starred by the great white shark. One of these bloody stories was about a fatal shark attack to a local man, which was occurred off Naples coast, on July 6th, 1721. The story, which is accompanied by an unrealistic illustration of the great white shark (Figure 14), is briefly as follows (Ricciardi 1721): *“In days past a swimmer, who fished seafood along the beach of il Ponte della Maddalena, was devoured by a great “Dogfish”, which was noticed in time by other fishermen who were around, and had fortune to have saved themselves. Then, considering the serious damage that the aforesaid monstrous fish would have brought to their catch, not to mention the vendetta for their dead companion, they joined together, and having made at the expense of their chapel various iron tools and large steel fish hooks, and were set on the trail of the fish. The fishermen threw into the water large hooks hidden a horse’s thigh, but the beast, as if it was aware of needles, having smelled the thigh, rejected it. Then, the courageous fishermen placed into work another trick that they had prepared, throwing into the water a slip knot with bait in the middle. So that the fish went to devour the bait, and advancing with a fury, caught itself within the loop. Then sailors open the stomach of the shark weighing 800 kg, and found within half of a human skull still covered on the outside with hair. This skull supposedly belonging to the poor aforesaid fisherman eaten a few days prior...”*

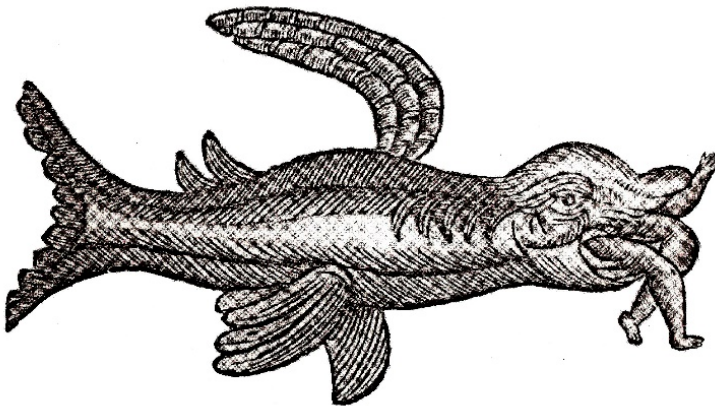


Figure 14. The illustration, accompanying the story told by Francesco Ricciardi, is the depiction of our fear being hunted by a predator, it is not even close the outlines of *C. carcharias*. (Hakan Kabasakal’s archive).

The story told by Francesco Ricciardi, is one of the many incidents of Mediterranean great white shark attacks to humans. For a predator of this

irresistible power, a man is obviously no more than just a piece of snack, despite a claim by a 16th century French naturalist Guillaume Rondelet, that a whole man in an armour had been found in sharks caught off southern France (Steel 1985). According to De Maddalena and Heim (2012), a total of 55 great white shark attacks were recorded in the Mediterranean, including 13 that must be considered doubtful because there is some doubt over the exact identity of the species of shark. In this book, I decided to focus on the great white shark attacks reportedly occurred in Turkish waters, thus, I will not further mentioning the incidents recorded in other parts of the Mediterranean Sea. If you would like to know about the details of Mediterranean great white shark attacks, you can refer to De Maddalena and Heim (2012) and Global Shark Attack File (GSAF 2020), which you can access by the following link:

<https://www.sharkattackfile.net/incidentlog.htm>

In a recent article, Kabasakal and Gedikoğlu (2015) reported on the shark attacks, that occurred in Turkish waters between 1931 and 1983. According to Kabasakal and Gedikoğlu (2015), 80 percent of 13 shark attacks occurred in the Marmara Sea, and in some of the incidents, the suspected species of shark was *C. carcharias*! The story of the great white shark attacks on humans started in 1930. In that year, two British citizens were set sail on board of a small fishing boat and their boat had been reportedly attacked by a great white shark off Yeşilköy (Santo Stefano) coast (De Maddalena and Heim 2012). Although the species of the shark was assumed to be a great white shark, this assumption has never been confirmed. Twenty eight years after Yeşilköy incident, the fishing boat of Mr. İrfan Yürür, one of the legendary bluefin tuna handliners of the İstanbul Strait, had been attacked by a great white shark, which was estimated ca. 600 cm of length (Kabasakal and Gedikoğlu 2015). During our interview, Mr. Yürür compared the teeth of a great white shark, which the author of this book showed him, with the teeth stucked into the timbers of his boat in 1958, and confirmed that it was a great white shark, as well. Voice record of the full interview with Mr. Yürür, can be accessed via following link and available on request:

<https://www.youtube.com/watch?v=OZYzJaCpzN0>

According to Mr. Yürür, while the great white shark was struggling fiercely to get rid of the hook, it grasped another fishing boat, which has been very close to Mr. Yürür's boat at the moment, and some of its teeth get stucked into the timbers. On December 28th, 1958, a great white shark was attacked to another fishing boat, during handlining for bluefin tuna off Ahırkapı coast (southern İstanbul Strait), and several teeth of this shark were also get stucked in the timbers as well (Figure 15). The alleged great white shark attack occurred off Tuzla coast (northeastern Marmara Sea) on July 7th, 1967, resulted with the reportedly killing of a diver, Dr. Güngör Güven. Although, the species of shark, which has been assumed responsible of this incident, was not identified, the large high dorsal fin appeared

at the surface a few minutes following the attack suggested it could be a great white shark. Dr. Güven incident is listed in GSAF (2020) as the incident No 3791. In 1983, a large fusiform bulky shark with a high dorsal fin, attacked a free diver, who was spearfishing, off Dilovası coast (northeastern Marmara Sea), without any fatality. Although, the species of the shark could not be confirmed, it was assumed to be a great white shark because of the description of the shark (Kabasakal ve Gedikoğlu 2015).



[RÜCHAN ÜNVERİ
Orkinos avına çıktıkları zaman köpekbalığının hücumuna uğrayan Yunus Potur (sağda) ile Ali Durmaz (solda), arkadaşımız Neemi Onur'a hâdiseyi anlatıyorlar. (Sandalin kıcındaki yarayı köpek balığı açmıştır)

Bir köpekbalığı sandala saldırdı

Orkinos avlayanların sandalına hücum eden canavar kayıkta delik açtı. Balıkçılar endişede

Figure 15. Newspaper clip, published in daily Milliyet on December 28th, 1958, reporting on an attack to the fishermen's skiff, reads "a shark attacked to the tuna handliner's boat and pierced the hull. Fishermen are worried."

(Hakan Kabasakal's archive).

A few dangerous encounters with the great white shark have also been occurred in the Turkish Aegean waters. In May 1999, a great white shark (ca. 500 cm TL) was encountered by a diver off Büyükkemikli Cape (Saros Bay) (Kabasakal 2014). A great white shark circled around the diver for several times, then swam away. In summer 2009, a diver who was diving for the routine check of the towing

cages for transporting bluefin tuna, saw a great white shark attempting to tear the net (Kabasakal 2014). In this incident, no attack occurred. Encounters with the great white sharks around bluefin tuna cages is a well-known incident in the Mediterranean Sea (see e.g. Galaz and De Maddalena 2004). Recently, a free diver who was spearfishing at a depth of 15 m, has been encountered a great white shark (ca. 500 cm TL), off Marmaris coast (southeastern Aegean Sea). In this non-fatal encounter, the shark was approached the diver for a few seconds and swum away (Kabasakal 2014).

The main reason behind all of the great white shark attacks occurred in Turkish waters was handling of bluefin tuna or spearfishing. In one incident, the great white shark was apparently stimulated by the trail of bluefin tuna transported in net cages. In several incidents, hooked great white sharks were apparently provoked to fiercely struggle to get rid of the fishing line and attack the boat. Spearfishing in several incidents were clearly created a trail in the sea, which attracted the great white shark to approach the free divers. Therefore, all of the great white shark attacks occurred in Turkish waters have been apparently provoked by fishing activities.

Fishery and Great White Shark Occurrences

The marine environment offers amazing examples of long-distance migrations, with a variety of animals crossing the entire ocean basins to reach fertile foraging grounds or secure breeding areas (Luschi 2013). Marine animals can migrate in the oceanic environment solitarily (e.g., the great white shark, *C. carcharias*) or in large schools (e.g., Atlantic bluefin tuna, *Thunnus thynnus*) aiming at specific targets (Bonfil *et al.* 2005; Fromentin 2009; De Maddalena and Heim 2012; Carlisle *et al.* 2012). This infinite flow of life, in which the hunter is in pursuit of its prey, is an interconnected story of different lives, sometimes including mankind.

In the past, the seasonal spawning migration range of *T. thynnus*, one of the largest and most valuable bony fishes, extended to the northernmost areas of Turkish waters, including the Black Sea (Deveciyan 1926). The seasonal occurrence and the historical captures of the great white shark in the Marmara Sea and İstanbul Strait waters between the late 1800s and the mid-1980s, always occurred during the migration of bluefin tuna (Üner 1984; Kabasakal 2003, 2016; Figure 16). It is a well-known fact that the movements of *C. carcharias* in the Mediterranean Sea are tightly linked to those of the Atlantic bluefin tuna (De Maddalena and Heim 2012). The decline of *T. thynnus* stocks in several parts of the Mediterranean Sea is known to have negatively affected the great white shark population (e.g., De Maddalena 2000; Barrull and Mate 2001; Soldo and Jardas 2002; Morey *et al.* 2003). Currently, the Atlantic bluefin tuna is apparently absent or drastically declined from the Marmara Sea. Although, insignificant amounts of bluefin tuna were caught in the Marmara Sea in the late 1990s and 2013 (Karakulak and Oray 2009; Hakan Kabasakal *pers. obs.*), large schools of bluefin tuna have not been observed in Marmara waters since 1987 (Karakulak and Oray 1994). Similarly, the last confirmed observation of the great white shark in the Marmara Sea was reported in 1985 (Kabasakal 2003). The drastic decline and the consequent absence of bluefin tuna in the Marmara and İstanbul Strait exhibit a remarkable synchrony with the decline and the following absence of the great white shark in the mentioned regions. The contemporary absence of *C. carcharias* and *T. thynnus*, apex predators of the marine ecosystem, from the Marmara Sea and İstanbul Strait, is a typical example of the loss of a predator in response to the loss of its coexisting prey (Kabasakal 2016). During the interview with one of the legendary tuna handliners of the İstanbul Strait, Mr. İrfan Yürür, explained the reason of why they caught the great white sharks, simply: “*We caught them, because we had to extract the hook, which got stuck in the jaws of the monster! Otherwise, we had to wait several days, until the blacksmith forged a new one. In those days –he was mentioning 1950s- we couldn’t find tuna hooks as easy as you can find today.*” Terminating the life of one of the magnificent creatures of oceans in return to an iron hook (Figure 17); this is where words fail...

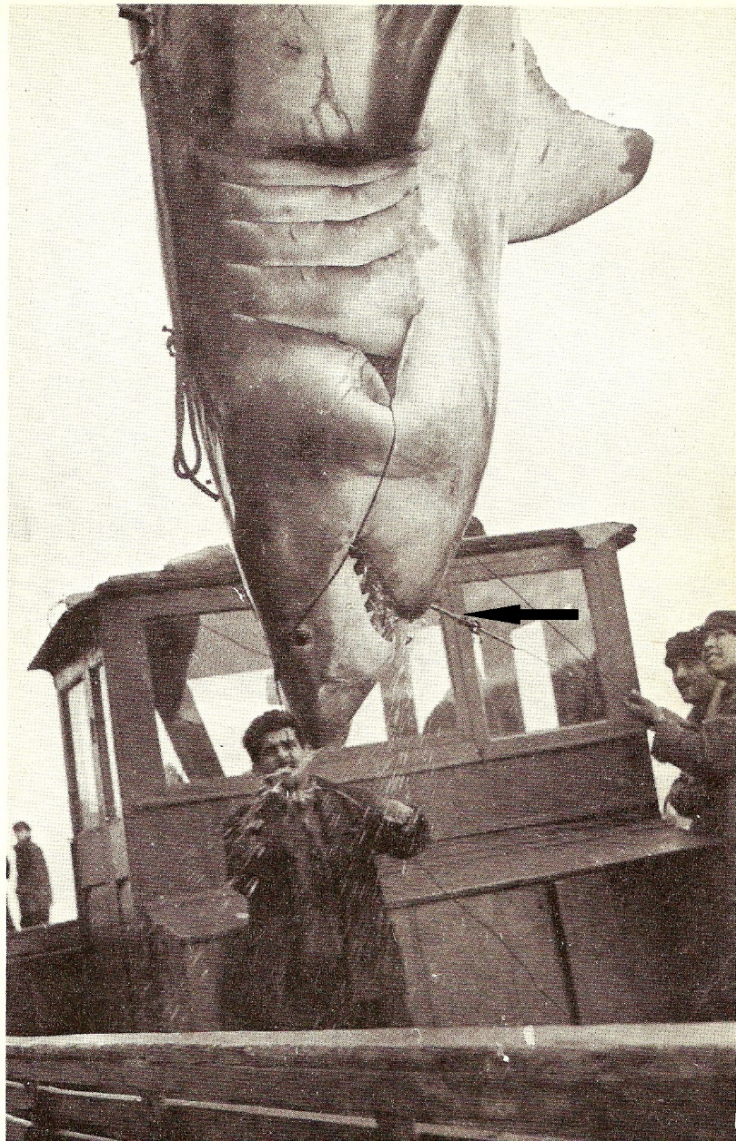


Figure 16. This great white shark was hooked off southern coast of Büyükada (northern Marmara Sea; TGWSDA specimen No 38; Appendix I), in 1967. The hook (arrow), protruding from the lower jaw of the great white shark is a typical long-shank shark hook, which shown in Figure 17 below. The length of this type of hooks usually varies between 30 to 40 centimetres; however, during the days of tuna handlining in Marmara Sea and İstanbul Strait, fishermen used to use regular tuna hooks, with the length not exceeding 20 centimetres (Mengi 1977). Thus, those fishermen seemed to have gone to sea for the targeted capture of a large shark. (Hakan Kabasakal's archive).



Figure 17. A typical shark hook with chain and swivel attached.
(Photo: Hakan Kabasakal).

Since the contemporary occurrence of *C. carcharias* in Turkish waters has been recorded from the Aegean and the western coast of the Levantine Sea (Kabasakal 2014, 2016, 2020b), the recent distribution range of the great white shark in Turkish waters coincides with the current fishing localities of *T. thynnus* in the same waters. With reference to Appendix I, the great white shark was recorded in February-May, July and September, in the Aegean and Levantine waters off Turkey. According to Karakulak and Oray (2009), the fishing season of the Turkish bluefin tuna fleet in these waters lasts from winter to the end of May, which is correlated with the period of seasonal occurrence of *C. carcharias* in the Aegean Sea. Although large specimens (≥ 500 cm TL) were captured by commercial purse-seiners, which were in pursuit of schools of scombrid fishes (e.g., bluefin tuna or bonito, *Sarda sarda*), with the exception juvenile great white shark (200 cm TL; TGSWDA specimen No 59; Appendix I), which was incidentally captured by a commercial purse-seiner off Didim coast, majority of newborns and juveniles were incidentally captured by artisanal coastal fisheries.

In the recently published national action plan for the conservation of cartilaginous fishes of Turkish waters, bycatch in trawl, trammel nets and purse seines, unreported and unregulated fishing, marine pollution and habitat loss are listed as four main threats for the cartilaginous species, occurring in Turkish waters (Öztürk 2018). Throughout its global distribution range, survival of young great white sharks is threatened by the pressure of coastal artisanal fisheries with stationary nets, such as gill-net or trammel-net fishery (Klimley 1985; Santana-Morales *et al.* 2012). According to Santana-Morales *et al.* (2012), highest incidental captures of juvenile great white sharks were recorded in the artisanal

bottom-set gill-nets, with nearly 75% of sharks caught using this fishing gear in western Baja California (Mexico). Curtis *et al.* (2018) also stated that bycatch of juvenile and YOY great white sharks in the New York Bight (western north Atlantic) occurs in gill-net fishery. In an extensive research on the interactions of juvenile *C. carcharias* with gill-net fishery, Lyons *et al.* (2013) reported that gill-net fishery is significantly and positively correlated with the incidence of great white shark captures. A recent study in the Turkish Aegean waters showed that, nearly 82% of newborn and juvenile great white sharks were incidentally captured by bottom fishing gears (Kabasakal 2020a). Previous studies revealed that juvenile great white sharks feed primarily on bottom dwelling fishes (White *et al.* 2019), and nursery grounds in their coastal habitats may overlap with areas highly impacted by fisheries (Boldrocchi *et al.* 2017). According to Domeier and Nasby-Lucas (2013), YOY and juvenile great white sharks do not have the mass and strength for breaking through most commercial fishing gear, thus they represent the most vulnerable stage of *C. carcharias*.

Preserved Specimens of Great White Sharks Caught in Turkish Waters

Jaws, teeth, vertebrae, dried skin or fins, scaled models and photographs. In many times, these are the only evidences, which can be remained after the death of the largest predatory fish. Regarding the great white sharks caught in Turkish waters, limited numbers of such evidences are being preserved in several private collections and in a single museum.

During his breathtaking journey in the wake of preserved specimens, great white shark expert Dr. Alessandro De Maddalena, has travelled many European museums and prepared a detailed catalogue of 101 preserved specimens (De Maddalena 2006). If you want to see these preserved specimens of *C. carcharias*, you should set out on a long journey through the 15 European countries. Unfortunately, no museum from Turkey is listed in the catalogue of De Maddalena (2006); however, this does not mean that no samples of *C. carcharias* caught in Turkish waters is being preserved. A considerable amount of jaws, teeth, dried fins and a single head and several taxidermied specimens are being preserved in several private collections and in the Marine Life Museum at İzmir Fisheries Faculty Katip Çelebi University. Regarding the full taxidermied specimens of *C. carcharias* (Figure 18), preserved in Marine Life Museum's collection, consist one of the outstanding collections of taxidermied juvenile great white sharks in the Mediterranean, as a whole.



Figure 18. Taxidermied great white shark on display at İzmir Katip Çelebi University Fisheries Faculty Marine Life Museum. (Photo: Erdi Bayrı).

One of the dried jaws of *C. carcharias*, dissected from the newborn caught on July 1st, 2008 off Altınoluk (125.5 cm TL; TGWSDA specimen No 46; Appendix I; see Figure 13a in Food of the Great White Shark part), is being preserved in Hakan Kabasakal's collection. Dried jaws of another newborn great white shark, caught on July 4th, 2008, off Altınoluk (145 cm TL; TGWSDA specimen No 47; Appendix I), is being preserved in Sait Özgür Gedikoğlu's collection. Teeth samples extracted from the jaws of a juvenile great white shark, caught on February 21st, 2009, off Gökçeada (180 cm TL; TGWSDA specimen No 48; Appendix I; Figure 19a), are being preserved in Aylin Yarmaz Türkeğilmez's and Hakan Kabasakal's collections. Dried jaws of another newborn specimen, caught on July 8th, 2020, off Kumkale (155 cm TL; TGWSDA specimen No 61; Appendix I; Figure 19b), is being preserved in Erdi Bayrı's collection. Taxidermied head of the juvenile specimen of *C. carcharias*, caught on January 2nd, 2016, off Altınoluk (175 cm TL; TGWSDA specimen No 56; Appendix I; Figure 20), is being preserved in Halil Ataç's collection. Unfortunately, no physical samples of huge great white sharks (≥ 500 cm TL) historically occurred in the Marmara Sea and İstanbul Strait, have been preserved. A tooth sample reportedly extracted from the jaws of a great white shark, caught in the 1950's off Burgazada Island (ca. 400 cm TL; TGWSDA specimen No 13; Appendix I); however, despite the hard efforts I've spent, neither I could access nor examine this alleged tooth sample. Photographs, newspaper clips reporting on the capture of a great white shark, photographs published in old newspapers depicting great white sharks and raw data of historical and contemporary occurrences of 62 great white sharks caught in Turkish waters, are being preserved in the private archive of Hakan Kabasakal.

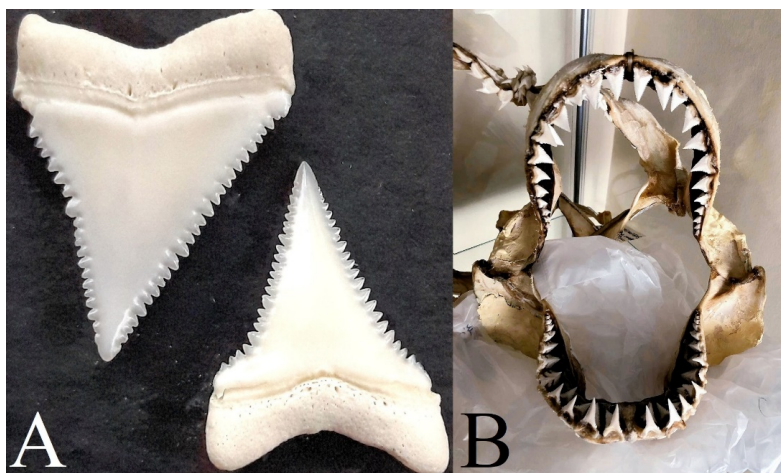


Figure 19. Preserved teeth and jaws of great white sharks caught in Turkish waters. (A) teeth being preserved in Hakan Kabasakal's collection (TGWSDA specimen No 48; 180 cm TL), and (B) jaws being preserved in Erdi Bayrı's collection (TGWSDA specimen No 61; 155 cm TL). (Photos: (A) Hakan Kabasakal and (B) Erdi Bayrı).



Figure 20. Taxidermied head and jaws of great white shark (175 cm TL; TGWSDA specimen No 56), which is being preserved in Halil Ataç's collection.
(Photo: Halil Ataç).

Conservation Issues of the Great White Shark in Turkish Waters

Our current knowledge on the occurrence and life story of the great white sharks in Turkish waters is totally based on the examinations of specimens incidentally caught in commercial fisheries. Although *C. carcharias* is not a targeted fish, it is clearly negatively impacted by the commercial fisheries. During the days while I was writing my first book on the great white shark entitled *Büyük Beyaz Bilmece* (Kabasakal 2015), I interviewed one of the legendary bluefin tuna handliners of the İstanbul Strait, Mr. İrfan Yürür, and I remember his words saying: “*Being close to the monster was an excitement, makes you scared...*” While he was talking to me, the old fisherman was just like facing to an old opponent! The sea monster, which has been locked in his personal oceans many years ago, was unleashed and circling around our table. “*This monster is not being worth to protect!*” he said, anxiously.

Should we protect the monster? Is the monster worth protection? If we decide to protect it, what kind of benefits can we obtain? Short but crucial questions and we have to give reliable answers to all of them! Great white shark is the top star of the megafauna. It is the flagship of conservation efforts in marine world.

When the great white shark is in question, legal mechanism of conservation seems working quite slowly, at least in several regions of the world! As required by Turkish Fishery Law No 1380, currently at least 10 species of sharks are being totally protected in Turkish seas (Öztürk 2018); however, for some reason, *C. carcharias* has always been neglected during the proposal of species for taking conservation actions, every year! Although, the number of protected species of sharks in Turkish waters has been rising for the last 10 years,¹¹ *C. carcharias* has always been failed to enter the the list.

The previously published Red List assessments of *C. carcharias* represent dramatic change from ‘Insufficiently Known’ in 1990 to ‘Vulnerable’ in 2009 (Rigby *et al.* 2019). In the recent Red List assessment by Rigby *et al.* (2019), global conservation status of *C. carcharias* was evaluated as vulnerable; however, according to Dulvy *et al.* (2016) and Otero *et al.* (2019), *C. carcharias* is critically endangered in the Mediterranean Sea. In 1996, the great white shark was listed on Annex II (Endangered or Threatened species) of the protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean of the

¹¹ The following species of sharks are being protected, as required by the Turkish Fishery Law No. 1380 (Official Gazette 2016, Article 16(1), page 16; Official Gazette 2018, Article 3, page 15): *Carcharhinus plumbeus*, *Cetorhinus maximus*, *Galeorhinus galeus*, *Lamna nasus*, *Alopias vulpinus*, *Isurus oxyrinchus*, *Squalus acanthias*, *Squalus blainvillei*, *Oxynotus centrina*, *Squatina aculeata*, *Squatina oculata* and *Squatina squatina*.

Barcelona Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean (De Maddalena and Heim 2012). Following the council of ministers' decision on July 22nd, 2002, article No. 2002/4545, the text of Barcelona Convention has been published in the Official Gazette on August 22nd, 2002, publication No. 24854; therefore, Republic of Turkey is signatory state of the convention.¹² Because of the resultant responsibilities as a signatory state of the Barcelona Convention, Turkey should take action for the protection of *C. carcharias*, immediately.

Well, what if no legal gaps remained, can *C. carcharias* be completely safe in the Mediterranean and in Turkish waters, as well? I wish I could say 'yes', but legal protection seemed inadequate for the future survival of the great white shark. Obviously, we need more than laws for the survival of *C. carcharias*, in the Mediterranean and elsewhere in the world oceans! We need a total awakening on the ecological importance of *C. carcharias* and other shark species in the nature. I personally suppose that we need to find a formula of win-win negotiation between the man and the man-eater, to make possible the coexistence of them in the same environment. Could someone have found this formula?

Today, geographical locations, where *C. carcharias* is being protected by law, present a patchy appearance on the world map. Currently, great white shark is 100 percent protected in Australia (nationally and statewise), South Africa, Namibia, Israel, Malta and United States (statewise off California and Florida and with directed fisheries prohibited off all coasts) (Compagno 2001). In the mentioned states, besides the prohibition of killing the great white shark, you can't even trade any part –teeth, jaws etc.- of *C. carcharias*, as required by CITES¹³.

Convincing the society to protect the monster, we have to explain that a live great white shark is worth more than a dead one. It is not surprising that shark cage-based ecotourism activities are taking place in the waters of Australia, South Africa and California, where the great white shark is under strict protection (Figure 21). *Carcharodon carcharias*, whose execution decrees elsewhere as a

¹² Uluslararası Çevre Koruma Sözleşmeleri (International Environmental Protection Conventions). Türkiye Barolar Birliği Yayınları: 247. 2014. Full text of Barcelona Convention is appeared in the pages 99-122; text in Turkish.

¹³ 1973 – Washington (CITES) / Convention on the International Trade in Endangered Species of Wild Flora and Fauna. Following the council of ministers' decision on April 27th, 1996, article No. 96/8125, the text of CITES Convention has been published in the Official Gazette on June 20th, 1996, publication No. 22672; therefore, Republic of Turkey is signatory state of the convention CITES Convention. Uluslararası Çevre Koruma Sözleşmeleri (International Environmental Protection Conventions). Türkiye Barolar Birliği Yayınları: 247. 2014. Full text of CITES Convention is appeared in the pages 73-98; text in Turkish.

monster, is valued as a source money in these waters. Carefully planned ecotourism activities, where the involvement of local people (fishermen, divers, etc.) is ensured and safety precautions are applied without exception, are seen as a tool that can contribute to the protection of endangered species (Krüger 2005). However, we may be opening the Pandora's box while trying to reconcile ecotourism and conservation! There are also those who worry that we might be changing the monster's behaviour by baiting to keep the great white sharks around the cage (Laroche *et al.* 2007). One way or another, we have to find a way to reach an agreement with the monster. Indeed, in Australia, South Africa and United States, where *C. carcharias* is under 100 percent protection, the formula of win-win negotiation seems working. Including *C. carcharias* under 100 percent protection in Turkish waters is the first and most important step. The next step remains to raise awareness of the ecological importance of the monster in society, and it is clear that this will not be easy.



Figure 21. A bunch of curious eyes inside of the shark cage, watching the great white in South African waters. (Photo: Alessandro De Maddalena).

Would You Like to be a Great White Shark Researcher?

The Mediterranean is simply a hot spot when it comes to shark conservation. In the Mediterranean, where 50 shark species currently occur, and 57 percent of these species are endangered according to IUCN Red List (Bargnesi *et al.* 2020). The hot spot in the Mediterranean clearly hurts hands. The numbers are obvious. We want to protect Mediterranean sharks and therefore have to learn their life stories as much as possible. Without knowledge we cannot protect them, neither the great white shark nor the others.

Throughout the ages, we have nourished an imagination of the great white shark, mixed with mystery, fear and curiosity. Sometimes one element of this complex emotion became stronger and sometimes the other. We are now working hard to protect the monster, once we wanted to slaughter. While our conservation efforts are scattered across the world map, the possibility of earning money or fame at the expense of the great white shark has made our desire to keep them alive increasingly. The easiest way to gain fame thanks to the great white shark, is to research it and take your place in great white science as the person who unearthed an unknown about the predator! Maybe one of these people will be you, why not?

As of now, the number of scientific publications on "shark" has exceeded 13,000 worldwide (Bargnesi *et al.* 2020). A quick search on Google Scholar with the keyword "*Carcharodon carcharias*" yielded more than 8,000 results (as of October 7th, 2020; H. Kabasakal pers. obs.). When the keyword "citizen scientist" (CS) is entered to the search engine, it is revealed that CSs take part in more than 7500 publications (Bargnesi *et al.* 2020). The number of shark studies involving citizen scientists is increasing. In an age where social media, internet and smartphone use are indispensable to life, digital technologies offer CSs a unique opportunity to research the great white shark and other sharks in a non-invasive way and to spread the results to the world (Kabasakal and Bilecenoğlu 2020). If you want to be a part of the great white shark research that has been going on for years in Turkish waters and make contributions that will enrich the TGWSDA, you can start by sharing the information you will collect. However, while doing all these, you have to act in accordance with the basic research methodology. Your needs are that simple: a tape measure, notepad, pencil, your smartphone, and the data form (Appendix III and IV). A diver, fisherman, enthusiast of the sea, or an ordinary citizen who buys fish from a fishmonger for dinner, can make valuable contributions to great white shark studies conducted in Turkish waters by sharing basic data collected using standard methods, with professional researchers. Your contribution will be appreciated and will always be remembered with gratitude. As there are many examples in this publication, your contribution will always be referred to by your name.

Epilogue

“Sir, I would like to add a bit of information to shark sightings in the Marmara Sea. My family was at this base from the summer of 1972 to the summer of 1975 given my father was stationed there with The United States Air Force. Karamursel CDI was on the coast between Karamursel and Yalova. I believe it is still a Turkish base, though no American Military for many years now. We were often out on the water either water skiing or sailing. In the summer of 1975 (I was 18 years old) a great white shark swam beside the Sunfish sail boat I was on, following my girlfriend and I for about a minute. We were about 100 meters from the shore. A Sunfish is 4.2 meters in length. This fish was longer than our boat. Using the boat as a reference, I would estimate this shark to be 5.5 meters in length. I am quite certain this was a great white and feel the estimated length is very close. That summer, there were two other reports by younger children water skiing of “a giant fish” near them. No way to know what species or real length. Just thought this would be worth telling you. As an aside, the time I was in Turkey was just a great overall experience...”

I received this email from Mr. Ples Kujawa, an orthopedic surgeon in San Antonio (Texas, USA) on November 11th, 2019. Although, Dr. Kujawa was 100 percent sure that the monster he encountered during sailing pleasure was the great white shark, I did not add this mysterious monster into TGWSDA, due to the lack of a photographic evidence. If one day I get evidence of this specimen, this mysterious monster will take its place in the TGWSDA as the “great white shark of Karamürsel”. However, it will remain an enjoyable memory until then.

We now know more about the life of the great white sharks in Turkish waters. Although research on the monster goes back a few centuries ago, it has not yet been 30 years since we began to focus on the monsters in our waters. I do not ignore that in the books of Fethi Akşıray, Sadullah Ayaşlı and Karakin Deveciyan, the great white is mentioned as “harharyas” and short sections of its life are conveyed. But the monster has a life that is too rich to fit in a few pages. Although it is late, eventually we started to examine one of the mysterious components of the megafauna, occurring in our waters. Despite we know more than ever before about the great white sharks living in our seas, we are just at the beginning. A new question appears next to every answer we learnt. How often do great white sharks visit our shores? How long do baby great white sharks stay on our shores? Is the migration of adult great white sharks in our waters with a certain regularity today, as in the past? Could the great white shark still be entering the Marmara? The questions are endless.

We know that great white sharks live in Turkish waters and there is a possible breeding zone in Edremit Bay. Although the mentality that tries to keep it away from our shores and ignores its presence next to us gradually loses its power, it seems that it will take a long time for it to disappear completely. After all, it is

not easy to come to terms with the monster, to accept it, it takes courage. From time to time I ask myself the question: what if the reason for ignoring the great white shark, ignoring the pages of information revealing its existence in our waters, is not to suppress the fear of monsters within us? We have to get rid of this fear now. Because our fear ends in the death of another great white shark (Figure 22).



Figure 22. We need to get rid of our fear of the shark so that the great white shark can swim safely in the oceans. (Photo: Alessandro De Maddalena).

Appendix I. Turkish Great White Shark Data Archive (TGWSDA). Content last updated on September 25th, 2020.
N/A: not available.

No	Date	Location	TL (cm)	W (kg)	Sex	Remarks	Reference
1	Feb, 1881	İstanbul Strait	391	?	?	Stranded near Beylerbeyi coast.	Fergusson (1996)
2	17 Nov 1881	İstanbul Strait	470	1500	♀	Type of fishing gear unknown.	Fergusson (1996)
3	1916	Sea of Marmara	ca. 700	?	?	Entrapped in Salistra fish trap; shot by fishermen with 3 bullets in its head.	Deveciyan (1945)
4	1920	Sea of Marmara	~500	?	?	Caught off Prince Islands and displayed to public in Taksim Square, İstanbul city.	Kabasakal (2014)
5	May 1920	Sea of Marmara	465	ca. 1200	?	Caught off Sedef island; a bluefin tuna, weighing ca. 200 kg, remains of a swordfish, a few bonitos, and a small stone found in its stomach.	Deveciyan (1945)
6	1923	Sea of Marmara	?	?	?	N/A	Unpublished data
7	before 1926	Sea of Marmara	ca. 400	?	?	Displayed in İstanbul Fish Market; eight large bonitos found in its stomach.	Deveciyan (1926)
8	before 1926	İstanbul Strait	ca. 800	ca. 4500	?	Two large tunas per weighing 200 kg, and one large dolphin found in the stomach.	Ayaşlı (1937)
9	20 Feb 1926	Sea of Marmara	450	over 1500	?	Caught off Büyükkada island.	Kabasakal (2003)
10	1930	Sea of Marmara	?	?	?	Attacked to a fishing boat off San Stefano (Yeşilköy).	Kabasakal (2014)
11	21 Mar 1937	Sea of Marmara	?	1700	?	Harpooned by fishermen set sail for catching swordfish off Büyükkada. Landed at the fish market for public display.	Kabasakal (2016)

Appendix I. Continued

12	1939	Sea of Marmara	?	ca. 3000	?	Caught by the tuna handliner Karnilyas and delivered to the fish market.	Kabasakal (2016)
13	1950's	Sea of Marmara	ca. 400	?	?	Caught by a tuna handliner off Burgazada coast.	Kabasakal (2020d, in press)
14	30 Mar 1954	Sea of Marmara	450	1500	?	Caught off Tuzla island.	Kabasakal (2003)
15	1 Feb 1955	Sea of Marmara	?	1500	?	Caught by the fisherman Mr. Hayri Kuloğlu, after struggling nearly 4 and half hours. Almost 50 kg of bonito, <i>Sarda sarda</i> found in the stomach contents.	Kabasakal (2016)
16	15 Apr 1956	Sea of Marmara	?	2500	?	Caught by the handliner Mr. Needet Şarcı off Ahırkapı. According to newspaper report, fisherman struggled the shark nearly 8 hours before harpooned it.	Kabasakal (2016)
17	15 Apr 1956	Sea of Marmara	618	ca. 3000	♀	Caught off Prince Islands; its mass surely miss-estimated.	Kabasakal (2003)
18	1957	Mediterranean Sea	?	?	?	Caught in İskenderun Bay.	Akyüz (1957)
19	1958	İstanbul Strait	ca. 700	?	?	Caught off Ahırkapı, but escaped from the hook and attacked to a fishing boat.	Kabasakal (2014)
20	5 Mar 1958	Sea of Marmara	500	2500	♀	Caught off Prince Islands. Delivered to fish market for public display and auction.	Kabasakal (2016)
21	25 Dec 1958	Sea of Marmara	ca. 700	ca. 2000	♀	Caught off Prince Islands by fishermen Niyazi Dalgın, Cemil Unalır and Şadan Şalvarlı, then landed at Ahırkapı coast.	Unpublished data
22	28 Dec 1958	İstanbul Strait	ca. 800	?	?	Caught off Ahırkapı coast by fishermen Yunus Potur and Ali Durmaz. Great white shark attacked the boat and caused damage.	Unpublished data

Appendix I. Continued

23-30	Between 1958-1960	İstanbul Strait	500 to 700	ca. 1500 to 4000	?	Seven great white sharks captured in bosphoric and prebosphoric area by the same fisherman, "Samatyalı" İrfan Yürür. Voice record of an interview with Mr. Yürür is available on the following link (in Turkish): https://youtu.be/OZYzJaCpZNO	Kabasakal (2014)
31	Feb 1962	İstanbul Strait	500+	3750	♀	Mass surely miss-estimated.	Fergusson (1996)
32	19 Mar 1962	İstanbul Strait	?	3000	♀	Caught by the fishermen Mr. Hayri Kuloğlu and Mr. Ziya Zeki Zayni off Ortaköy.	Kabasakal (2016)
33	28 Dec 1965	İstanbul Strait	500	ca. 4000	♀	Caught off Dolmabahçe coast; mass surely miss-estimated.	Kabasakal (2003)
34	28 Dec 1965	İstanbul Strait	700	ca. 3000	♀	Caught near Maiden's Tower.	Kabasakal (2003)
35	13 Jan 1966	Sea of Marmara	?	?	?	Incidentally caught by tuna handliners and harpooned off Kumkapı. Auctioned at the fish market for its liver oil.	Kabasakal (2016)
36	13 Jan 1966	İstanbul Strait	ca. 400	ca. 2000	?	Harpooned off Kabataş coast.	Kabasakal (2003)
37	13 Jan 1966	İstanbul Strait	ca. 400	ca. 2000	?	Harpooned off Kabataş coast; belly of the second specimen shown overturned on the left of the photograph presented in Kabasakal (2003)	Kabasakal (2003)
38	1967	Sea of Marmara	?	?	?	Caught off Büyükada coast by a tuna hand-liner.	Kabasakal (2008)
39	Mar 1968	İstanbul Strait	551	?	♀	Caught by a tuna hand-liner.	Kabasakal (2011)
40	before 1974	Sea of Marmara	?	ca. 2000	?	Caught off Prince Islands.	Güney (1974)
41	May 1985	Sea of Marmara	ca. 500	?	?	Sighted off Kapıdağ peninsula.	Kabasakal (2003)

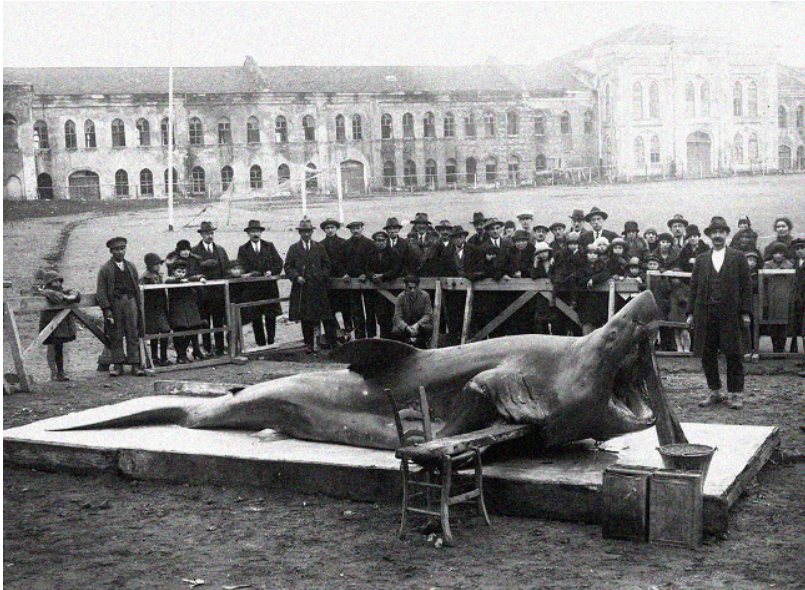
Appendix I. Continued

42	18 Mar 1991	Aegean Sea	ca. 500	3500	♀	Caught off Foça coast by a commercial purse-seiner; transported to İstanbul Fish Market and displayed to public.	Kabasakal (2008)
43	Mar 1996	Aegean Sea	550	?	♀	Caught off Bozcaada island by a commercial purse-seiner.	Kabasakal and Kabasakal (2004)
44	Apr1998	Aegean Sea	ca. 450	?	?	Sighted by a gill-netter.	Kabasakal and Kabasakal (2004)
45	May 1999	Aegean Sea	ca. 500	?	?	Sighted by a diver off Büyükkemikli cape.	Kabasakal and Kabasakal (2004)
46	1 Jul 2008	Aegean Sea	125.5	30	♂	Caught in Edremit Bay, off Altınoluk coast by a commercial gill-netter; unhealed birth mark was visible on the belly.	Kabasakal and Gedikoğlu (2008)
47	4 Jul 2008	Aegean Sea	145	?	♂	Caught in Edremit Bay, off Altınoluk coast by a commercial gill-netter; unhealed birth mark was visible on the belly.	Kabasakal and Gedikoğlu (2008)
48	21 Feb 2009	Aegean Sea	180	47.5	♀	Caught off Gökçeada island; two angler fish (<i>Lophius</i> sp.), one gar fish (<i>Belone belone</i>) and one hake (<i>Merluccius merluccius</i>) were found in the stomach.	Kabasakal <i>et al.</i> (2009)
49	15 Apr 2009	Aegean Sea	300	102	♀	Caught off Çanakkale coast by a commercial purse-seiner; transported to İstanbul and displayed to public.	Kabasakal <i>et al.</i> (2009)
50-52	2010; late Jun, early Jul	Aegean Sea	ca. 80- 100	?	?	Three juveniles captured by coastal gill- or trammel-nets in Edremit Bay, off Altınoluk.	Kabasakal (2014)

Appendix I. Continued

53	6 Jul 2011	Aegean Sea	85	12	♀	Caught in Edremit Bay, off Altınoluk by a trammel-netter in inshore waters. After landing, the specimen transferred to seawater tank but upon observing stress signs, it was released after a couple of hours of captivity. A video of this specimen is available on the following link: http://vimeo.com/46296179	Kabasakal (2014)
54	28 Sep 2011	Aegean Sea	~500	?	?	Sighted by a diver at a depth of 15 m, while he was spearfishing off Marmaris coast. According to interview with the diver, great white shark approached to him, but no attack occurred.	Kabasakal (2014)
55	19 Sep 2014	Aegean Sea	200	40	♂	It was incidentally caught by a stationary net off Yeni Foça, which was deployed for lobster fishing.	Kabasakal and Kabasakal (2015)
56	2 Jan 2016	Aegean Sea	175	?	♀	Entangled in a coastal stationary net in the Bay of Edremit. The dried head, jaws and caudal fin of the specimen are preserved by local fishermen in Altınoluk province.	Kabasakal <i>et al.</i> (2018)
57	Jan 2017	Aegean Sea	180	?	?	Entangled in coastal stationary net off Gökçeada coast.	Kabasakal (2020a)
58	Apr 2017	Aegean Sea	160	?	?	Entangled in coastal stationary net in the Edremit Bay.	Kabasakal (2020a)
59	4 Jun 2017	Aegean Sea	200	60	♂	Captured by a commercial purse-seiner off the Didim coast.	Kabasakal <i>et al.</i> (2018)
60	14 Apr 2018	Aegean Sea	180	?	♀	Captured by a coastal stationary-netter, off the İzmir coast.	Kabasakal <i>et al.</i> (2018)
61	8 Jun 2020	Çanakkale Strait	155	?	?	Captured by means of a stationary-netter, off Kumkale coast (southern entrance of Çanakkale Strait).	Kabasakal and Bayrı (2020, in press)
62	14 Jun 2020	Aegean Sea	ca. 200	?	?	Sighted by the amateur fishermen in waters of Saros Bay, off Enez coast. First documented case of leucism in <i>C. carcharias</i> .	Kabasakal (2020c, in press)

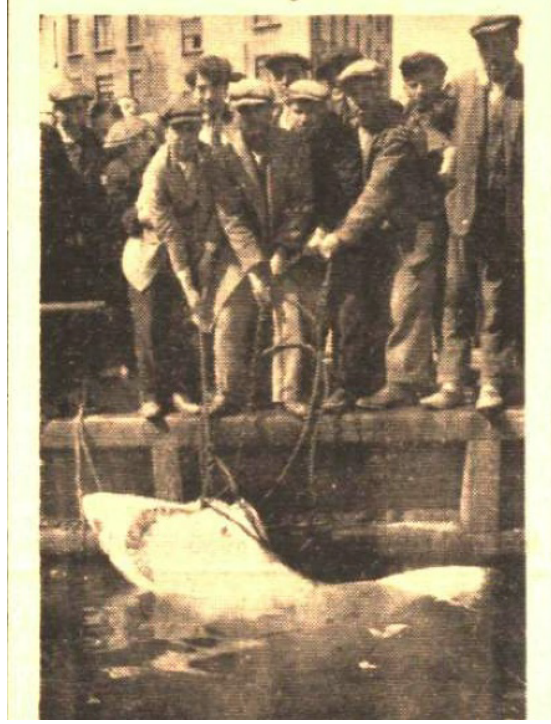
Appendix II. Photographs of several specimens of *C. carcharias* recorded in the TGWSDA.



Great white shark (ca. 500 cm TL; TGWSDA specimen No 4), caught off Prince Islands in 1920. (Hakan Kabasakal's archive).



Great white shark (450 cm TL; TGWSDA specimen No 9), caught off Büyükada Island on February 20th, 1926. (Hakan Kabasakal's archive).



Great white shark (TL unknown; TGSWDA specimen No 11), caught off Büyükada Island on March 21th, 1937. (Hakan Kabasakal's archive).



Great white shark (TL unknown; TGSWDA specimen No 12), caught off Prince Islands in 1939. (Nasuh Albulak's archive).



Great white shark (ca. 400 cm TL; TGSWDA specimen No 13), caught off Burgazada Island in the 1950's. (Hakan Kabasakal's archive).



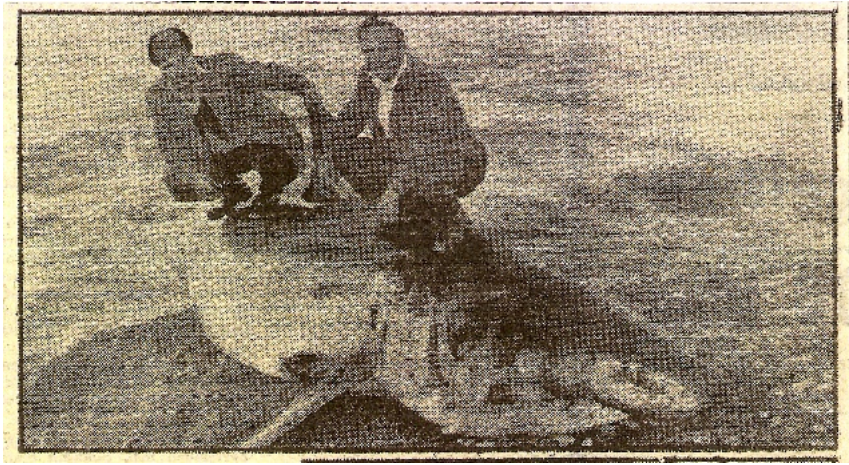
Great white shark (TL 450 cm; TGSWDA specimen No 14) caught off Tuzla Island on March 30th, 1954. (Hakan Kabasakal's archive).



Great white shark (TL unknown, TGSWDA specimen No 15), caught off Ortaköy coast on February 1st, 1955. (Hakan Kabasakal's archive).



Great white shark (TL unknown; TGSWDA specimen No 16), caught off Ahırkapı on April 15th, 1956. (Hakan Kabasakal's archive).



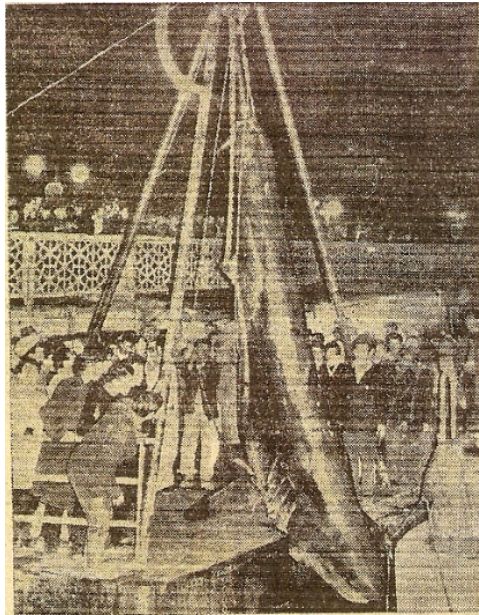
Great white shark (618 cm TL; TGSWDA specimen No 17), caught off Prince Islands on April 15th, 1956. (Hakan Kabasakal's archive).



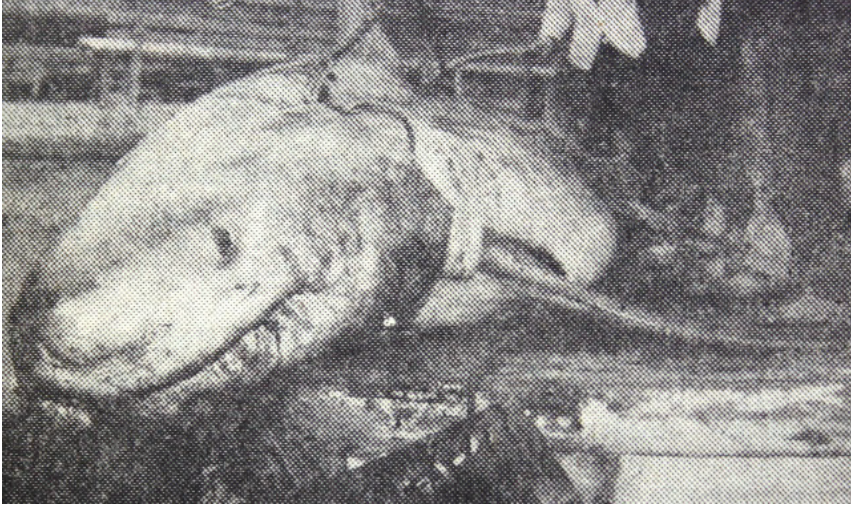
Great white shark (TL unknown; TGSWDA specimen No 32), caught off Ortaköy on February 19th, 1962. (Hakan Kabasakal's archive).



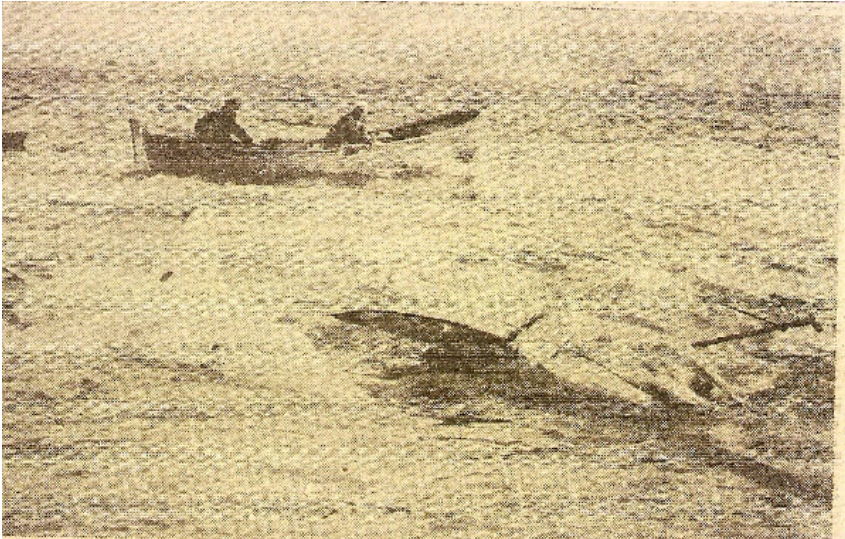
Great white shark (500 cm TL; TGSWDA specimen No 33), caught off Dolmabahçe coast on December 28th, 1965. (Hakan Kabasakal's archive).



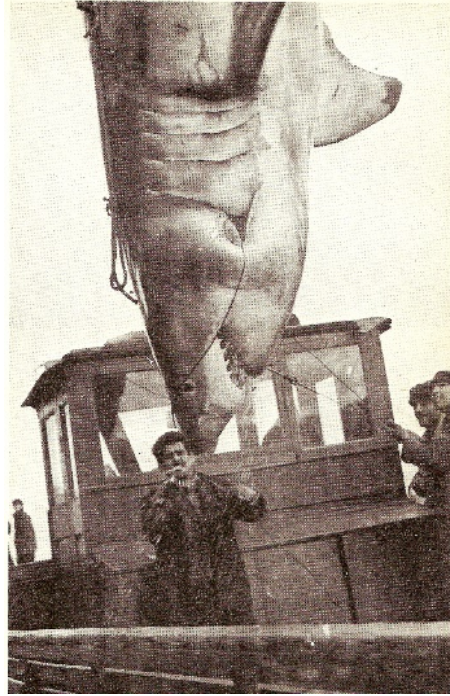
Great white shark (700 cm TL; TGSWDA specimen No 34), caught near Maiden's Tower on December 28th, 1965. (Hakan Kabasakal's archive).



Great white shark (TL unknown; TGSWDA specimen No 35), caught off Kumkapı coast on January 13th, 1966. (Hakan Kabasakal's archive).



Great white sharks (ca. 400 cm TL; TGSWDA specimen Nos 36 and 37; on the left of the photo, ventral surface of one of the specimens, is seen) harpooned off Kabataş coast, on January 13th, 1966. (Hakan Kabasakal's archive).



Great white shark (TL unknown; TGSWDA specimen No 38), caught off Büyükada coast in 1967. (Hakan Kabasakal's archive).



Great white shark (551 cm TL; TGSWDA specimen No 39), caught in the İstanbul Strait in March 1968. (Hakan Kabasakal's archive).



Great white shark (ca. 500 cm TL; TGSWDA specimen No 42), caught off Foça coast on March 18th, 1991. (Hakan Kabasakal's archive).



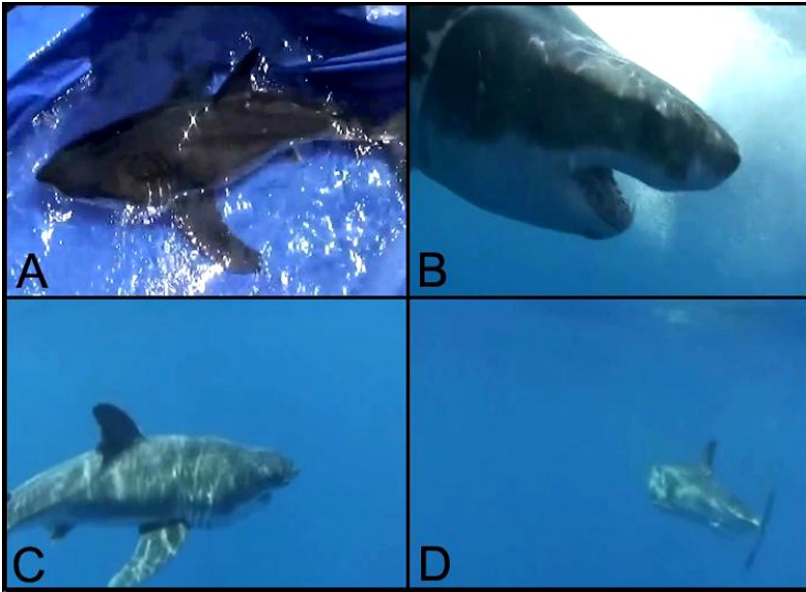
Great white sharks (125.5 cm and 145 cm TL; TGSWDA specimen Nos 46 and 47), caught in Edremit Bay off Altınoluk coast, on July 1st and 4th, 2008, respectively. (Photo: Hakan Kabasakal).



Great white shark (180 cm TL; TGSWDA specimen No 48), caught off Gökçeada coast on February 21st, 2009. (Photo: Aylin Yarmaz Türkeğilmez).



Great white shark (300 cm TL; TGSWDA specimen No 49), caught off Çanakkale coast on April 15th, 2009. (Photo: Emrah Evsen).



Captured images from the video of releasing a YOY white shark (85 cm TL; TGSWDA specimen 53) off the coast of Altınoluk, on July 6th, 2011. (Video footage: Cenk Balkan).



Great white shark (200 cm TL; TGSWDA specimen No 55), caught off Yeni Foça on September 19th, 2014. (Photo: Ceyhun Gamze Ekinci).



Great white shark (175 cm TL, TGSWDA specimen No 56), caught in Edremit Bay on January 2nd, 2016. (Photo: Halil Ataç).



Great white shark (180 cm TL; TGSWDA specimen No 57), caught off Gökçeada coast in January 2017. (Hakan Kabasakal's archive).



Great white shark (160 cm TL; TGSWDA specimen No 58), caught off Altınoluk coast in April 2017. (Hakan Kabasakal's archive).



Great white shark (200 cm TL; TGSWDA specimen No 59), caught off Didim coast on June 4th, 2017. (Hakan Kabasakal's archive).



Great white sharks (180 cm TL; TGSWDA specimen No 60) caught off İzmir coast, on April 14th, 2018. (Hakan Kabasakal's archive).

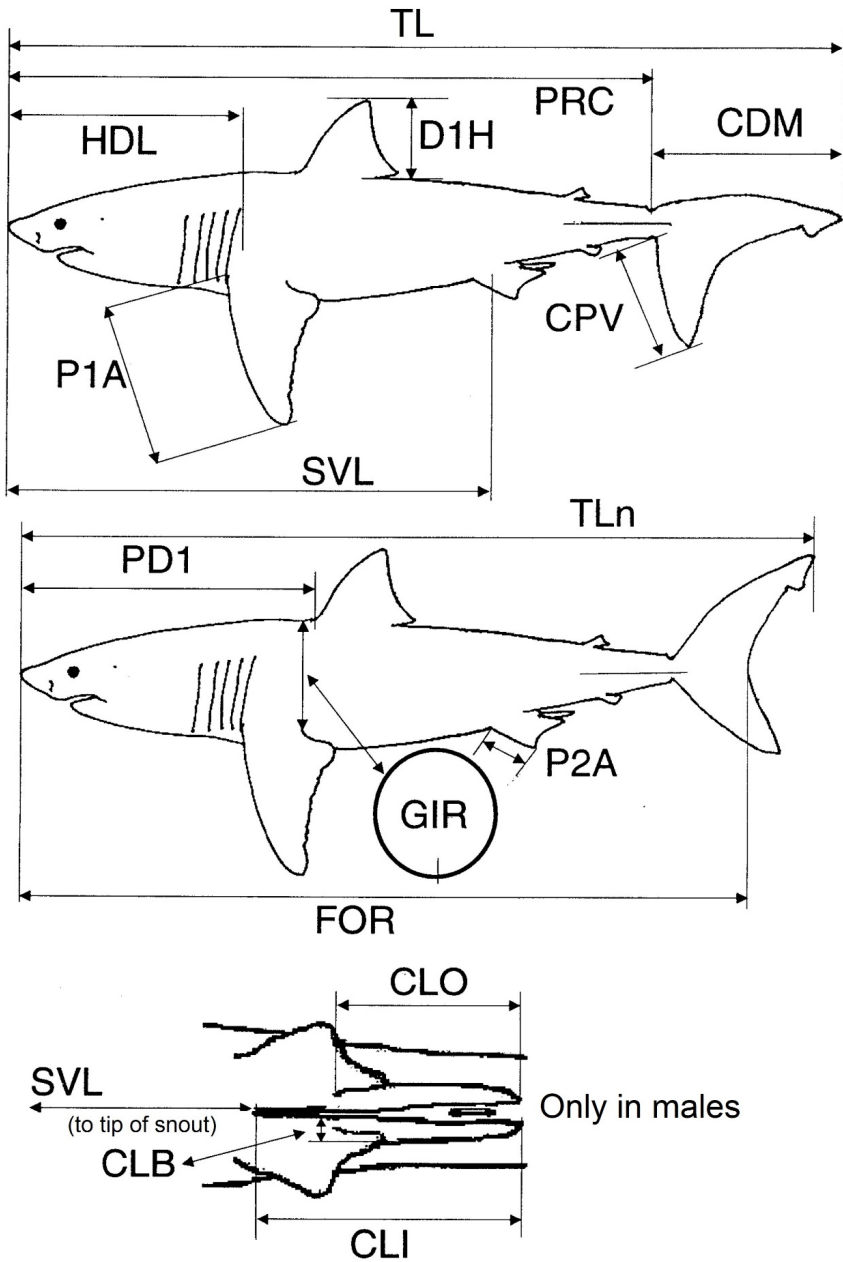


Great white shark (155 cm TL; TGSWDA specimen No 61), caught off Kumkale coast on June 8th, 2020. (Photo: Erdi Bayrı).



Great white shark (ca. 200 cm TL; TGSWDA specimen No 62), sighted in waters of Saros Bay, off Enez coast on June 14th, 2020. (Hakan Kabasakal's archive).

Appendix IV. Basic measurements of great white shark
 (adopted from Mollet *et al.* 1996).



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