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## Why coastal communities lay at the heart of conservation work in Pakistan- An untold story of Abdullah Mirbahir an activist of marine turtles at the Kakapir community

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The writer's purpose is to connect the dots of citizen science/ ecological and traditional knowledge of fishers of the fisher community with marine conservation and science while acknowledging their contributions to conservation.

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### Marine Turtles - Biology, Vulnerability, and Vital Role in Marine Ecosystems

Marine turtles belong to the superfamily Cheloniidae and are classified as reptiles within the order Testudines and the suborder Cryptodira. Turtles encompass all reptiles characterized by a shell consisting of an upper half, the carapace, and a lower half, the plastron (Pough et al., 2019). The term "turtle" is commonly used to describe all reptiles with this shell structure. Marine/ Sea turtles, being a subset of turtles, share the general life cycle observed in turtles, albeit with some minor variations. The complexity of their life cycle is consistent across all sea turtle species: they rely on the ocean for feeding and growth, but they require sandy beaches for reproduction (Plotkin, 2003).

Marine turtles, scientifically known as sea turtles, are ancient creatures that have existed on Earth for approximately 110 million years (Benson et al., 2013). These fascinating reptiles possess a distinctive physical structure, where their upper shell, or carapace, is composed of numerous bones covered with horny scales called scutes (Pritchard, 1997). Unlike their land-dwelling relatives, marine turtles are unable to retract their heads into their shells.

There are seven recognized species of marine turtles: green sea turtle (*Chelonia mydas*), hawksbill turtle (*Eretmochelys imbricata*), loggerhead sea turtle (*Caretta caretta*), olive ridley turtle (*Lepidochelys olivacea*), Kemp's ridley turtle (*Lepidochelys kempii*), leatherback sea turtle (*Dermochelys coriacea*), and flatback turtle (*Natator depressus*) (Mrosovsky, 2003).

Sea turtles have evolved remarkable adaptations for life in the ocean. Their hydrodynamic body shape, large size, and powerful front flippers enable them to dive to considerable depths and cover long distances (Hochscheid et al., 2007). The front flippers of sea turtles are elongated, slender, and resemble wings, while their hind flippers are comparatively shorter. Over more than 100 million years, marine turtles have traversed vast oceanic expanses, playing a crucial and interconnected role in marine and coastal ecosystems (Hays et al., 2010).

The vulnerability of marine turtles as a species stems from a combination of factors, leading to their classification as globally endangered on the IUCN Red List. In tropical and subtropical oceans, marine turtle populations are experiencing a decline due to numerous threats encountered in their aquatic habitats and nesting areas.

Marine turtles lack the ability to retreat into their hard shells for protection, unlike freshwater turtles and tortoises, making them particularly vulnerable to predation and other hazards. Their risk exposure begins early in life, as hatchlings face challenges from nesting beaches to the ocean. Predation by

natural predators, disorientation caused by artificial lighting, and obstacles on their path pose significant threats to their survival during this critical period (Hamann et al., 2010).

Throughout their lives, marine turtles encounter a variety of dangers. In their marine habitats, they are exposed to entanglement in fishing gear, collisions with boats and vessels, ingesting marine debris, and pollution of their foraging areas (Wallace et al., 2013). These factors have been found to have detrimental effects on marine turtle populations, contributing to their declining numbers.

Illegal trade further exacerbates the vulnerability of marine turtles. Prized for their aesthetic value, Hawksbill turtle shells are sought after to produce antique artifacts and jewelry (Dobbs et al., 2019). This illegal commerce poses a significant threat to marine turtles, as it drives their exploitation and further endangers their populations.

Additionally, marine turtles and their hatchlings face threats from the illegal meat trade and the poaching of hatchlings and eggs from nesting sites. These activities directly contribute to the overexploitation of marine turtle populations, putting them at an even greater risk of extinction (Casale et al., 2018)

The conservation of marine turtles is of utmost importance due to their pivotal role as flagship species, significantly contributing to the overall health and balance of the marine ecosystem. Various species of marine turtles, such as green turtles, play crucial ecological roles that extend beyond their own populations.

Green turtles, for instance, are essential in maintaining the health of underwater vegetation in shallow waters. Their herbivorous feeding behavior helps control the growth of seagrass beds, providing essential habitats for numerous aquatic species, including sedentary organisms and active swimmers within coral reef ecosystems (Bjorndal et al., 2019). By maintaining a balanced ecosystem, marine turtles support intricate food webs and promote biodiversity in their habitats, benefiting both marine life and the livelihoods of fishing communities.

The activities and behaviors of marine turtles also contribute to vital ecological processes. As marine turtles repeatedly surface to breathe and subsequently dive back into the water, they facilitate the mixing of nutrients between different water layers. This vertical movement aids in transferring essential nutrients from surface waters to deeper layers, influencing nutrient availability and productivity in marine ecosystems (Lutcavage et al., 1997).

Additionally, marine turtles exhibit migratory behaviors and nesting activities, contributing to ecosystem dynamics. Adult marine turtles often remain in shallow coastal waters, providing habitat and shelter for various marine organisms. Female turtles undertake long-distance migrations between breeding and nesting grounds, allowing for the dispersal of nutrients and the exchange of genetic material across different regions (Hays et al., 2017). Moreover, the nesting behaviors of marine turtles, including the excavation of nests, contribute to nutrient recycling and the mixing of sand on nesting beaches (Christianen et al., 2017). As the eggshells degrade, they release calcium carbonate and other nutrients into the nesting sands, enhancing fertility and supporting subsequent generations of flora and fauna.

Protecting marine turtles is crucial for preserving these ecological processes and maintaining the health and resilience of marine ecosystems. Conservation efforts focused on marine turtle populations and their habitats have broader implications for marine environments' overall functioning and biodiversity.

**Hawks Bay as one of the important habitats for green turtles in Pakistan**

The nesting grounds for sea turtles at Hawks Bay provide a significant and carefully chosen location for their reproductive activities. Hawks Bay and Sandspit, situated approximately 15 kilometers southwest of Karachi, constitute the turtle beach. Within the intertidal zone between Hawks Bay and Sandspit Beach lies the Kakapir region, which features a small rocky outcrop. This area is a nesting site for green turtles and is home to a coastal fishing town (Karam et al., 2016).

The turtle beaches possess specific characteristics that make them suitable for turtle nesting. They exhibit a gentle slope, fine sandy texture, and favorable conditions of humidity and drainage, all of which are ideal for successful hatching (Girondot & Fretey, 1996). These sandy beaches play a crucial role on a global scale by providing a critical nesting site for green turtles during their winter nesting seasons (Girondot & Fretey, 1996).

Observations have revealed interesting behaviors exhibited by female green turtles during their nesting process. After sunset, the female turtles were observed remaining submerged until high tide. High tide assists the turtles in reaching the tidal mark on the beach more easily, allowing them to cross a shorter distance to reach their nests (Karam et al., 2016). Female turtles returning to the exact location where they hatched, known as natal homing, is a fascinating and instinctive behavior (Putman & Mansfield, 2015). This behavior ensures that the turtles return to familiar and suitable nesting sites, enhancing their offspring's chances of successful reproduction and survival.

Upon locating her nest, the female green turtle engages in several activities. Depending on her size and age, she spends nearly two hours digging a body pit and remaining submerged within it for protection against predators (Girondot & Fretey, 1996). The subsequent step involves digging the chamber where the eggs will be laid using her hind limbs or back flippers. The egg-laying process takes approximately 5 to 10 minutes (Karam et al., 2016). It is crucial for this process to remain undisturbed, as any disruption can have significant consequences for the reproductive success of the green turtle population.

After completing the egg-laying process, the female green turtle camouflages the nest. This process involves covering the nest with sand to provide protection and concealment. The time required for this activity varies, typically 15 to 30 minutes, although occasionally it can extend up to an hour (Girondot & Fretey, 1996). Once the nest is camouflaged, the female green turtle returns to the sea, leaving the fate of the eggs at the mercy of natural processes.

Over the past two decades, significant efforts have been undertaken in Pakistan to conserve sea turtles. These initiatives emerged in the 1970s, coinciding with the introduction of mechanical fishing techniques that allowed fishermen to explore previously untapped fishing grounds. Recognizing the importance of protecting sea turtles, the Sindh Wildlife Department (SWD) and the Kakapir fishing community near Hawks Bay, Karachi, joined forces to implement conservation measures (Shaikh et al., 2017).

The conservation project initiated by the SWD and local community involved various activities to safeguard sea turtles. These activities included monitoring adult turtles, monitoring and counting the nests (cultch), relocating eggs to a nearby hatchery, and releasing hatchlings into the sea (Shaikh et al., 2017). By monitoring the nesting activities of green turtles around Hawks Bay and Sandspit, the conservation NGOs could gather valuable data and information about the population dynamics and nesting success (Saeed et al., 2015).

In addition to the direct protection of nests and hatchlings, efforts were directed toward safeguarding the nesting zones against potential threats posed by predators and poachers. Measures were implemented to deter predators and prevent human-induced disturbances that could negatively

impact nesting activities (Shaikh et al., 2017). Protecting nesting sites is crucial for ensuring sea turtle eggs' survival and successful hatching.

Furthermore, conservation NGOs actively raised public awareness and promoted education regarding sea turtle conservation. Public education initiatives focused on highlighting the importance of sea turtles and their habitats and the significance of preserving these species for the overall health of marine ecosystems. Additionally, beach cleanup operations were conducted near nesting locations to create cleaner and safer environments for sea turtles (Saeed et al., 2015).

### ***Introducing Abdullah – a conservation activist from the Kakapir community***

In a recent interview, Abdullah, a prominent member of the Kakapir fishing community, shared insights about his long-standing involvement in marine turtle conservation efforts. Abdullah, a 48-year-old individual, has dedicated his life to protecting sea turtles in the Kakapir village.

#### **Q) how He involved in marine turtle conservation?**

Abdullah's involvement in marine turtle conservation commenced during his early years when he embarked on employment under a relative who held a position in the Sindh Wildlife Department. Alongside his wife, Abdullah assumed the responsibility of monitoring sea turtles and actively collected their eggs, which were transported to a hatchery. Moreover, they diligently observed the nesting behaviors of marine turtles and undertook efforts to rescue and reintroduce hatchlings to their natural marine habitat. Abdullah distinctly recalls his voluntary engagement in these activities since the tender age of 12. His collaboration with his father's cousins fostered his burgeoning interest in comprehending the significance of these oft-overlooked creatures. He was astounded to uncover the vulnerabilities sea turtles encounter at sea and on land, which ultimately drove his unwavering dedication to their well-being.

Abdullah reminisces about specific incidents and underscores the challenges encountered when adult female turtles veered from their intended nesting grounds due to physical factors, necessitating immediate intervention. In such circumstances, he rallied community members to assist in locating and rescuing the disoriented turtle. Employing a cautious approach, they gently wrapped the turtle in fabric to ensure its safety and released it back into the water without causing harm or disturbance. On certain occasions, boats were employed to transport turtles to deeper waters with stronger sea waves for their release.

Furthermore, Abdullah was privileged to participate in a research endeavor supported by the International Chemical Industry (ICI) and conducted by WWF Pakistan. This research involved the nocturnal observation of sea turtles and nesting temperatures on the beach. In recognition of Abdullah's invaluable contributions to this research project, he received appropriate compensation totaling approximately 6,000 Pakistani rupees, disbursed over six months.

#### **Q) In his opinion, what do adults of marine turtles face the threats on nesting grounds?**

Abdullah emphasizes various perils that impact the nesting green turtles on their breeding sites. He contends that these hazards arise from predators, such as canines, which occasionally divert adult turtles from locating their nests. Although dogs seldom prey on emerging hatchlings, they can detect hatching events and linger in the vicinity, awaiting the vulnerable hatchlings' emergence from the sand. Abdullah has witnessed dogs actively excavate the nests to prey upon the submerged hatchlings. Apart from predation, poachers also constitute a significant threat to the hatchlings throughout the nesting season.

The adult female turtles encounter threats primarily due to human activities and the illumination of the nesting beach. However, the development of the beachfront, coupled with the presence of marine debris and litter, including disposable plastics, significantly impedes the green turtles' ability to successfully oviposit at Hawks Bay beach. These threats cause distractions for the turtles, leading them to return to the water without depositing their eggs. Furthermore, beachgoers often leave behind waste, contributing to the accumulation of marine litter in the habitat. Additionally, discarded or lost fishing lines and nets entangle the adult turtles, luring them towards their potential prey but resulting in their mortality instead.

The compaction of sand resulting from footfall on the beach poses an additional challenge for female turtles. This compaction necessitates the turtles to invest more time and effort in preparing the body pit of the nesting chamber before depositing their eggs in a specific nest.

**Q) In his opinion, what do hatchlings of marine turtles face the threats on nesting grounds?**

He reiterated that the hatchlings are also at risk due to the proliferation of disposable plastics. As they emerge from the sand surface, they can become entangled in these materials, diverting their attention from reaching the ocean. Moreover, beachgoers who camp and leave burning fires on the beach pose a threat to the hatchlings. Human activity during the nesting season, including that of beachgoers and tourists, can cause damage to the nests, making them more difficult to identify and compact the sand surface. These disturbances hinder the hatchlings' successful emergence to the sand surface.

Abdullah recounts a specific incident where he witnessed five dogs barking at a nest directly across from the WWF-wetland center around 11 a.m. Upon his arrival, he immediately commenced digging the nest. He discovered approximately 70 to 80 hatchlings entangled in a ghost net, a monofilament net that obstructed their exit from the nest and prevented them from reaching the ocean. Abdullah promptly collected both the monofilament net and the hatchlings, releasing them into the sea during low tide at night.

**Q) How many sea turtles has he rescued and released, and any notable incidents?**

Abdullah has been actively engaged in the voluntary monitoring and conservation of marine turtles in the Hawks Bay region since the 1970s. The quantification of his rescue and release efforts for marine turtles, including adult individuals and hatchlings, presents a challenge due to the continuous and prolonged nature of his endeavors. Within his extensive repertoire of rescues and releases, Abdullah has successfully intervened to save several injured and disoriented marine turtles discovered on the beach. A meticulous assessment of the physical well-being of these turtles was conducted, ensuring the absence of any injuries to their flippers or shell and confirming the absence of plastic or fishing net ingestion. Over the past decade, Abdullah approximates that he has released approximately five to seven mature green turtles, all of which were subsequently able to return to their natural habitat.

Beyond the rescue and release of adult turtles, Abdullah has made a significant contribution in response to an incident approximately eight years ago. During this time, he encountered a group of young individuals attempting to poach baby turtles from the primary nesting site during the cover of the night. This occurrence transpired near the WWF center, where Abdullah frequently engaged with the local fishing community. Noticing the suspicious activities of these individuals, he approached them and uncovered their intention to capture hatchlings unlawfully. This encounter ignited a passionate discussion, wherein Abdullah highlighted the vulnerability and declining population of marine turtles while questioning the ethical implications of exploiting the young offspring of a voiceless species, which he regarded as a religious transgression. This passionate dialogue persisted

for approximately an hour and a half, eventually leading Abdullah to successfully persuade the individuals to release the hatchlings into the ocean.

On separate occasions, Abdullah refrained from his fishing activities and remained home. Between 7 and 8 a.m., he received an anonymous phone call instructing him to proceed to the Maripur roundabout. Within 5 to 8 minutes, Abdullah reached the specified location while the morning light illuminated the road. Upon arrival, he encountered a group of people who were assisting injured workers involved in a car accident. Amidst the commotion, a person on a bike stood out from the crowd and approached Abdullah before he could even respond to the call. This individual handed him a cloth bag and entrusted him with the responsibility by stating, "Now it is your responsibility." When Abdullah opened the package, he discovered approximately 250 hatchlings that were only a few hours old. Taking his scarf, he carefully enveloped the cotton bag to ensure the hatchlings' safe transportation, preventing any escape. Abdullah possessed a sandy-cemented pond at his residence and temporarily housed the hatchlings there, providing them with a tranquil environment to facilitate their energy conservation. He also believes the "presence of yolk beneath their abdomens, indicating that nature had already supplied their initial nourishment."

**Q) What initiatives did he undertake to influence the youth and the local community, and what is the community's perspective?**

Abdullah has implemented various initiatives to influence the youth and the local community positively, and their perspectives on these efforts have been favorable. Due to his lifelong commitment to the conservation of sea turtles along Hawks Bay, Abdullah has attained a prominent position within his community. From an early age, he has actively volunteered to protect these turtles, leaving a lasting impact on the community. Abdullah's unwavering dedication and ability to work independently despite local constraints are a profound source of inspiration for community members, particularly the youth. Observing his relentless endeavors to safeguard turtles, community members have been inspired to join his cause and provide support.

Moreover, Abdullah has played a pivotal role in engaging teenagers through educational initiatives and involving them in activities centered around beach cleanup. These young individuals now partake in organized classes and actively contribute to removing litter from the beaches. Notably, they demonstrate utmost respect and sensitivity towards the breeding beaches, nests, and hatchlings, ensuring their actions do not disrupt these crucial processes. As a united community, they have developed a deep understanding of the significance of turtle conservation. They take great pride in stewardship of the Pakistani beach, recognizing its vital role as a habitat for green turtles. With a primary focus on raising awareness among tourists, they strive to educate visitors about the importance of turtles in marine ecosystems and emphasize the imperative to preserve and protect the beach from any potential harm.

**Q) What message do you convey regarding the conservation of marine turtles and his perspective on the situation at Hawks Bay?**

In response to the question regarding the conservation of marine turtles and Abdullah's perspective on the situation at Hawks Bay, Abdullah emphasizes the significance of Hawks Bay, specifically Kakapir, as an optimal habitat for marine turtles to engage in their reproductive activities. The breeding season typically commences in late July, peaks in August, and extends until December. Abdullah notes that approximately ten female turtles daily approach the coastline, yet only 2-3 of them successfully lay their eggs. Each clutch comprises an average of 60-90 eggs, while the remaining turtles are forced to return to the water due to various disturbances. It is important to mention that although nesting

activities predominantly occur during this period, there have been instances where turtles may visit in January and February for the purpose of egg-laying. Abdullah further highlights that adverse weather conditions have played a significant role in the decline of nesting habitats in recent years.

Abdullah firmly believes that the conservation of marine turtles holds paramount importance in light of their diminishing global population and the multitude of natural and human-induced threats they encounter throughout their life cycle. Given the inability of sea turtles, as wild creatures, to express their vulnerability through vocalization, they remain highly susceptible to the capricious forces of nature. Abdullah underscores the moral and societal responsibility, particularly in the context of their Muslim identity, to contribute to the preservation efforts of these creatures, acknowledging the inherent value of every organism's existence.

Abdullah's perspective underscores the crucial nature of marine turtle conservation and advocates for collective action to protect these remarkable creatures, considering the global decline in their population and the imperative to mitigate their diverse threats.

### **Q) What is the significance of having more individuals like Abdullah?**

The presence of additional individuals like Abdullah bears significant importance in addressing the limitations faced by sea turtle conservation organizations in effectively safeguarding vulnerable species, particularly in the absence of a robust and consistent beach monitoring mechanism. Individuals such as Abdullah, who actively participate in the community and dedicate much of their time to personally monitor and protect sea turtles, assume a pivotal role. Their active engagement and unwavering commitment are indispensable for expanding monitoring endeavors and augmenting the overall protection of sea turtle species in the region.

The involvement of community members, encompassing individuals and volunteers, carries profound significance in scaling up monitoring activities and amplifying the protection of sea turtles within the area. By actively participating, community members can contribute to preserving their beaches by ensuring the safety of marine creatures and refraining from causing any disturbances to marine environments. Through their resolute support and engagement in turtle conservation efforts, the community can fulfill its responsibility towards the conservation of sea turtles in Pakistan and strive towards achieving the overarching objective of ensuring the long-term survival of these magnificent creatures.

### **Need for the involvement of the coastal fisher communities in marine conservation:**

The significant involvement of coastal fisher communities in marine turtle conservation is crucial for the sustainable protection of these iconic species. As key stakeholders residing near nesting grounds and actively engaging in fishing activities, these communities provide valuable knowledge, cultural practices, and hands-on efforts toward conservation efforts. They act as custodians of nesting grounds, utilizing their intimate understanding of nesting behavior to monitor and safeguard these habitats, deterring poaching and raising awareness within their communities. This commitment ensures the long-term survival of nesting populations.

Coastal fisher communities also play a pivotal role in reducing incidental captures and mortality of marine turtles during fishing activities. By adopting sustainable fishing practices, such as responsible fishing techniques and safe handling and release of accidental catches, these communities protect turtle populations while ensuring the sustainability of fish stocks and overall marine ecosystem health.

Preserving traditional knowledge and cultural practices among these communities further strengthens marine turtle conservation efforts. Recognizing the importance of marine turtles in their historical

narratives, rituals, and beliefs, they demonstrate deep reverence and responsibility toward their protection. By harnessing this traditional wisdom through community-led initiatives, conservation efforts are bolstered, cultural heritage is preserved, and sustainable practices are fostered for future generations.

The involvement of coastal fisher communities in marine turtle conservation also has socio-economic implications. Supporting alternative livelihoods, such as ecotourism initiatives centered around turtle conservation, benefits these communities economically while alleviating pressure on marine resources. This positive feedback loop incentivizes continued commitment and participation in conservation efforts.

Effective marine turtle conservation requires collaboration between coastal fisher communities, government agencies, and non-governmental organizations. Empowering fisher communities through capacity building, education programs, and resource management initiatives strengthens their ability to contribute actively. A synergistic approach can be achieved by fostering partnerships that merge scientific knowledge, traditional wisdom, and community-driven actions, ensuring sustainable and long-lasting marine turtle conservation.

In conclusion, the involvement of coastal fisher communities in marine turtle conservation at nesting grounds and during fishing activities is of paramount significance. Their contributions, rooted in traditional knowledge, cultural practices, and direct engagement, make them indispensable partners in preserving these iconic species. Recognizing and supporting their efforts is vital to ensure the continued existence and thriving populations of marine turtles, securing a vital component of coastal ecosystems for future generations.

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