CONFLICTS IN CONSERVATION: A REVIEW OF THE IMPACT OF SEA TURTLE CONSERVATION ON FISHER COMMUNITIES IN INDIA

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INTRODUCTION

Conservation and management of wild species and resources requires a thorough understanding of ecological factors and effective engagement and contribution by different stakeholders, including local communities that co-habit or utilise similar space and resources (Ban *et al.*, 2013). As the world has become largely human-dominated, conservation planning and activities are increasingly taking into consideration the welfare of local communities. However, conservation of wild species can result in conflicts, especially when a local community's access to a resource or space is prohibited, and in the absence of any suitable alternatives (Berkes, 2004). Consequently, this can turn many people against biodiversity conservation efforts, resulting in a lowered respect for the value of wildlife and, sometimes, negative interactions with the species (Naughton-Treves *et al.*, 2003; Agarwala *et al.*, 2010; Skogen, 2015). It can also lead to clashes between different stakeholders when communities regard the governments or park managers as possessing the "ownership" of wildlife (McCoy, 2003) that has the potential to harm their (communities') interests. If conflict arises, its resolution often revolves around a complicated mix of ecological, cultural, and economic factors (Marshall *et al.,* 2007; White *et al.,* 2009; Dickman, 2010). Ecological factors include wildlife behaviour and may or may not impact humans and their property. Economic factors include the monetary value of the loss or damage to human property, if any, and cultural factors determine human response/s to wildlife conflict (McCoy, 2003; Dickman, 2010). Therefore, devising an effective mitigation strategy to ensure a peaceful co-existence requires an in-depth look at the types of interactions between humans and wildlife and the factors just described.

Conservation in the marine ecosystem mainly focuses on improving quality of different habitats, reducing take of marine wildlife resources, and lessening fisheries-marine fauna interactions. In the context of fisheries, regardless of the intended target species, marine species such as the sea turtles can be accidently captured in fishing nets, what is known as bycatch. For sea turtles, fisheries and specifically bycatch have emerged as a major threat contributing directly or indirectly to the decline of many populations (Putman *et al.*, 2020). What complicates the issue further is that sea turtles are highly migratory, and interactions with fisheries become inevitable in most regions.

Of the five species of sea turtles found in India, olive ridley (*Lepidochelys olivacea*) and green (*Chelonia mydas*) turtles often interact with humans, mainly fisher communities in regions where turtles occur in abundance. In the past, all sea turtle species were hunted for their meat, eggs, carapace (shell), and fat/oil for sale or local consumption (Shanker *et al.,* 2012). There were even specific markets for sea turtle meat in West Bengal and Tamil Nadu, and in the Andaman and Nicobar Islands (Frazier, 1980; Kar & Bhaskar, 1982; Vijaya, 1982), and turtles were killed for oil in Gujarat and the Lakshadweep islands. Turtle eggs were widely consumed by communities along the entire coastline (Shanker & Kutty, 2005). Cultural factors such as religion played a role in prohibiting some communities from consuming turtles. For example, turtles are considered an incarnation of the deity Vishnu, the protector, in Hindisum; therefore, certain communities did not hunt and/or consume sea turtles (Shanker & Kutty, 2005). In Islam, turtles are believed to be 'haram' and unsuitable for consumption, but eggs and other products can still be utilised (Shanker & Kutty, 2005; Rusli *et al.,* 2020). An additional factor that reduced turtle consumption in territories like the Lakshadweep islands was an increase in supply and availability of other food items (Anonymous, pers. comm., 2018). However, it was mainly after the Wild Life Protection Act (WLPA) of 1972 came into force, that most turtle hunting activities ceased (Shanker & Kutty, 2005) except for that by the Scheduled Tribes of the Nicobar Islands whose rights remained protected under Section 65 of the Act.

However, the WLPA had implications for communities that lived alongside sea turtles. While actions to reduce threats and improve sea turtle populations were being implemented, certain stakeholders in coastal communities found these strategies to be detrimental to their subsistence and livelihoods. This paper will provide an overview of two cases where sea turtle conservation has affected fisher communities, collated using studies and ethnographies from India. It will also describe different causes of conflicts, the direct and indirect impacts on local communities and their livelihoods, and potential steps that could be employed by conflict managers and conservationists to strike a balance between enforcing conservation and safeguarding local livelihoods.

PROTECTING TURTLES = HARMING LIVELIHOODS? OLIVE RIDLEY TURTLES AND FISHERIES IN ODISHA

Sea Turtle Legislation in Odisha

Odisha (formerly known as Orissa) has historically been home to three important mass nesting sites of olive ridley turtles on mainland India: Gahirmatha beach, Devi River mouth, and Rushikulya River mouth. The olive ridley turtle breeding season at these sites lasts from October to May; mating occurs in offshore waters from October to December and nesting from January to May (Behera & Kaiser, 2020).

Between 1980-90, an increase in the export of shrimp to developed countries led to a rise in trawler fisheries in India, and the latter won governmental support because of the revenue it generated (Ramesh, 2021). As most trawling, gill-netting, and other forms of fisheries occurs in near-shore areas, there tended to be frequent interactions with marine megafauna such as sea turtles, dolphins etc that also utilised these habitats (Ramesh & Rai, 2017). Increased observations of dead turtles were attributed to drowning after accidental capture in gillnets and trawler nets (Rajagopalan *et al.*, 1996; Pandav *et al.*, 1997, 1998; Chadha & Kar, 1999; Behera *et al.*, 2013, 2016). Other potential causes of turtle mortality due to fisheries were suggested to be injuries due to entanglement, propellor strikes, and/or the increased use of monofilament nets (Sridhar, 2005).

The first level of protection to olive ridley turtles was already provided by the WLPA listing it as a Schedule I species. Secondly, under the Orissa Marine Fisheries Regulation Act (OMFRA) passed in 1982, the Odisha State Government reserved the rights to regulate, restrict or prohibit all forms of fishing in different areas. OMFRA regulations further required that only 1,000 mechanised fishing vessels could be licensed to operate along the Odisha coast. Furthermore, in 1997, Gahirmatha rookery was declared a Marine Sanctuary (Gahirmatha Marine Sanctuary; GMS) under Section 26(1)(b) of the WLPA, protecting a total area of 1,435km^2 (core area of 725.50km^2 and buffer zone of 709.50km^2) and serving as a spatio-ecological solution to safeguard the olive ridley turtle population. The core area is located near the coastline and extends 10km out to sea, while the buffer zone is located in waters between 10-20km seawards. As per the marine sanctuary stipulations, catamarans and other crafts using motors less than 10 horsepower and employing monofilament nets were permitted within the buffer zone; however, all fishing activities were prohibited in the core zone (Sridhar, 2005).

In addition to fishing restrictions in the GMS, the Government of Odisha imposed a seasonal ban on trawler fishing within a 20km seaward radius in areas between the Jatadhar River mouth, Devi River mouth, and Chilika River mouth, and Rushikulya River mouth from 1st January 1998 to 30th May 2000. The seasonal ban continues to be enforced every year since. The OMFRA, 1994, also made installation of Turtle Excluder Devices (TEDs) mandatory for trawler nets; failure to comply resulted in cancellation of licenses. Later in 2001, the rule was amended to require compulsory usage of TEDs by all 'mechanised fishing vessels'. In 2003, a new directive was issued by the Central Empowered Committee (CEC) of the Supreme Court and the State High Power Committee (HPC) to ban all gillnet operations within 5km of the three mass nesting sites and completely prohibit trawling and gillnet fishing operations in Dhamra, Devi, and Rushikulya River mouths from 1st November 2003 to 31st May 2004 respectively (Sridhar, 2005).

To check if the aforementioned rules were being followed, the CEC of the Supreme Court made a site visit to Odisha and passed three more orders in 2004. The first order was that traditional, non-motorised gillnet vessels should use only small-mesh, monofilament nets with a maximum length of 300m within 5km from the coastline, and these vessels be allowed only in limited numbers within the areas where olive ridley turtles congregated for mating. The second order permitted motorised vessels deploying gillnets within 5km of the coastline except in the 5km restricted area near Devi and Rushikulya River mouths. These vessels were permitted to use only small-mesh, monofilament nets of a maximum length of 300m and not multifilament large-mesh nets. The third order prohibited the usage of sting ray nets, ring seine nets, sea bass nets, and all nets measuring 140mm and above in mesh size, whether monofilament or multifilament, along the entire Odisha coastline. Additional restrictions included that the area 5km

from the shore could only be used by non-mechanised traditional crafts whereas mechanised vessels up to 15m length were allowed to operate 5km off the coastline. Any mechanised vessel weighing 25 gross tonnes and over or more than 15m in length, was permitted only beyond 10km from the shore (Sridhar, 2005).

Implications for Fishers

The declaration of the GMS had come with its own set of problems. Its declaration was a move by the government with the following intentions: 1) to show the World Trade Organisation (WTO) that the government was dedicated towards the protection of the olive ridley turtle breeding population and 2) to serve as a counteraction to the USA's decision to ban shrimp imports from India due to environmental concerns (Ramesh, 2021). As the protection of olive ridley turtles through the GMS was considered a means to an end, it is possible that the ramifications of such a declaration were not fully considered.

After its declaration, a lot of the fishers did not have clarity on the precise rules and restrictions to operate within the GMS. There was also ambiguity over what was categorised as mechanised (with inboard engines and propulsion systems) and motorised (boats with outboard motors or transportable inboard engines) vessels and gear, which caused further confusion over permissible form of fishing within the buffer zone (Sridhar, 2005). This worsened as the Forest Department officials patrolling the region had no understanding of vessels and gears, resulting in clashes with fishers in the region.

In addition, the demarcation of the core area and the buffer zone of the GMS was such that, in order to access the buffer zone, fishers had to pass through the core zone. While there was a provision that allowed safe passage to traditional fishers through to the buffer zone, it brought into question the rationality with which the core area had been assigned (Sridhar, 2005). Another point of contention was the year-round ban on fishing and prohibition of activities in the core zone considering that turtle breeding (congregating, mating, and nesting) lasted for 6-9 months in an entire year. Fishers argued that the GMS did not even ensure complete protection of olive ridley turtles as breeding congregations were observed further northeast and outside the designated area (Ram, 2000). Therefore, any fishing restrictions imposed in the GMS predominantly affected the small-scale fishers who were already struggling to earn a livelihood, leading to a belief that turtle conservation efforts were 'anti-poor' (Ramesh, 2021).

The trawler industry also strongly opposed many of the conservation measures. Trawler owners complained that a year-round fishing ban in the GMS was unjustified as the turtle breeding season lasted only nine months (Sridhar, 2005). Moreover, as per the Government requirements, it was mandatory for trawlers to use TEDs which, according to the trawler industry, resulted in a considerable loss in fish catch. Additionally, TEDs were to be used year-round even though the turtle season lasted for nine months. Trawler operators were open to modifying the TEDs to ensure that there was minimal fish loss. While institutes like Central Institute of Fisheries Technology (CIFT) made changes to the TEDs (Boopendranath *et al.*, 2006), these modified designs were not assessed for efficiency and trawler operators remained unconvinced about their efficacy (Shanker & Kutty, 2005). Consequently, as the implementation of TEDs was not monitored by the enforcement agencies (Shanker *et al.,* 2004), trawlers continued operating as per usual which did not help the cause of turtle protection. The trawler operators also pointed out that threats such as light pollution, habitat destruction, and depredation were left unchecked while the trawler industry was unfairly blamed for all or most turtle mortality on the Odisha coast (Behera, 2006).

The conflict was further fuelled by instances of violence initiated by both fishers and State Forest Department guards. Forest guards alleged that trawler crews would often intimidate them by employing scaring tactics such as throwing dynamite (Wright & Mohanty, 2006). In 2003, forest guards were 'abducted' by gill netters, and one guard died after being pushed overboard (Wright & Mohanty, 2006). It was reported that two fishers were shot dead by guards in 2005/06, which led to a public uproar over treatment of fishers by the enforcement agencies (ICSF, 2009).

Fishers also reported that forest guards would stop and seize catch from gill netters and trawlers even though the fish were caught outside the sanctuary boundary, where fishing was permitted (Chhotray, 2016). Similar complaints were raised by trawler operators who said that the Forest Department would try to charge hefty penalties, not comparable to the value of catch that was seized. Their complaint indicated that the Department would go against the CEC's recommendation of auctioning the fish seized in the sanctuary in the presence of the trade union representatives (Wright & Mohanty, 2006). There were several cases of fisher suicides due to loss of livelihoods and inability to pay back debts reported from Kendrapara district till 2006. These restrictions also had larger implications for fisher families, as women who were involved in post-harvest and marketing activities were also impacted. Furthermore, other community members that

earned their daily income through crab collection and fishing in the creeks and mangroves near Bhitarkanika Wildlife Sanctuary and GMS were adversely affected due to lack of access to these habitats (ICSF, 2009).

In addition to the declaration of GMS, various seasonal and gear bans were imposed with the intention of protecting olive ridley turtles; however, it had adverse impacts on fishers as these restrictions along the coast reduced their access to fishing grounds. As there were no studies conducted on the impact of different gears or fisheries on sea turtle mortality, there was no justification to the specifications provided under the rules (Sridhar, 2005). The usage of the ambiguous terms and phrases in these regulations further exacerbated the situation (Shanker & Kutty, 2005):

> a) When 'gill netters' was mentioned, the type of craft was not specified, and therefore, enforcement agencies interpreted this as any vessel using a gillnet was not permitted. However, all boats except trawlers used gillnets, and, thus, it impacted vessel owners that were permitted under the general vessel type rules; and,
> b) There was lack of clarity in legislation over the meaning of terms 'mechanised, 'motorised', and 'traditional' while referring to vessels and types of fisheries.

Often, the State Forest Department would penalise (via fine and confiscation of nets) traditional fishers using monofilament nets in the Rushikulya area. The terrestrial-centric training of the guards in the Forest Department meant that they could not distinguish between different types of gears, nets, and vessels leading to unpleasant interactions. It finally culminated into a conflict in 2003 when a ban on the usage of gillnets was proposed for Devi and Rushikulya River mouth areas as well. As the ban resulted in distress within the fisher community, the Orissa Traditional Fishworker's Union (OTFWU) brought forward their issues to the Odisha government and the CEC. The lack of consultation prior to the declaration of GMS made the fishers fear that if the Rushikulya and Devi River mouth areas were declared as marine sanctuaries, it would further reduce accessible fishing grounds and harm their livelihoods. In addition to prohibiting mechanised fishing near the Devi and Rushikulya River mouths within 20km of the high tide line between 1st November and 31st May of every year, there was also the annual fish breeding season ban from 15th April to 31st May (Sridhar, 2005). Therefore, along with reduced access to fishing grounds, fishers were also unable to fish in months when economically important fishes such as hilsa were abundant. While the use of mechanised vessels in the nearshore waters was banned in all coastal states of India in order to safeguard traditional fisher livelihoods, the strict imposition for turtle protection was viewed as a turtle vs. people rule (Shanker & Kutty, 2005).

Recommendations Towards Mitigating the Conflict

Over the years, there has been considerable attention given to fisheries impacts on olive ridley turtle mortality in Odisha. While it is well known that interaction with fisheries is one of the major threats to sea turtle mortality across the world (Swimmer *et al.,* 2006; Lewison *et al.*, 2014), in there needs to be sufficient information on how the different types of nets, gears and fisheries contribute to this mortality in Odisha. Moreover, the singular focus on fisheries has negated the need to assess and mitigate other threats, including light pollution that causes dis- and/or mis-orientation in hatchlings and disturbance to nesting turtles, nesting habitat degradation due to sand mining and beach armouring, development activities on nesting beaches, and egg depredation by feral animals (Pandav, 2000; Sridhar & Shanker, 2007). There is also a need for better coordination between different agencies of the Government, such as the Fisheries and Forest Departments, in the monitoring and conservation of sea turtles and reducing threats, as well as in framing legislation that fall under the purview of both bodies (Sridhar, 2005). Deriving from the ethnographies of the GMS and Rushikulya, Ramesh (2021) also suggested that conservation practitioners and managers must consider development activities in the region keeping in mind larger political economy and determine different ways of collaboration for conservation.

As Shanker & Kutty (2005) explained, the intense focus on olive ridley turtles in Odisha created a rift between fishers and conservationists, and the flagship status of the turtles ended up creating a "polarised and politicised battle". Conservation regulations can pit conservationists and the State against local stakeholders such as fisher communities as these measures can impact livelihoods, cause harassment and violence by all sides, and result in other complications that stem from 'fortress conservation' (Sridhar & Shanker, 2007).

MORE TURTLES, MORE PROBLEMS: GREEN TURTLES AND LAGOON FISHERS IN THE LAKSHADWEEP ISLANDS

Sea Turtle Legislation and an Improvement in Green Turtle Numbers

The Lakshadweep islands lie approximately 200km off

the southwestern coast of mainland India. The islands and adjoining lagoons serve as breeding and foraging grounds for green turtles (Tripathy, 2002, 2007). Earlier records showed low numbers of green turtles utilising these habitats (Bhaskar, 1978), potentially as a result of local harvest to obtain oil used to caulk boats and eggs for consumption. However, between 1995 and 2000, a remarkable rise in green turtle numbers was noted in the lagoon of Agatti Island (Tripathy *et al.,* 2002, 2007; Kelkar *et al.*, 2010). This was potentially the result of: 1) successful conservation activities such as nesting beach protections, hatchery programmes, and reduction in bycatch in the Indian Ocean (Arthur *et al.*, 2013); 2) intensive fishing of turtle predator, the tiger shark (*Galeocerdo cuvier*), in the region (Heithaus *et al.*, 2008; Arthur *et al.*, 2013); and/or, 3) change in the type of material used to construct boats (wooden to fibre) lowering the demand for turtle fat-based oil, and consequently, turtle hunt; and 4) increased availability of food coming from the mainland in the Lakshadweep islands reducing turtle egg consumption (Kale *et al*., 2022). The increased turtle numbers in the Lakshadweeps continues to be observed across space and time (Lal *et al.*, 2010; Kelkar *et al.*, 2013; Kale *et al*., 2022).

In 2008, Lal *et al.* (2010) observed that the high densities of green turtles were overgrazing seagrass meadows and causing changes such as reduced blade densities, canopy height, and biomass, especially of *Thalassia hemprichii* and *Cymodocea rotundata* species in Agatti island. As these seagrass characteristics reduced, the density and biomass of fish such as *Lethrinus harak* and *Parupeneus berinus*, that relied on seagrass meadows as habitats for feeding and protection, also reduced (Kelkar *et al.*, 2010). Similar trends in green turtle and seagrass densities were also observed in Kadmat (2013) and Kalpeni (2016) islands (Kale *et al*., 2022), which could have potentially impacted the lagoon fish density and biomass there as well.

Implications for Fisher Resources and Livelihoods

Local fishers first experienced the effects of high green turtle densities on seagrass meadows and fish populations around 2004 (Kelkar *et al.*, 2014). The direct impact of increased turtle numbers included material losses in the form of destruction of fishing nets due to entanglement and/or breakage of nets, and disturbance of fish. The indirect impact was reduced catch of fish that were used as bait and for consumption. This caused considerable economic losses for fishers due to the costs incurred in buying and/or repairing nets, and fish catch loss and hence, sale or consumption. As the turtles harmed their livelihoods, fishers developed antagonistic feelings towards green turtles. It resulted, on rare occasions, in fishers killing or hurting adult sea turtles, destroying nests, and being verbally hostile about green turtles (Arthur *et al.*, 2013). Fishers, for most part, refrained from inflicting fatal harm to green turtles due to their protected status in the WLPA and strict monitoring by the local authorities (Anonymous, pers. comm., 2019).

Arthur *et al.* (2013) conducted a study to understand the logic that the fishers used to link green turtles with fish loss at Agatti and Kadmat Islands. Fishers at both locations described similar direct and indirect impacts of the increase in green turtle abundance. Interestingly, fishers at Agatti felt more strongly about the losses incurred and put more blame on the turtles. In comparison, while fishers at Kadmat also attributed their losses to green turtles, they believed that there were additional reasons for reduced fish catch, e.g., increasing number of fishers. When asked to suggest ways to reduce interactions or losses caused by green turtles, fishers' responses ranged from extreme measures such as culling of turtles, to methods to control their numbers, to changes in netting methods or target fish species. Fishers at Kadmat also provided neutral responses based on the understanding that there was no effective solution to this issue and that, once the seagrass regrew, the turtles would return, and this cycle would continue. Arthur *et al.* (2013) also measured fish catch and recruitment biomass which showed that the fisher perceptions of green turtles affecting seagrass abundance which in turn, diminished fish species aligned with the ecological patterns.

In 2014, it was observed that, despite green turtle densities reducing at Agatti, fisher perceptions had not changed and they continued to blame turtles for their loss of gear, the rates of which had also reduced (Kelkar *et al.*, 2014). Simultaneously, and even though Kadmat had experienced a dramatic rise in turtle numbers and fall in seagrass and fish resources, fishers at this location continued to have few negative feelings towards green turtles. Some considered the lagoon being cleared of seagrass as a good thing and felt it made catching fish easier, reduced seagrass entangling in nets, and made the lagoon look clean (Kelkar *et al.*, 2014).

As the turtle population size changed across islands over time, it was believed the conflict would eventually resolve itself (Arthur *et al.*, 2013). There was also the belief that the conflict would 'migrate' along with the turtles that were moving from one island lagoon to another for foraging, and perhaps antagonise fishers on other islands as well. This showed that drastic management measures were required to resolve the first-order conflict between turtles and fishers. The second-order conflict, because of the reduced fish numbers, could be mitigated by allowing seagrass meadows to recover to a sufficient density and

canopy. The study highlighted the need to focus on active habitat or ecosystem conservation and management to allow for regrowth in seagrass and fish numbers and reduce other anthropogenic stressors such as dredging, sedimentation, pollution etc. (Arthur *et al.*, 2013). This case also emphasised that taxa- or species centric conservation can have adverse impacts and lead to habitat collapse due to green turtles overgrazing seagrass (Christianen *et al.*, 2014). Furthermore, to allow fishers to cope with the loss in fish catch as turtles continued to overgraze seagrass, resource managers and conservationists would have to help them adapt to targeting non-seagrass associated fish species such as *Gerres* or *Trachinotus* spp. (Arthur *et al.*, 2013). Gangal *et al.* (2021) also suggested regulating shark fisheries to improve seagrass populations by controlling the increase in green turtle numbers through predation.

Lessons from the Lakshadweep Conflict

While most conflict management is aimed at solving the direct conflict caused by sharing of resources and is often easily quantifiable, there is also a need to consider the indirect impacts or second-order conflicts in devising management plans. Moreover, community perceptions and reactions are often ignored by managers who consider it biased or difficult to quantify and do not incorporate this dimension while forming management strategies. These opinions and perceptions, however, were useful in understanding the human perspective of the human-wildlife interface and determining the drivers behind a conflict. The Lakshadweep scenario shows that the fisher concerns were valid and sufficiently backed by ecological evidence that green turtles were the primary reason for reduced seagrass and fish biomass (Arthur *et al.*, 2013). It also showed that the same conflict can illicit different reactions in local communities (Kelkar *et al.*, 2014) and, therefore, conflict management requires a deep understanding of ecological mechanisms in conjunction with equal consideration towards human attitudes and perceptions to devise mitigation strategies.

SUMMARY

Sea turtles have a wide habitat range and, therefore, interactions with a coastal population of nearly 560 million people in India are inevitable. In the past, cultural significance of sea turtles has been crucial in ensuring a peaceful co-existence between the two. However, the inefficacy of dated conservation techniques, where spatial separation or legal protection for wildlife can often be ineffective, or compensatory schemes to recover losses incurred by the communities too inadequate to cover the full costs of the conflict (Dickman *et al.*, 2013), defeats the purpose. The situation worsens when the livelihoods of an already impoverished community are threatened, resulting in hostility. The two cases from India presented in this paper highlight common themes and shortcomings caused by wildlife conservation actions that consequently resulted in the conflict scenarios. These conflicts show that there is a greater need for different stakeholders to work together while strategising ways to conserve a wild species. There should be a thorough assessment to identify relevant stakeholders, which include not only those that will be involved in the active conservation but also groups that may be affected by conservation plans. Further, if conflict arises, detailed studies must be conducted on relevant ecological, social, and economic factors to determine the most effective means of resolution. Prior to implementation of any laws, awareness campaigns can also be held to inform the community about the need to protect wildlife. This will also increase engagement between the State, conservationists, and the community which could be important for a transition as the conservation legislation comes into effect. In conclusion, the two cases provide different insights into the 'what to do' to avoid a conflict scenario due to wildlife conservation and the proposed mitigation methods must be considered by conflict managers to deal with potential future conflicts.

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