

Development of Alternative Tourism Destinations along the Sindhudurg Coast, Sindhudurg District

1. Introduction

Tourism is considered as main factor for economy of most countries in the world. It is the fastest growing industry in the modern world. It is gaining universal acceptance as a potent engine for comprehensive socio-economic development because of the employment opportunities it created and the infrastructure development as a result of it. It has the prospective to inspire other economic indicators through its forward and backward linkages. Also it has the capacity to generate more employment due to its multiplier effect in the economy.



Tourism has boasted virtually uninterrupted growth over time, despite occasional shocks, demonstrating the sector's strength and resilience. International tourist arrivals have increased from 25 million globally in 1950 to 278 million in 1980, 674 million in 2000, and 1186 million in 2015.

Tourism sector is a major source of revenue and an employment generator for India. Tourism has direct impact on many related sectors such as transportation, Hotels and restaurants etc. Tourism is a significant contributor to GDP and foreign exchange reserve of the country. Tourism sector can also be considered the backbone for allied sectors, like hospitality, civil aviation, and transport. Considering the importance of this sector, Government of India has invested abundantly in the past for infrastructure development. It has been partially successful with increase in foreign tourist arrivals over the last decade, courtesy "Incredible India Campaign". It has resulted in steady growth in arrivals of foreign tourist which has increased from 2.45 million in 1999 to 4.18 million in 2015.

Domestic tourism is very enormous in the country, promoted by various intents. Pilgrim and leisure tourism are two very important sub sectors. India's domestic tourist visits rose from 190 million in 1999 to 1439 million in 2015. As per actual growth rate, the domestic tourism is expected to touch 4300 million figure in 2025. A lot of scope is available for new businesses to enter and tap the segment. With the rising economic status of the middle class and affluent population, outbound travel is on the rise. Though Thailand, Malaysia, and Singapore circuit the most favored destinations among the tourists, interest for off-track destinations are also increasing.

1.1 Coastal Tourism

One of the most common types of tourism is coastal tourism. It is based on a unique resource combination at the interface of land and sea offering amenities such as water, beaches, scenic beauty, rich terrestrial and marine biodiversity, diversified cultural and historic heritage, healthy food and, usually, good infrastructure. It includes a diversity of activities that take place in both coastal zones and coastal waters, which involve the development of tourism capacities (hotels, resorts, second homes, restaurants, etc.) and support infrastructure (ports, marinas, fishing and diving shops, and other facilities). Besides physical conditions, the development of tourism in coastal areas is related to socio-economic features of the receiving environment such as local community interests, health and security conditions, political factors including unpredictable crises, and traditional models of tourism.

Ocean Economy which is estimated to be USD 1.5 trillion in 2010 and it is expected to grow to USD 3 trillion by 2030. Marine and Coastal tourism is estimated to add values of 25% to ocean economy. In

2010, Marine Coastal tourism stood next to offshore oil and gas industry in ocean economy but it's expected to be the most value adding industry by 2030 (OECD: Ocean Economy by 2030).

In many countries, coastal areas provide the main tourism resource, with the greatest concentration of tourism investment and facilities. One of the main reasons is that visitors are strongly attracted by coastal environments (e.g., beaches, fine landscapes, coral reefs, birds, fish, marine mammals and other wildlife) and by associated cultural interests (e.g., coastal towns/villages, historic sites, ports, fishing boats and markets and other aspects of maritime life).

Tourism activities set in coastal and marine environments have evolved far beyond the traditional passive leisure experiences of the classic resort holiday. While the traditional beach holiday remains a contemporary mass tourism phenomenon. Marine tourism now extends far beyond beach activities to a wide spread spectrum of activities including scuba diving.

1.2 Scuba Diving Tourism

In the seven decades since Cousteau and Gagnan's modifications to self-contained diving equipment, which transformed their underwater experiences, scuba diving has assumed a place as a globally recognized form of marine-based leisure and tourism. Over this time, scuba diving has grown in popularity from being a sport pursued by hardy adventurers, to being featured in holiday activities or leisure pastime in tropical, subtropical, and temperate locations, all underpinned by an internationally recognized and standardized approach to leisure skills development and training. Millions have undertaken some level of scuba certification since scuba diving training became commercialized and internationalized as early as the 1930s, but significantly since 1967. Scuba diving is an important component of marine tourism and a 21st century scuba diving environment is economically important to tourism destinations, draws from advances in technology, involves multifaceted management approaches, and has relevance in discussions of climate change and environmental sustainability. Our interest as humans, in witnessing or discovering the experience of being below a watery surface, is evident in the global geography of scuba diving. Warm, tropical locations near the equator are well known and popular, including the Red Sea, Thailand, and Malaysia. Also popular are subtropical and temperate locations in Australia, US, and South Africa, where cooler ocean temperatures support different forms of marine life and habitats.

The data show that recreational scuba diving and scuba diving tourism is a powerful branch of the international economy with annual turnover of billions of dollars. Scuba diving tourism is internationally one of the fastest growing sectors and is now a multibillion dollar industry. Only in Europe there are currently more than 3 million active divers, while 1.5 million of them travel once a year to a diving destination spending more than 3.8 billion Euros. According to the World Tourism Organisation, scuba diving consists the second tourism sport activity after winter sports, with an annual turnover of 3.5 to 5 billion Euroes. According to the Professional Association of Dive Instructors (PADI), from 1976 to 2016 has certified more than 24 million international autonomous divers and each year approximately 1 million divers get certified. Among the factors that contribute to the appeal and popularity of recreational scuba diving has been the development of safe and affordable diving equipment, along with technological advances that enable marine craft to more easily access remote scuba diving sites and the growing interest in learning about and experiencing natural environments.

Entire nations (Caribbean, Seychelles, Maldives, Tobacco and Trinidad, Malaysia etc.) live solely from scuba diving tourism. In several countries (Thailand, Canary Islands, Egypt, Malta etc.) the income of diving tourism represents one of the largest sections of governments' budgets. For example, 27% of Malta's GTP originates from scuba diving. Tropical small island nation's economy is driven by tourism which is solely dependent on scuba diving industry. Scuba Diving industry also contributes significantly to the economy of larger nations such as Australia, USA etc. It is estimated that the dive-related spending in Australia is potentially worth as much as USD 2.2 billion a year (The Scuba Diving Industry in Australia: 2015).

The history of scuba diving industry in India is relatively in nascent stage. The first scuba diving activities started in Goa and then spread over to Lakshadweep, Andaman and Nicobar Islands in early 1990s. In recent years it also has extended over Pondicherry, Gujarat and Maharashtra. Scuba Diving has become one of the most sought activity by tourist in adventure tourism segment. However, there are no studies been conducted to estimate the economic impact of scuba diving industry in the country.

The type of attractions varies from location to location and the quality of scuba diving depends on underwater visibility/clarity and the diversity and abundance of marine life. Two island groups such as

Andaman and Lakshadweep Islands has advantage which has crystal clear water and luxuriant coral reef which supports extra ordinary diversity and abundance of marine life. Therefore, these islands are most popular among tourists who seek scuba diving and snorkeling experience. Though the scuba diving industry in these islands is flourishing but it is not growing to its potential due to its geographical isolation. Therefore, mainland India's scuba diving destinations have become the natural choice for tourists who seek to experience scuba diving at affordable prices.

1.3 Poverty on the coast

Poor people tend to be the most dependent upon the environment and the direct and indirect use of natural resources, such as the coast, and therefore are the most severely affected when the environment is degraded or their access to natural resources is limited or denied. Not only are their economic activities linked to these access issues, but their ability to engage in economic activities can be affected by poor environmental quality and the resulting impact on their health.

The livelihood strategies of the poor in coastal communities are diverse and often complex reflecting the variation in opportunities available on the coast. It is the generally consistent and very high degree of dependence on natural resources for food and income generation by the poor, which has led to conservation organisations having to address poverty in their programmes. Hence the emergence of pro-poor conservation as a concept. This high dependence on natural resources and considerable inter-linkages between different income and employment activities adds to the complexity of coastal livelihoods and challenges faced by conservation and development organisations.

Biodiversity conservation and role of community are both two sides of the same coin. It is believed that if people are benefitting from the bio resources, they themselves will take conservatory measures. It is therefore essential that we strive to achieve sustainable livelihoods along the coast if these environments are going to continue to provide such opportunities for people in the future. If we do not, we are going to see greater pressures on these resources leading to a downward spiral in the state of the coastal environment

1.4 Sindhudurg

Sindhudurg is southern most district of Maharashtra state which is bordered by Sahyadri mountain range on east and 122 km of coastline west, it is harboring critical habitats and rich biodiversity. The coastal and marine habitat includes creeks, tidal flats, marshes, mudflats, mangroves, coral reefs, rocky islets which harbors rich marine biodiversity. These waters are also known to be migrant routes for Whales, whale sharks etc. This placing Maharashtra State in top 5 states in India as rich in coastal and marine biodiversity. However, these habitats and biodiversity is threatened by unsustainable fishing. It is not only threatening biodiversity but also livelihood of traditional fishermen in long term.

Sindhudurg is an emerald district in Maharashtra with natural scenic beauty, abundant greenery, attractive beaches and temples and with distinctive style of architecture, colorful and lively feasts and festival and above all, hospitable people with a rich cultural milieu. Considering, tourism as a potential driver of regional economy of Sindhudurg, Government of Maharashtra declared the district as a Tourism District in 1997 emphasizing that the economic growth of the district can be achieved through tourism ensuring sustainable development in the district.

Maharashtra Tourism Development Corporation with the assistance of Ministry of Tourism, Government of India, initiated the project of marine and coastal tourism with the aim of establishing scuba diving and snorkeling tourism in Konkan Region in 2007. It was a deliberate attempt to establish niche tourism through sustainable scuba diving tourism in Sindhudurg. During the initial stage of the project, MTDC carried out detailed underwater exploration along the entire Konkan coastline. Survey revealed that Ratnagiri and Sindhudurg coastline has favorable conditions to establish first snorkeling and then scuba diving tourism. However, Sindhudurg has many advantages such as presence of rocky islands and coral reef providing diverse scuba diving and snorkeling sites. MTDC's underwater exploration identified few sites which were suitable for snorkeling and scuba diving. Thereafter, MTDC trained 50 local youth as a snorkeling guide in year 2007, so that, tourists can have safe, environment friendly and informative snorkeling experience. Once snorkeling tourism commenced, snorkeling became popular among the tourist visiting Sindhudurg within short time. Strategic and mouth to mouth publicity created buzz word among adventure seeking tourists. This resulted in increase of influx of tourists visiting Sindhudurg only for experiencing marine life with the help of snorkeling. After experiencing snorkeling, tourists were looking for more adventure, thus snorkeling tourism started its transition into scuba diving.

Development of snorkeling and scuba diving Tourism has increased tourist number from 1 lakh in 2007 to over 9 lakh in 2010 (Tourism Survey, 2010) in Sindhudurg district. Snorkeling and Scuba Diving tourism has provided direct employment to over 500 local youth and indirect employment to over 2000 local people and it is contributing substantially to local economy. Indian tourists who have never indulged in scuba diving are finding scuba diving more thrilling and easy way to understand what scuba diving is all about. Scuba diving tourism also now extended to other water sports such as parasailing, Jet Ski ride, banana ride etc. which has been initiated by local youth. The revenue from scuba diving and water sports tourism by year 2015 is estimated to be about Rs. 70 Crore (over USD 10 million.) per annum.

The direct and indirect benefits of scuba diving tourism have gone to local communities. Scuba diving tourism is creates awareness of diverse marine biodiversity of Sindhudurg and it has also made local culture popular. The majority of the local people involved in the tourism industry are from fishermen community. Therefore, the benefit for scuba diving tourism is directly reaching to local community.

Presently, scuba diving activities are focused near Sindhudurg Fort and Sargassum forest. However, currently over 90% rush for diving is in Sindhudurg fort due to connectivity and sheltered nature of the site (this trend may alter in future). Almost all divers are non-certified divers and do dive experience diving. Each dive lasts for 10-15 minutes in contrast average 40 minute dive elsewhere in the world. Considering the conservative estimates, around 2,00,000 dives carried out at 3 sites near Sindhudurg fort. Considering time spent by each diver, 3 dives around Sindhudurg fort and sargassum forest is considered as 1 dive thus it is estimated that around 66,000 dives are carried out at Sindhudurg fort. Even if these dives equally divided among three sites, each site has over 22,000 dives. The diving sites are not more than 4 meters deep and majority of corals occurs within the range of 1 meter to 3 meter of water depth. Diving in such shallow area makes corals exposed to damage due to diving. Currently, it is found that, there are no awareness initiatives by dive operators among tourists about the importance of corals and marine life and no code of conduct is followed to ensure damage by diving is minimized.

Declining marine biodiversity may lead to reduced aesthetic values of the underwater world and threaten the tourism potential and local economic development of many tropical regions. This may be

particularly true for small areas such as Sindhudurg, whose economies often thrive on beach and diving tourism. The touristic potential of tropical destinations depends in part on the quality of the ecosystem, but tourism itself exerts pressure on that same ecosystem. A driving force (tourism) leads to pressures on the reef such as physical reef degradation. This may lead to an altered ecosystem state and ecosystem conditions. Altered conditions can influence the available ecosystem services, which in turn can affect the potential of -in this case tourist activities. Thus, insight in tourism associated pressures on the natural resources is important to sustain tourist activities

Considering the age of Sindhudurg's diving industry's which less than decade old is relatively young industry. But the impact of diving on marine environment is evident. There are no studies conducted to evaluate the impact of diving on local marine environment and biodiversity. But from field observations it is evident that, the fish diversity and abundance is reduced, corals have been extensively damaged due to anchoring, direct contact by divers and diving guides. In past, there have been seasonal but extensive growth of Sargassum was observed in diving areas, but over period of time due to extensive diving, Sargassum failing to grow to form a habitat for juvenile fish.

2. The Project

With existing figures and trend it can be summarized that the scuba diving industry will not be sustainable for years to come. Degraded marine life/environment will force tourists to look for other options for scuba diving. However, another fact is that scuba diving industry provides opportunity for local fishermen community to have option of alternate livelihood which help to reduce pressure on fishery industry.

Therefore, it is important to identify alternate sites for scuba diving to ensure that, there is no pressure on one area but scuba diving industry is equally spread across the district to ensure the long term sustainability. It will also help to create employment/alternative livelihood options in other parts of the Sindhudurg where tourist footfall is minimal.

Under GOI-UNDP-GEF initiative project on alternative tourism destination is initiated to ensure the pressure on existing diving areas is eased and benefit of scuba diving industry with emphasis on capacity building of the local population in marine interpretation and capacity building of snorkeling/SCUBA

diving guides, boat operators etc. to generate employment. Alternative Destination program has with following objectives:

2.1 Objectives of the project

1. To decongest the existing underwater tourism destinations and explore the potential of new tourism destinations along the coastal region of Sindhudurg;
2. To identify and develop new destinations for eco-tourism, based on coastal and marine biodiversity (including corals, associated species, cetaceans, marine turtles etc.) and general tourism potential;
3. To define the carrying capacity for tourism at identified sites based on the principles of long-term sustainability and minimal impact on the environment;
4. To promote marine interpretation and environmentally sound practices as a professional activity for local communities;
5. To build capacities of the local population in marine interpretation, sustainable eco-tourism, hospitality management and destination marketing so as to generate sufficient employment;
6. To develop a learning module on marine biodiversity conservation and sustainable marine eco-tourism for schools and colleges to be imparted by trained local youth;
7. To assess the requirement of trained guides for snorkelling and SCUBA diving at each site and to identify/select potential trainees for SCUBA diving. Conduct 1st Pilot scuba diving training for selected local youth.

2.2 Methodology

As per the Terms of References (ToR) of the project, the prime objective was to identify new scuba diving destinations apart from the existing one along the coast of Sindhudurg. Therefore, incentive underwater surveys were carried out with the help of snorkeling and scuba diving to identify potential sites based on marine biodiversity, accessibility, water clarity and business potential to establish as alternate scuba diving destinations.

Following sites were selected based on their geographical location and primary and secondary information available on presence of rocky/coral area and biodiversity:

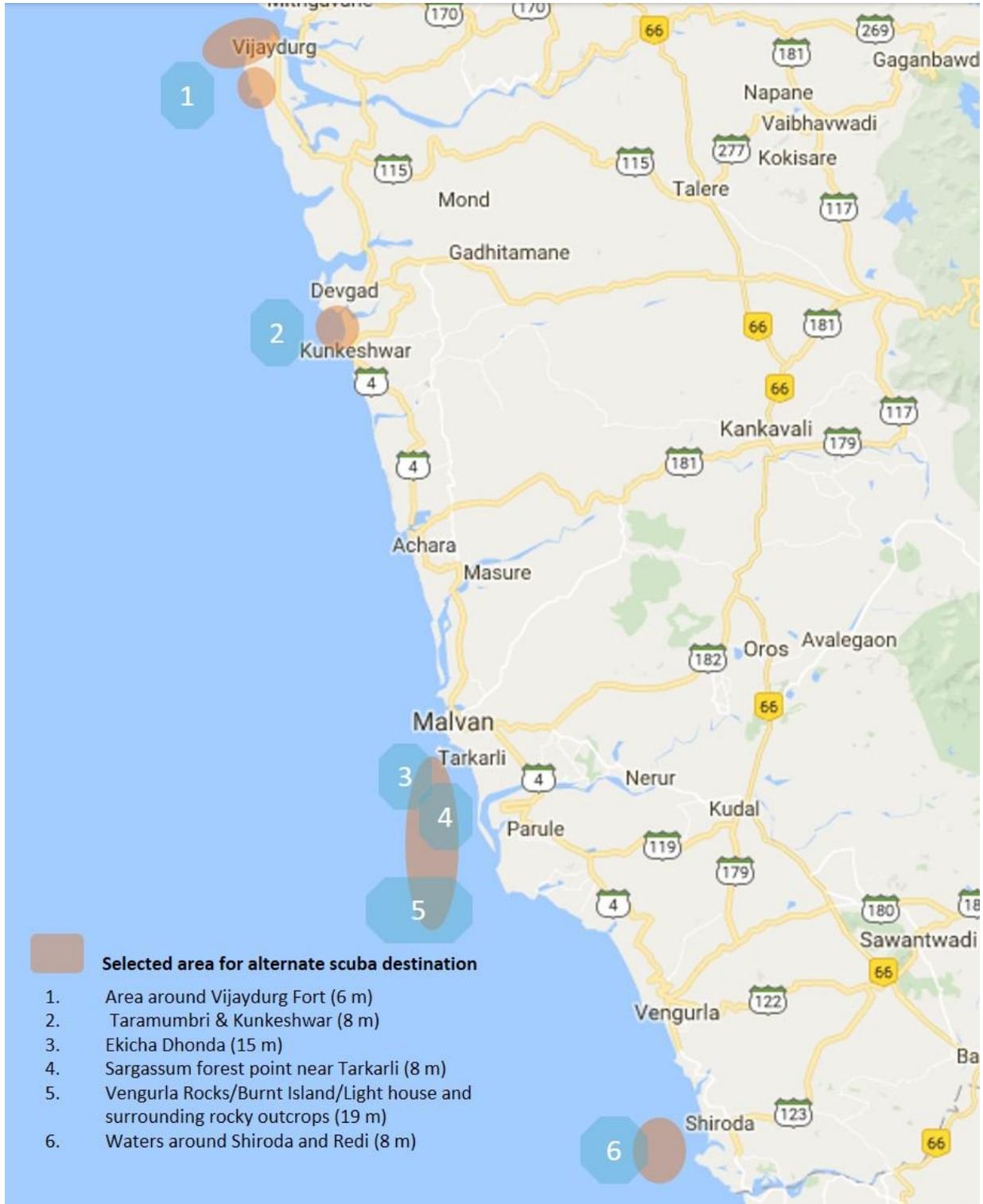
1. Underwater areas around Vijaydurg Fort
2. Area between Vijaydurg and Girye
3. Area around Devgad/Kunkeshwar
4. Rocky Patches near Achara
5. Kawada rock near Talashil-Tondavali
6. Coral patches adjoining Rock Garden at Malvan
7. Ekicha Dhonda (2 nautical miles off south west of Sindhudurg fort)
8. Sargassum forest point near Tarkarli
9. Vengurla Rocks/Burnt Island/Light house and surrounding rocky outcrops
10. Area Between Sargassum forests and Vengurla Light House
11. Waters near Redi
12. Area Between Redi and Terekhol

Surveys to above mentioned sites were extensively conducted by expert divers and marine biologist based on previous experience in the area and elsewhere in the world with the help of extensive scuba diving in all above mention sites.

Sites with the aim of selection of alternate diving destinations were selected on following parameters:

- a. Richness and diversity of marine life;
- b. Water conditions such as visibility, currents and minimum natural hazards.
- c. Accessibility to nearest boarding location
- d. Past and potential tourist footfall

Figure 1. Map showing the sites which were surveyed to selected potential sites for scuba diving sites to be developed as an alternate scuba destinations.



3. Results

3.1 Selection of sites

Based on various parameters such as water quality, diversity, abundance of biodiversity, suitable boarding facility or area, 17 sites are identified. Considering the connectivity and proximity, these sites are clubbed in following 6 regions are identified as potential alternate scuba diving/tourism sites proposed to be developed as alternate destination:

1. Areas around Vijaydurg Fort and Girye
2. Area Between Devgad/Taramumbri and Kunkeshwar
3. Ekicha Dhonda
4. Sargassum forest point near Tarkarli
5. Vengurla Rocks/Burnt Island/Light house and surrounding rocky outcrops
6. Waters around Shiroda and Redi

Since, majority of tourists now prefer scuba diving experience than snorkeling and also due to water quality, all identified 17 sites are recommended to be used and promoted as scuba diving destinations. It is estimated that 3 municipal councils (Devgad, Malvan and Vengurla) and 17 gram panchayats will be benefited from development of alternate scuba diving destinations. Figure 2 indicates the beneficiary gram panchayats and municipal councils with their respective proximity to the identified new scuba diving sites.

Figure 2. The identified scuba diving regions and potential benefiting Gram Panchayats, Nagar Panchayat and Nagar Parishad.

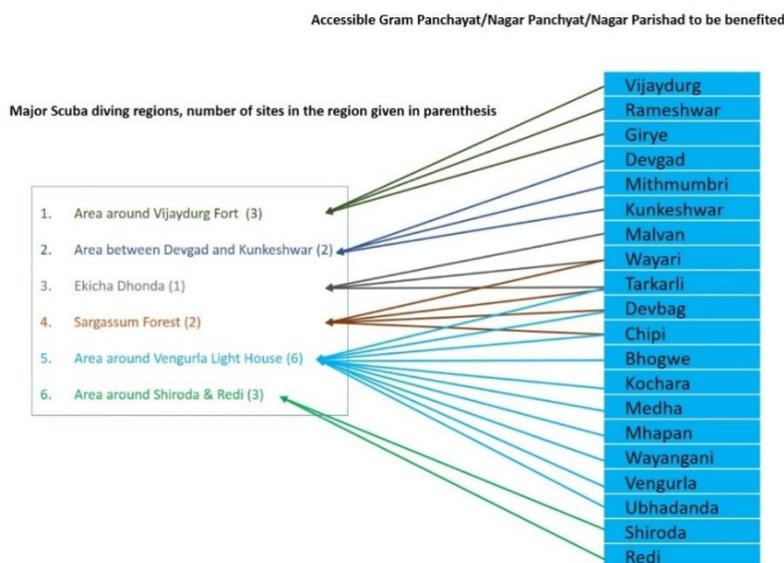


Plate 1. Photograph showing scuba diving site around Vijaydurg Fort



Plate 2. Photograph showing scuba diving site around Rameshwar village



Plate 3. Photograph showing scuba diving site around Girye village



Figure 3. Map showing approaches towards scuba diving site at Vijaydurg Fort and Rameshwar



Figure 4. Map showing approaches to diving site at Girye



Figure 5. Map showing bathymetry of scuba diving sites in Vijaydurg region.



Plate 4. Photographs showing the biodiversity and habitat of sites around Vijaudurg

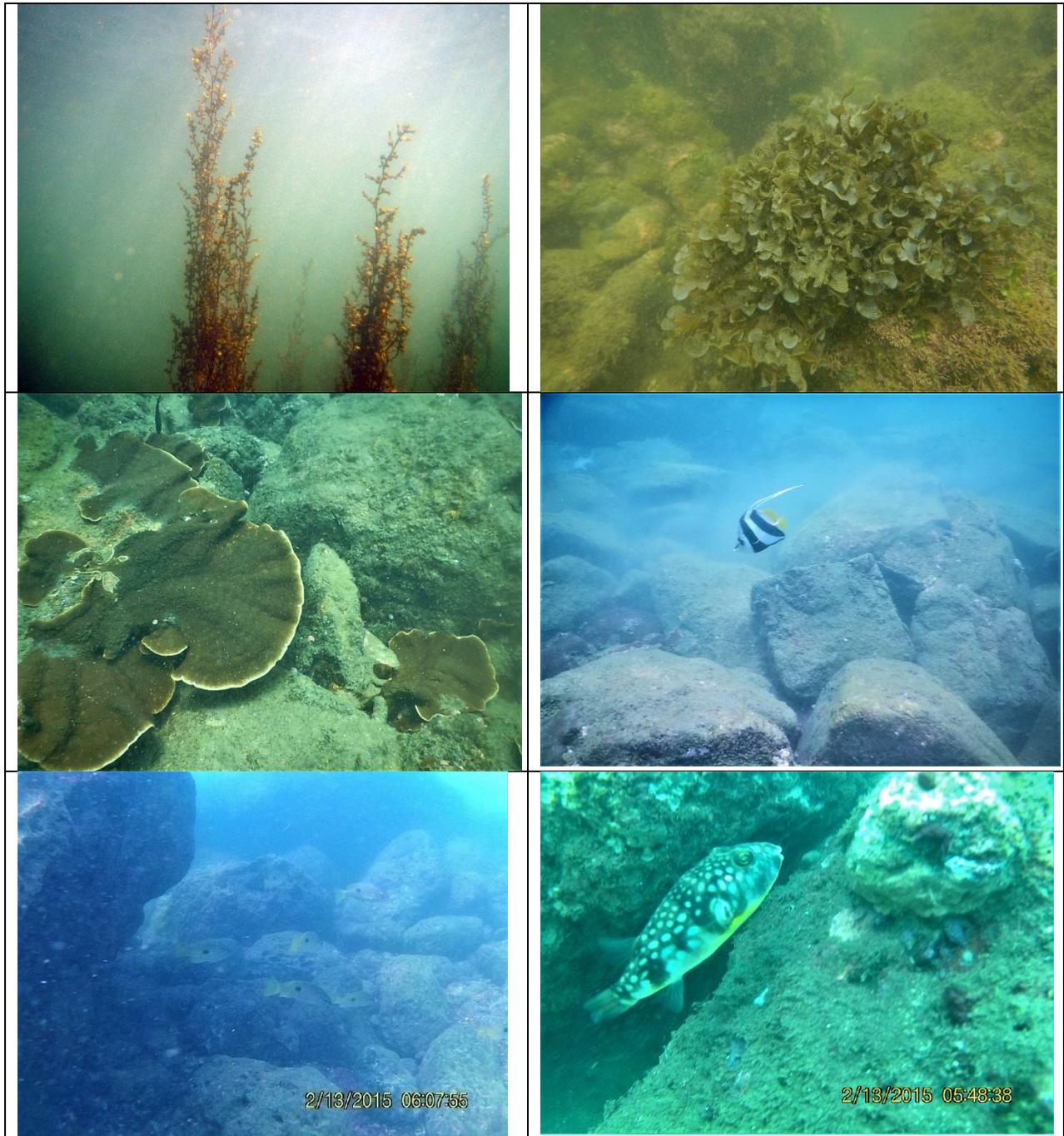


Plate 5. Photograph showing scuba diving sites in Devgad and Kunkeshwar

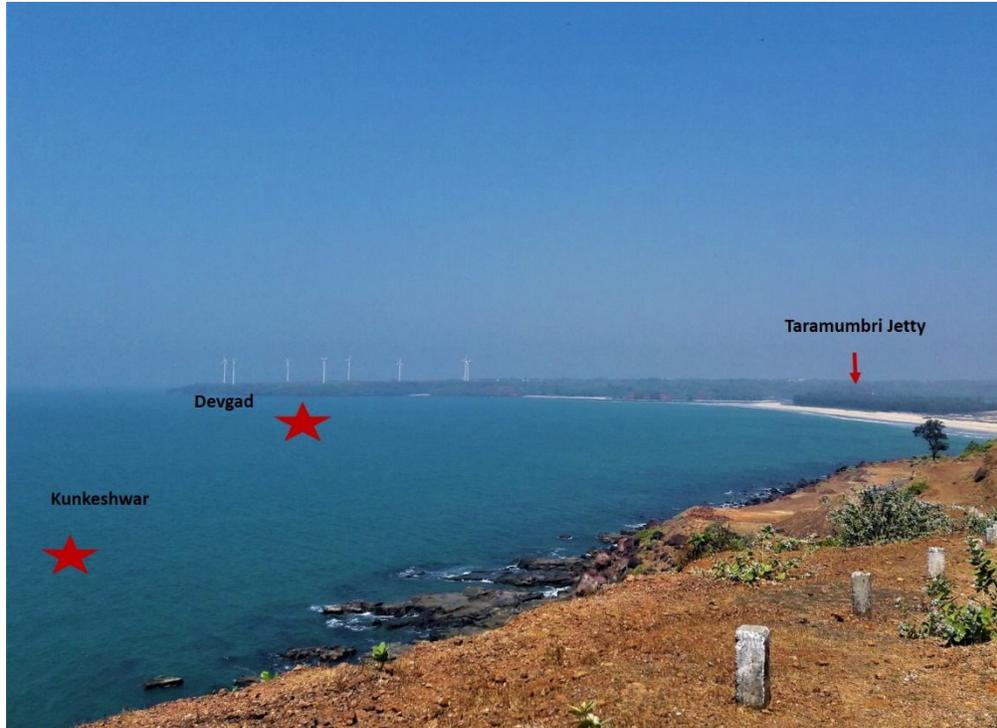


Figure 6. Map showing approaches to scuba diving sites at Devgad and Kunkeshwar

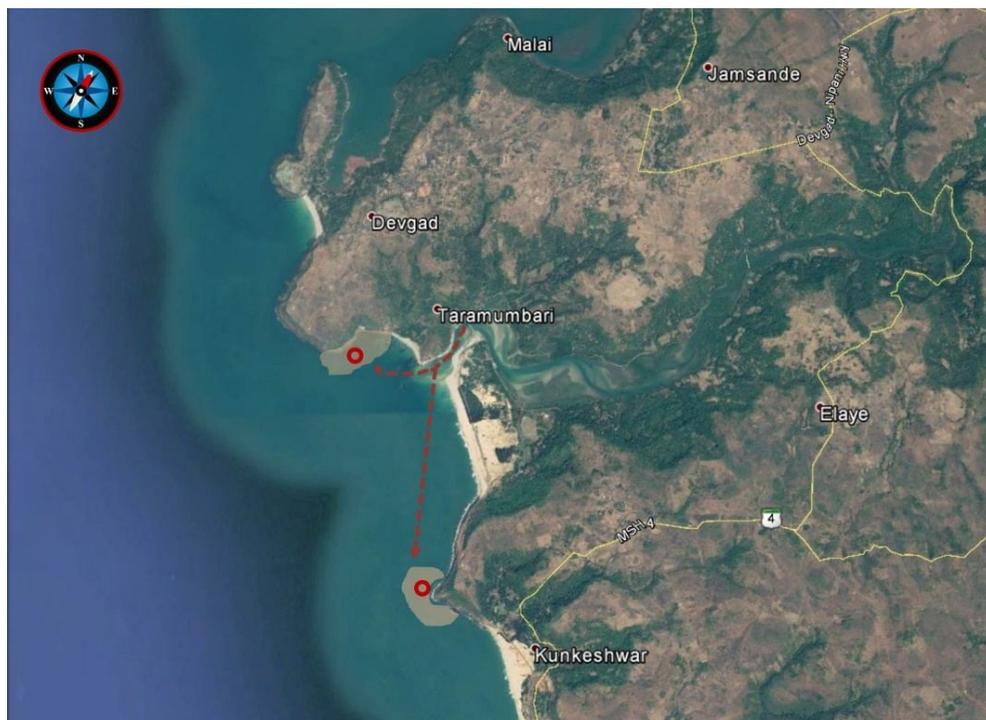


Figure 7. Map showing bathymetry of scuba diving sites in Devgad and Kunkeshwar.

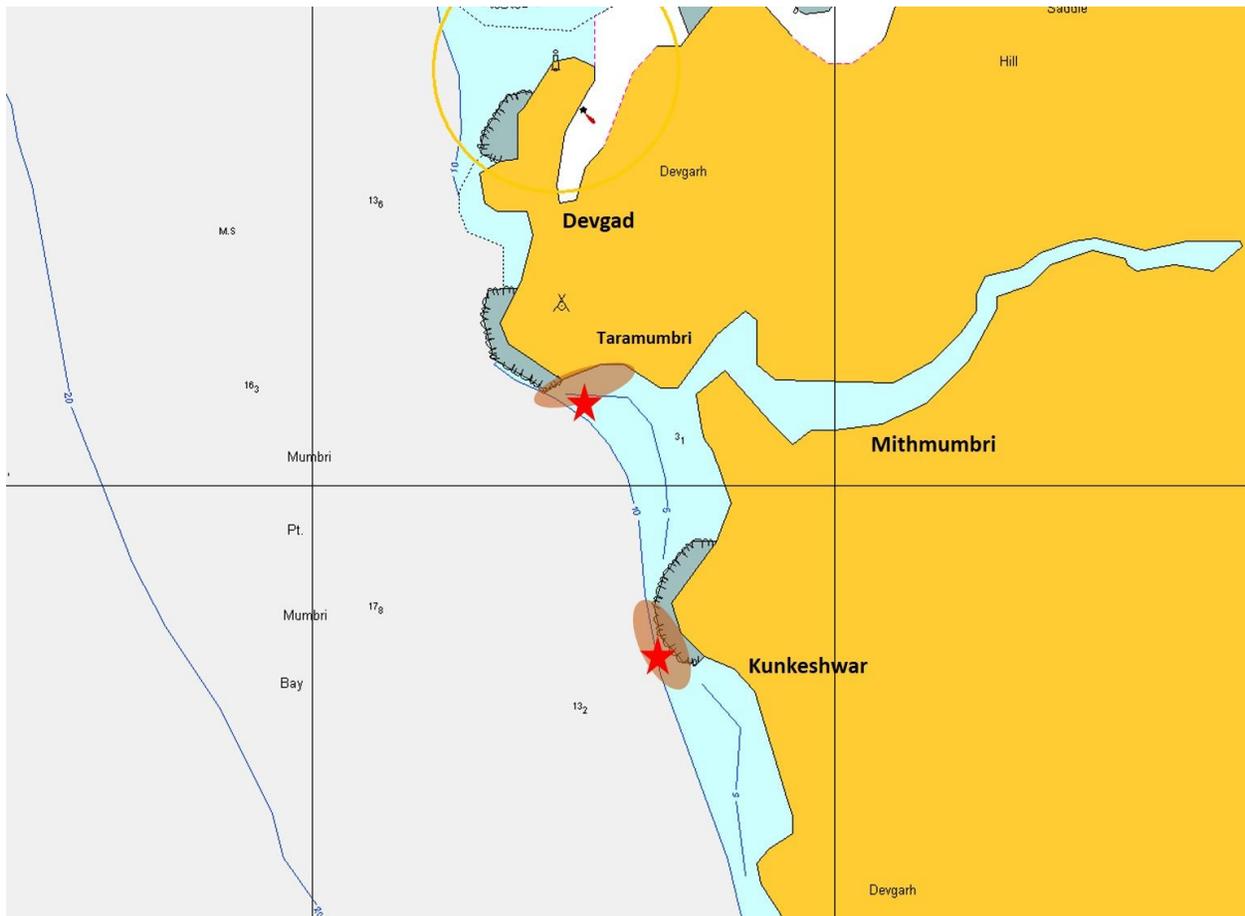


Plate 6. Photographs showing the biodiversity and habitat of sites around Devgad-Kunkeshwar

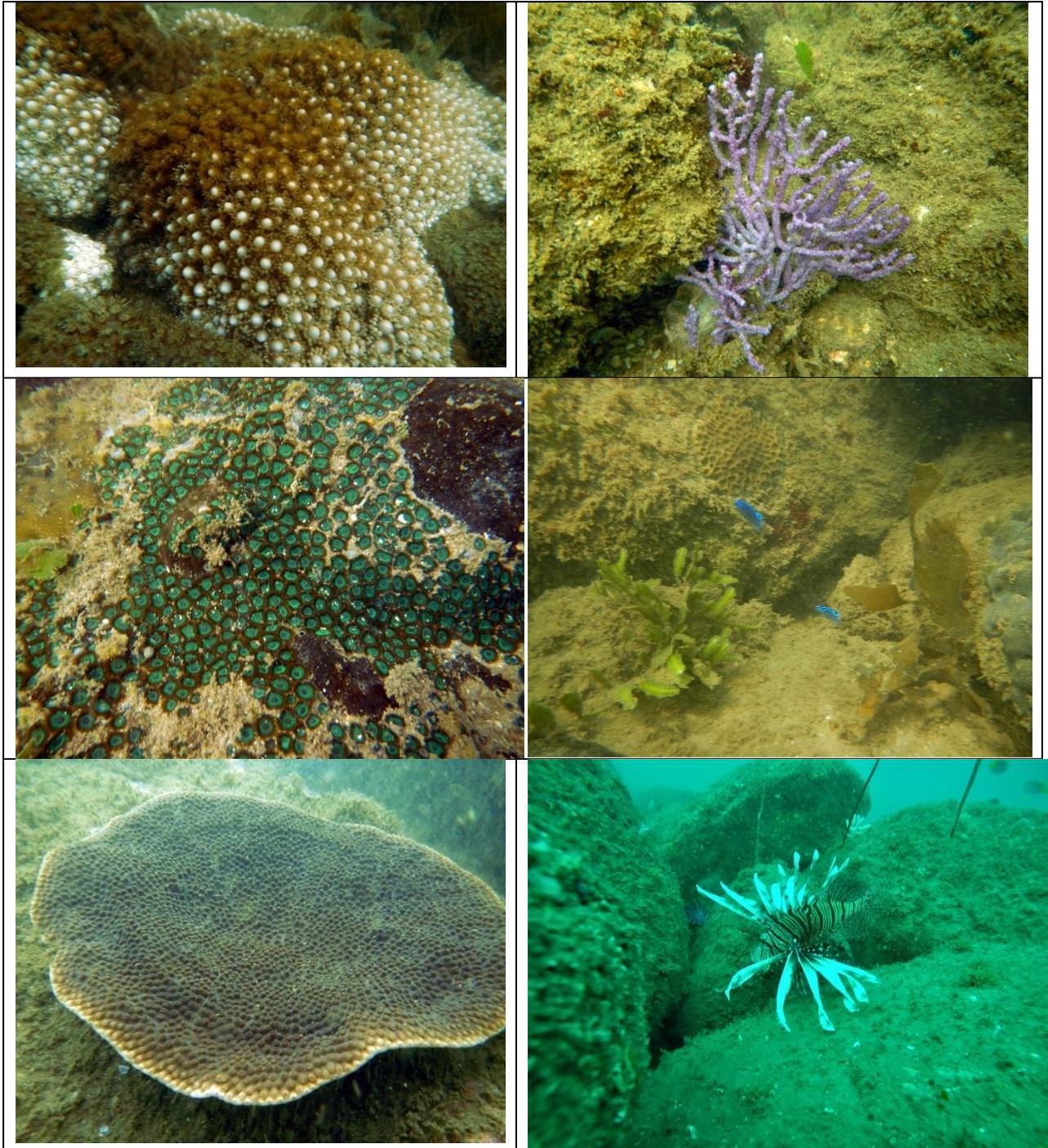


Plate 7. Photograph showing scuba diving site of Ekicha Dhonda



Figure 8. Map showing approaches to Ekicha Dhonda

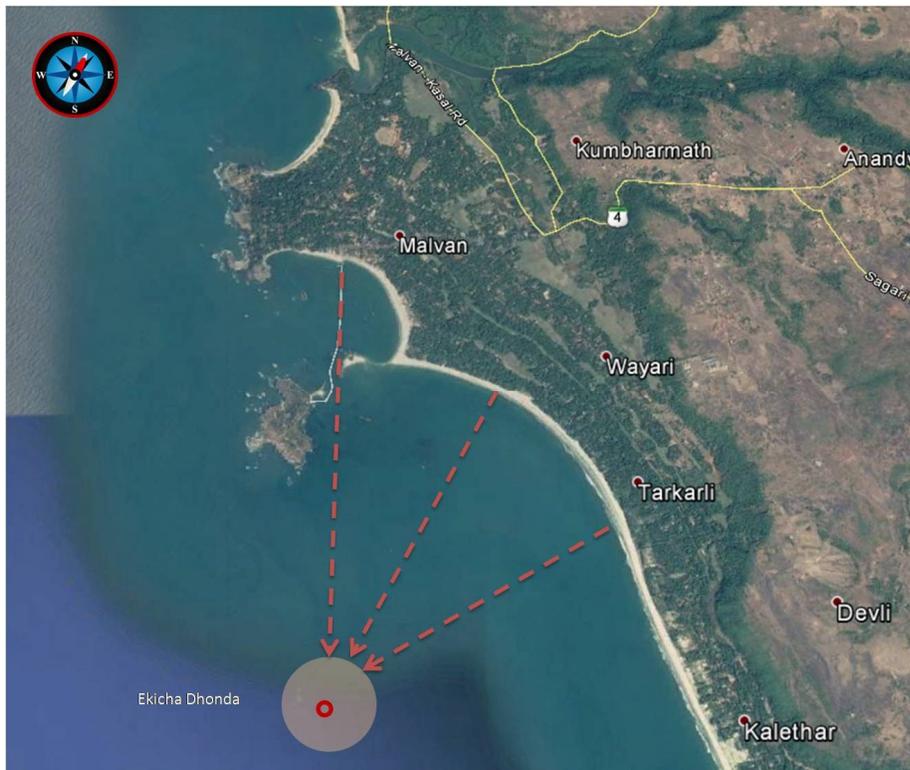


Figure 9. Map showing bathymetry of scuba diving site at Ekicha Dhonda

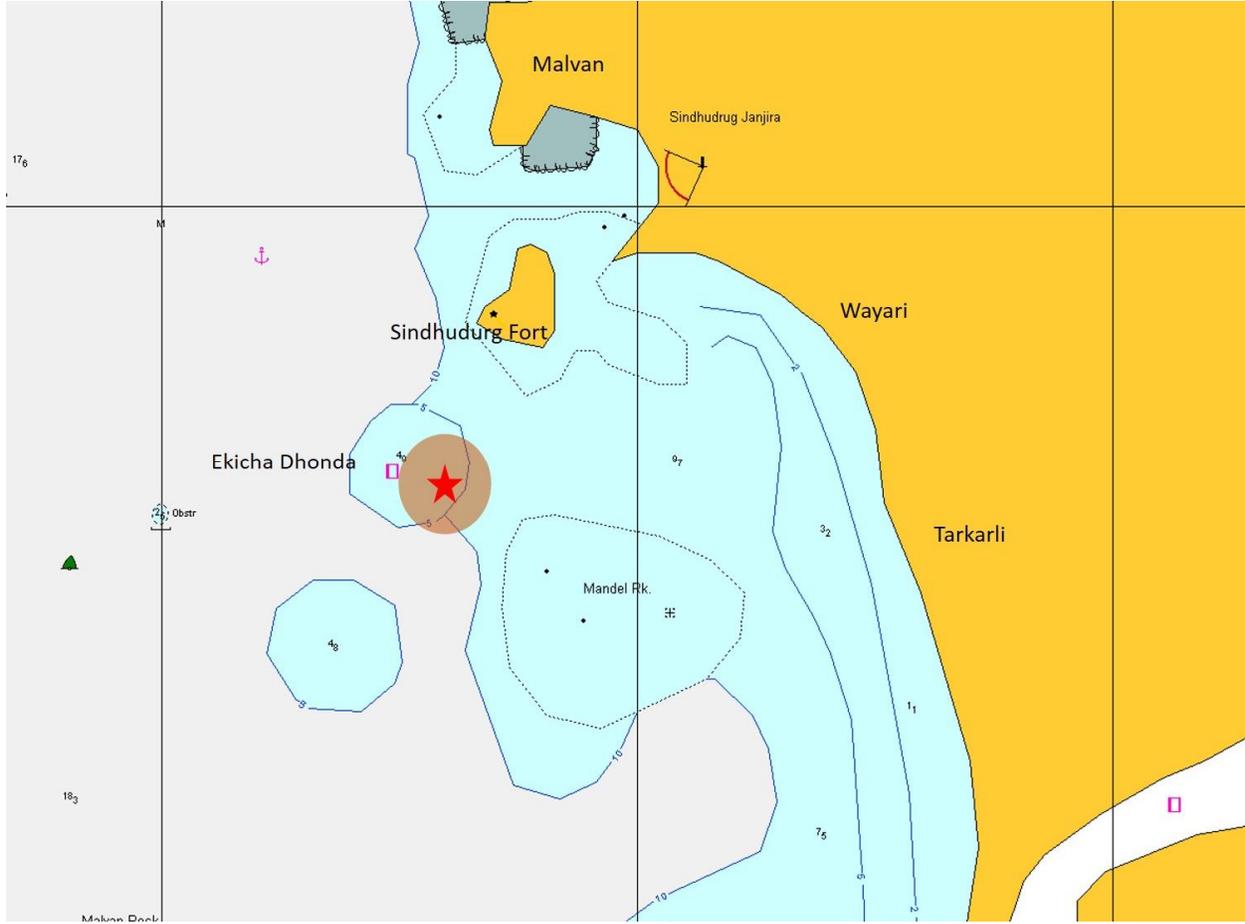


Plate 8. Photographs showing the biodiversity and habitat of sites around Ekicha Dhonda



Plate 9. Photograph showing scuba diving site at Sargassum Forest (Rocky outcrops opposite to Tarkarli)



Figure 10. Map showing approaches to scuba diving sites of Sargassum forest



Figure 11. Map showing bathymetry of scuba sites of Sargassum Forest

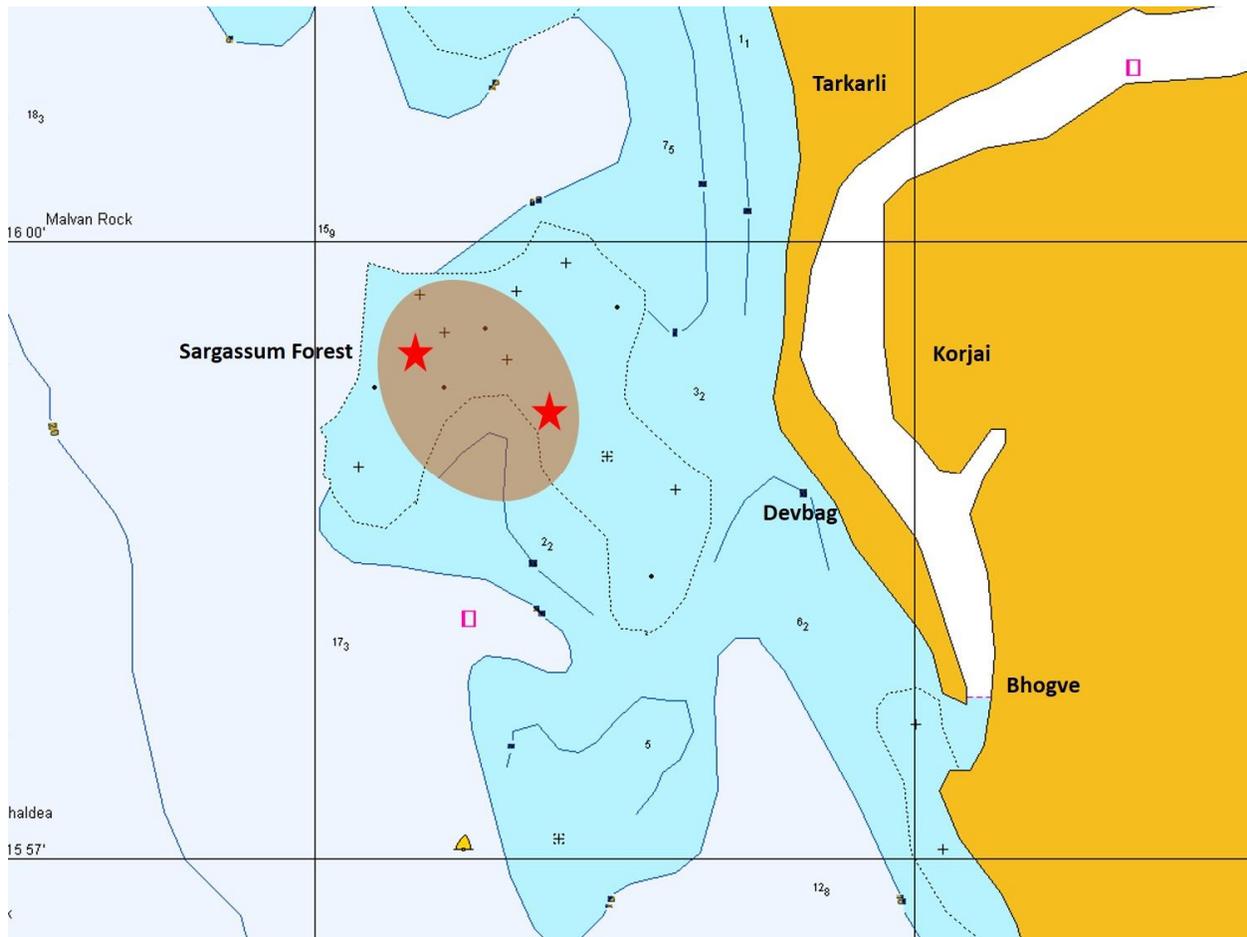


Plate 10. Photographs showing the biodiversity and habitat of sites around Sargassum Forest



Plate 11. Photograph showing scuba diving sites around Vengurla Rocks



Plate 12. Photograph showing scuba diving site of Trigger Island

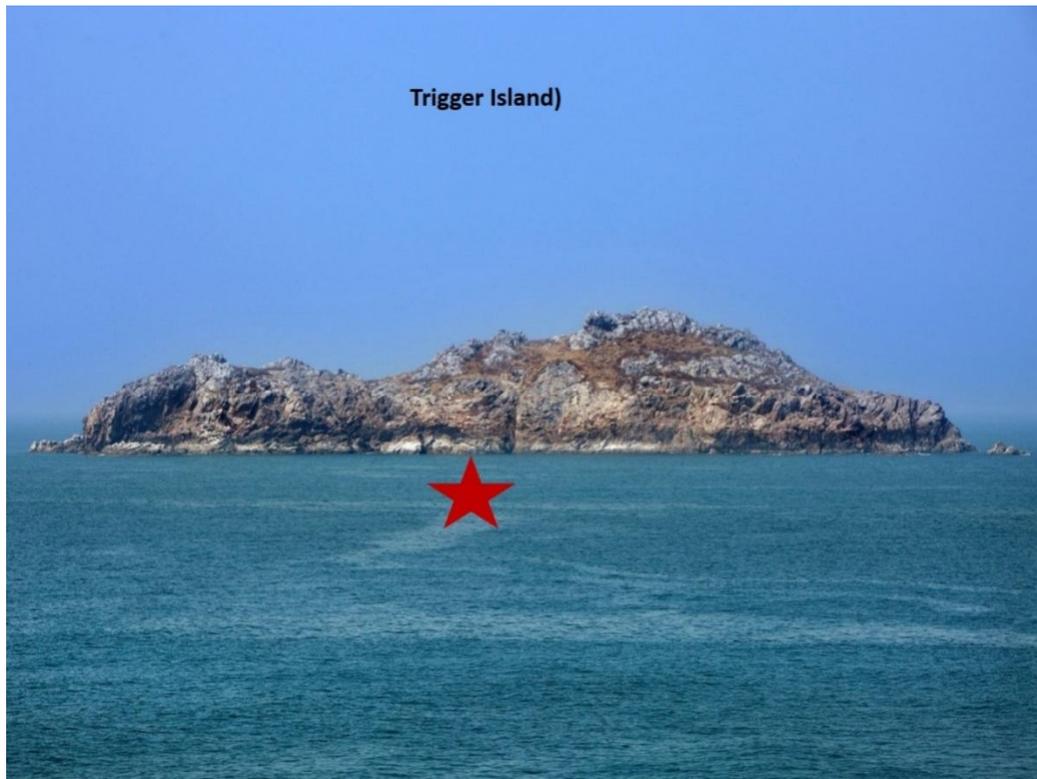


Plate 13. Photograph showing diving site at Vengurla lighthouse bay



Plate 14. Photograph showing diving site at eastern side of lighthouse

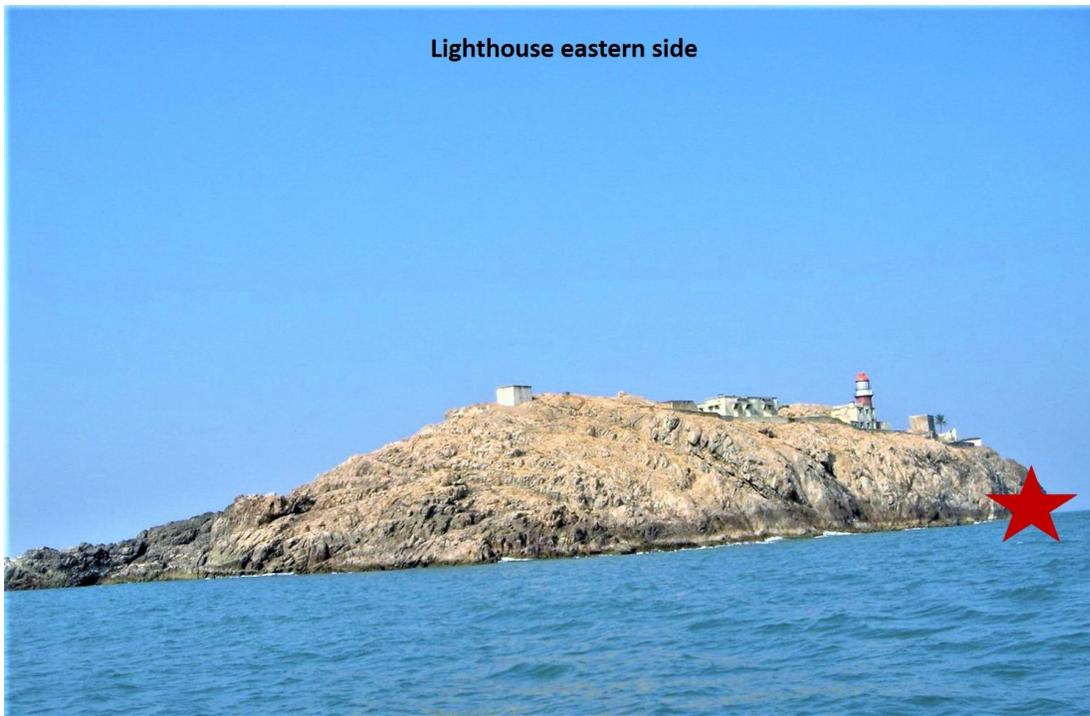


Plate 15. Photograph showing diving site at Portuguese Lighthouse, unnamed island and Fansa



Figure: 12. Map showing approaches to all scuba diving sites around Vengurla Rocks

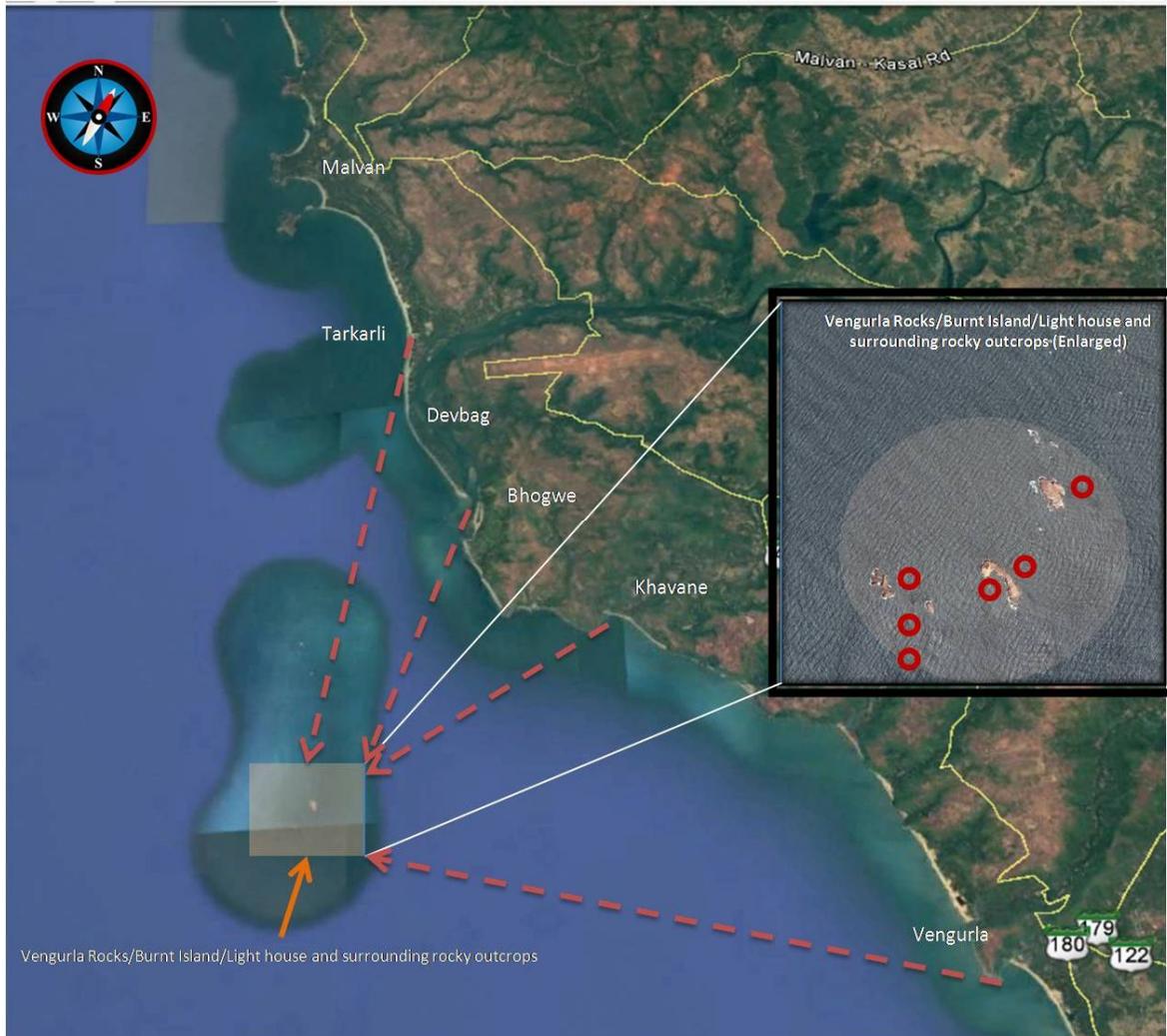


Figure 13. Map showing bathymetry of scuba diving sites around Vengurla Rocks

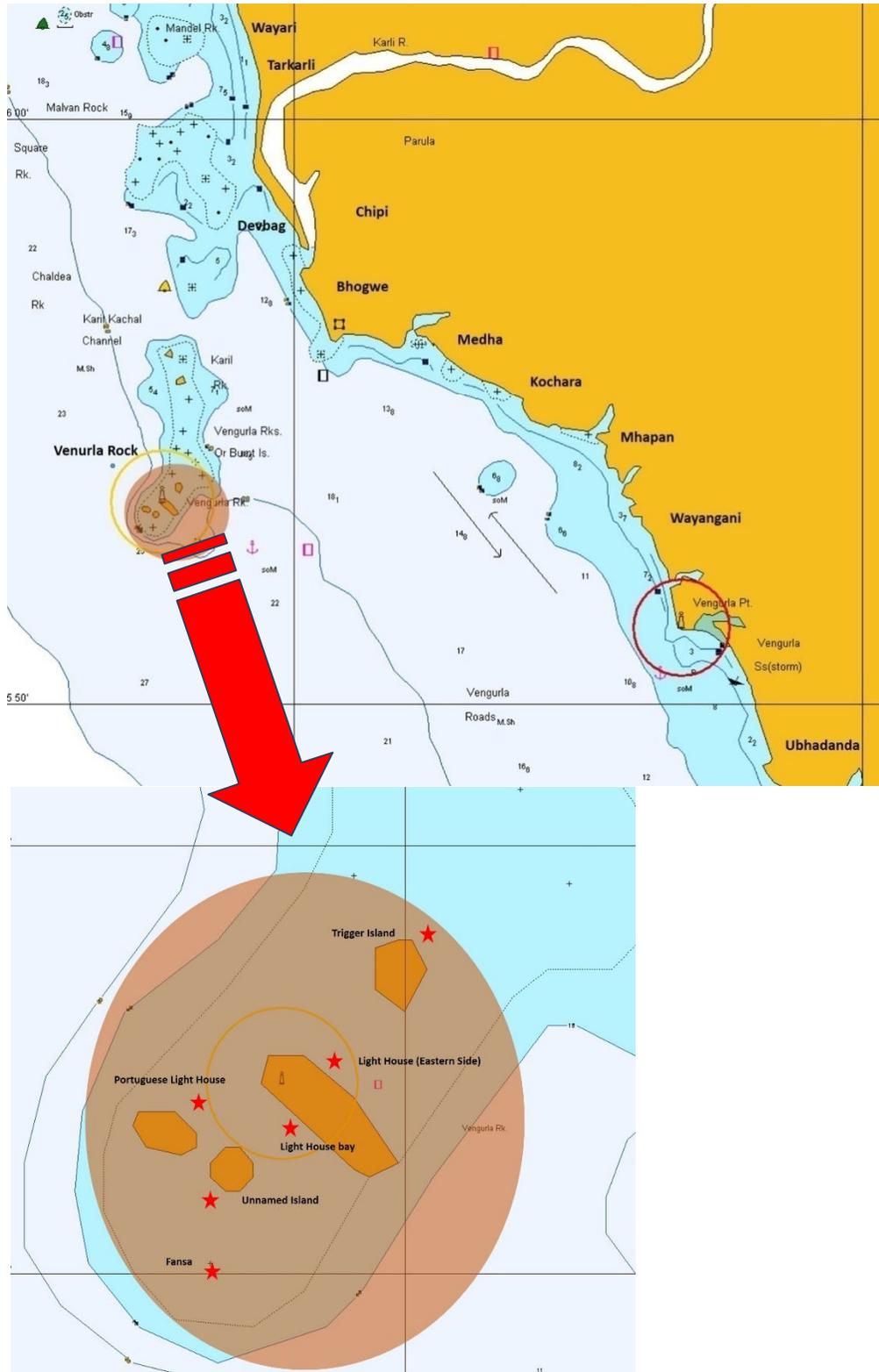


Plate 15. Photographs showing the biodiversity and habitat of sites around Vengurla Rocks

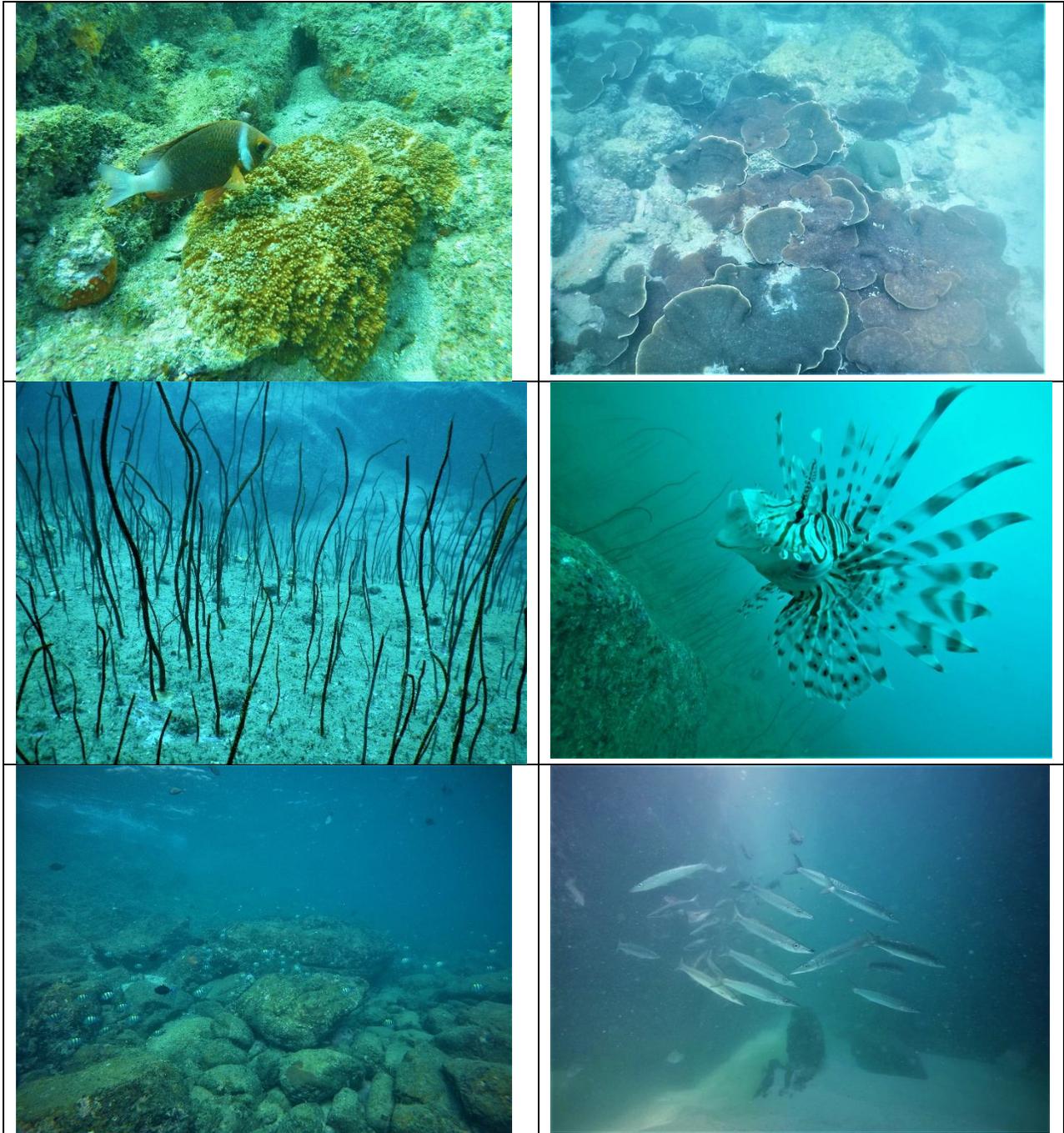


Plate 16. Photographs showing the biodiversity and habitat of sites around Vengurla Rocks



Plate 17. Photograph showing scuba diving sites near Redi



Plate 18. Photograph showing scuba diving site near Mama Bhache Rocks

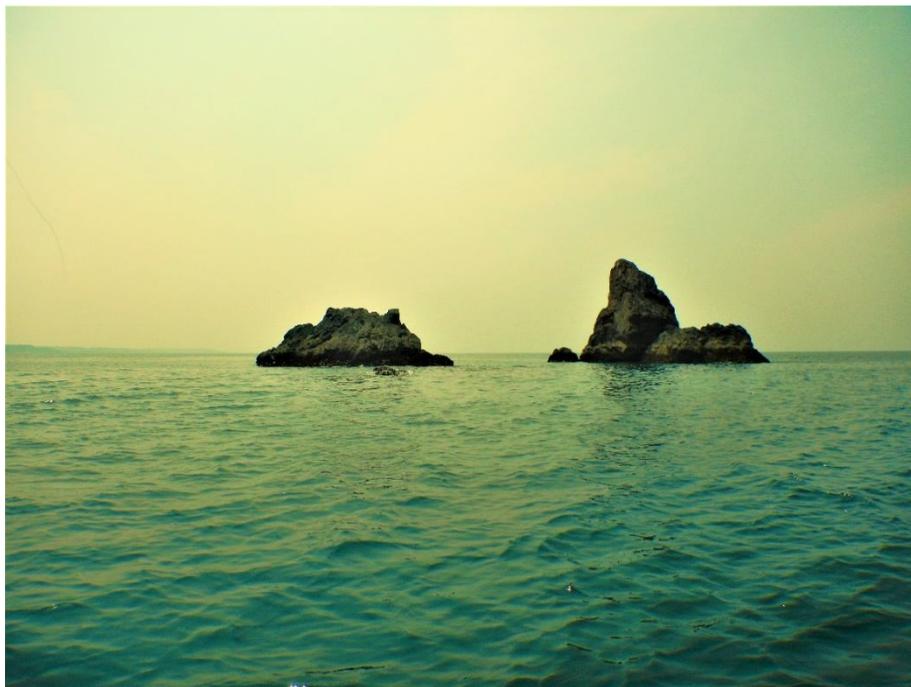


Figure 14. Map showing approaches towards diving sites around Shiroda and Redi

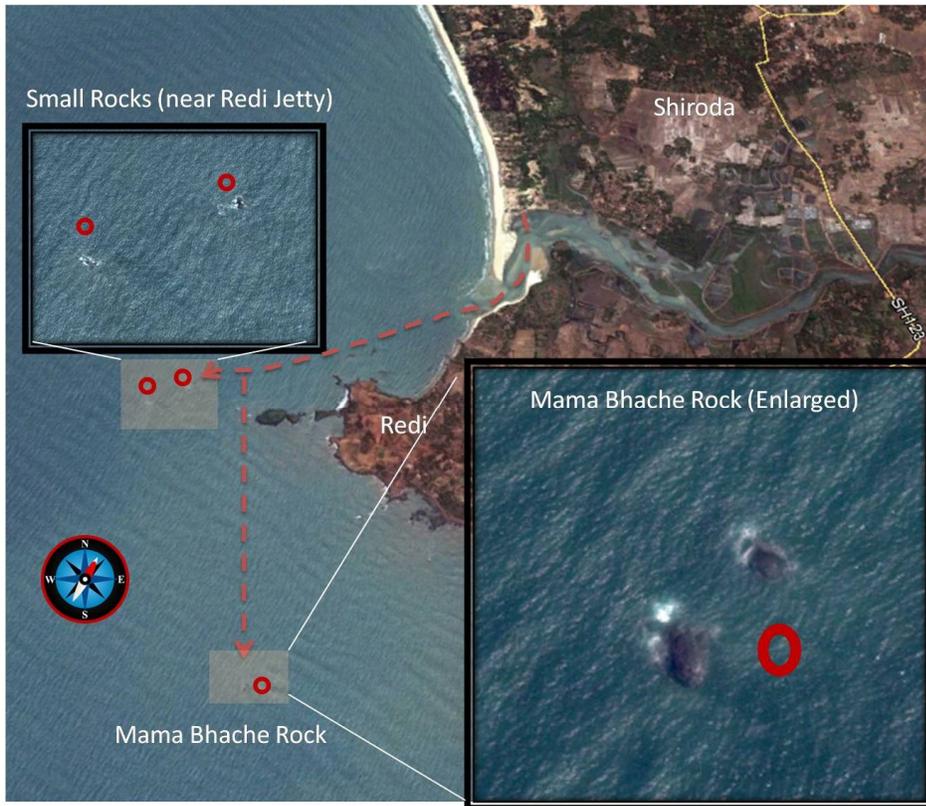


Figure 15. Map showing bathymetry of scuba diving sites around Shiroda and Redi

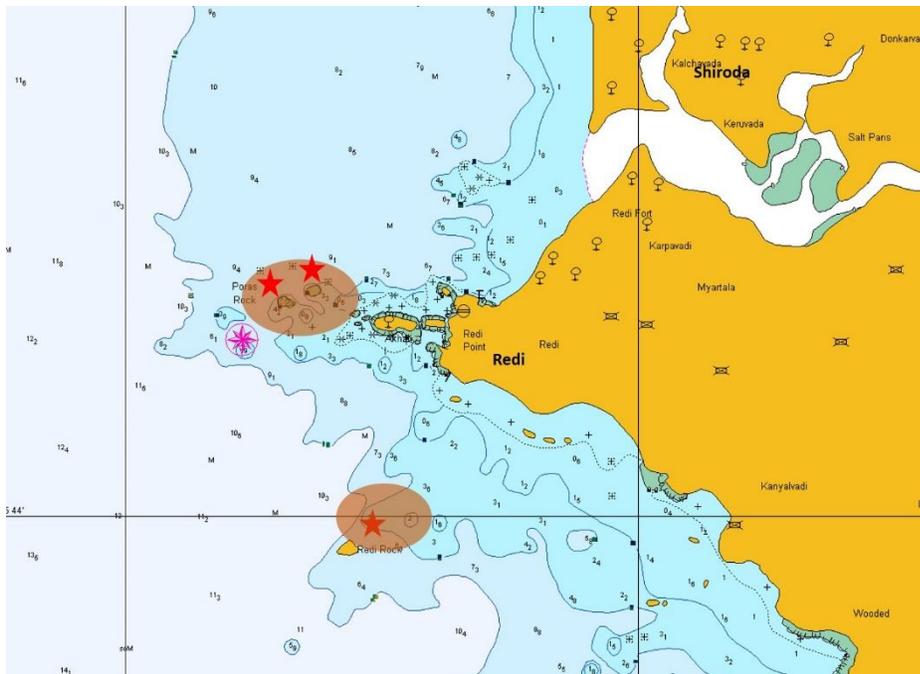
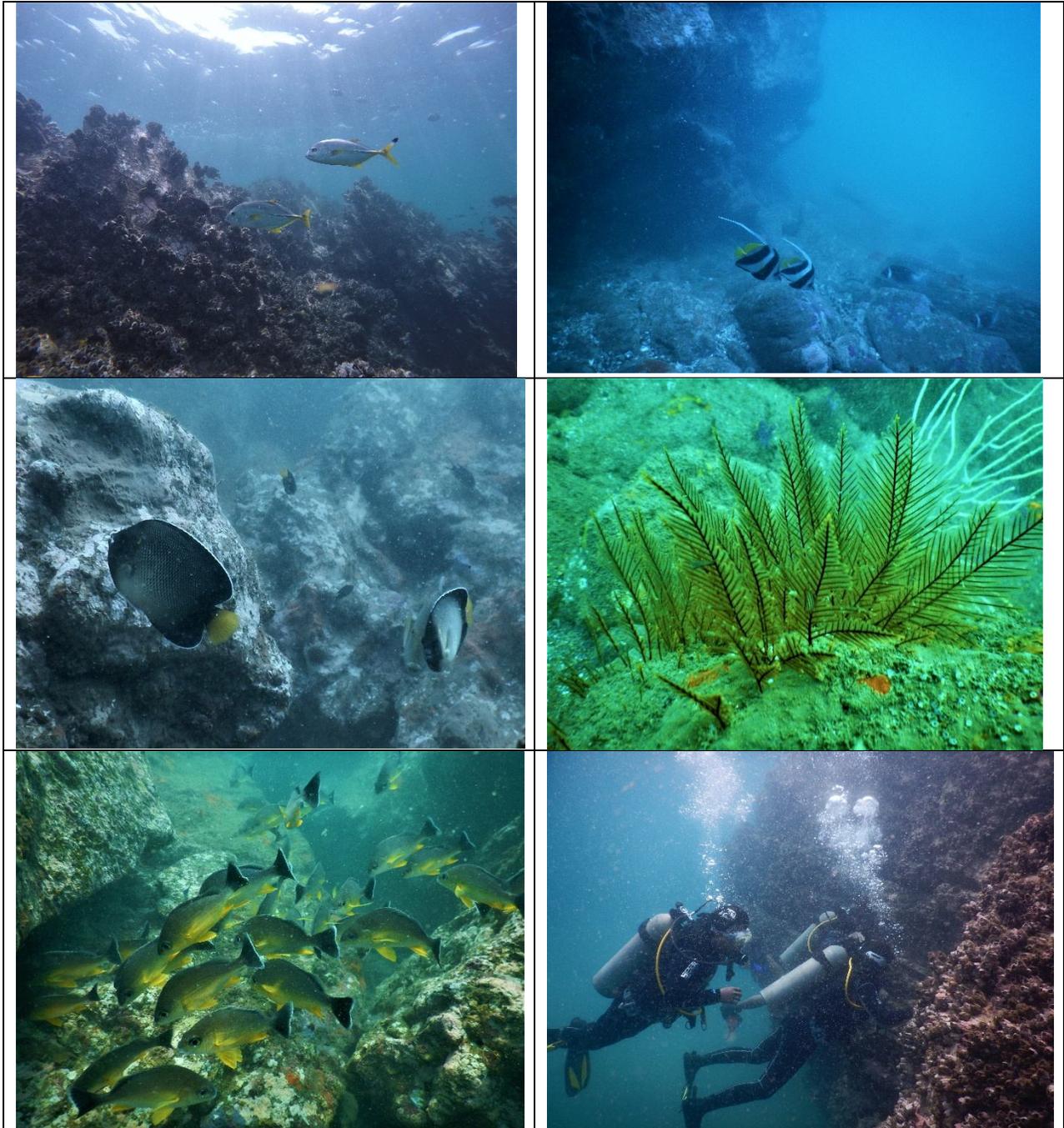


Plate 19. Photographs showing the biodiversity and habitat of sites around Shiroda and Redi



Based on detailed investigation along the coast of Sindhudurg Coasts, 17 sites (Table no. 1) have been found to have potential to be developed as alternate destination for scuba diving primarily based on water quality, biodiversity, diving conditions with distance from boarding point, accessibility and number of sites with respective of village/municipal council.

Table 1. Connectivity and benefit details of Identified scuba diving destinations under alternate tourism destination development.

Sr. No.	Diving Location	Number of Diving Sites	Benefiting Gram Panchayat/Nagar Panchayat/ Nagar Parishad	Safe Boarding Point	Distance to the diving site from nearest boarding point	
					Minimum (km)	Maximum (km)
1.	Vijaydurg Fort & Rameshwar Bay	2	Vijaydurg	Vijaydurg	0.2	2.3
			Rameshwar	Vijaydurg	-	0.2
			Girye	Vijaydurg	-	0.2
	Girye Bay	1	Girye	Vijaydurg	-	8.3
			Rameshwar	Vijaydurg	-	8.3
			Vijaydurg	Vijaydurg	-	8.3
2.	Area Between Devgad and Kunkeshwar	2	Devgad, Mithmumbri Kunkeshwar, (accessible from Taramumbri Jetty)	Taramumbri (Devgad)	1.4	3.1
3.	Ekicha Dhonda	1	Malvan	Malvan Jetty/Dandi	-	3.5
			Wayari	Malvan Jetty/Dandi	-	2.75
			Tarkarli	Dandi	-	2.8
4.	Sargassum Forests	2	Wayari	Dandi	-	3.1
			Tarkarli	Tarkarli Jetty	-	6.6

			Devbag	Devbag	-	6.6
			Bhogwe	Bhogwe	-	6
5.	Vengurla Rocks	6	Tarkarli	Tarkarli	-	16
			Devbag	Devbag	-	11
			Chipi	Bhogwe	-	10
			Bhogwe	Bhogwe	-	9.5
			Kochara	Nivati	-	17
			Medha	Nivati	-	
			Mhapan	Nivati	-	
			Wayangani	Navabag	-	
			Vengurla	Navabag	-	
			Ubhadanda	Navabag	-	
			6.	Water around Shiroda and Redi	3	Shiroda
Redi	Velagar Shiroda					

From boarding accessibility and maximum business visibility, 6 destinations/centers are recommended for alternate tourism development implementation. Scuba diving tourism is already established at Malvan, Wayari, Tarkarli and Devbag. Therefore these sites are not considered for alternate tourism destination development. Table 2 shows the proposed location for scuba diving center, benefiting Gram Panchayats/Nagar Panchayat/Nagar Parishad from potential tourism triggered by scuba diving. It is estimated that over 60,000 people economically will be influenced through tourism industry which will be catalyzed by development of scuba diving in various villages.

Table 2. Details of beneficiary areas through alternate tourism development through scuba diving.

Sr. no.	Proposed Location for Scuba Diving Centre	Gram Panchayats & municipal councils to be benefited/influenced from tourism	Population as per 2011 Census
1.	Vijaydurg	Vijaydurg	1735
		Rameshwar	2099

		Girye	2679
2.	Devgad (Taramumbri)	Devgad	8151
		Mithmumbri	920
		Kunkeshwar	2658
3.	Bhogwe	Chipi	682
		Bhogwe	1556
4.	Nivati	Kochara	2309
		Medha	1655
		Mhapan	2321
5.	Navabag	Wayangani	2223
		Vengurla	12471
		Ubhadanda	6797
6.	Shiroda (Velagar)	Shiroda	6329
		Redi	5477
Total population which will be influenced with growth of tourism			60,062

3.2 SWOT perspective development analysis of diving tourism at identified regions

In order to better understand the strengths, weaknesses, opportunities and threats for the development of alternate tourism destination through scuba diving, it is necessary to carry out SWOT analysis which would help derive the strategies for sustainable development of alternative tourism destinations. To make simplified SWOT analysis, all sites are clubbed together as per region wise as indicated in table no. 2.

3.2.1 SWOT analysis of Vijaydurg sites

Strength	Weakness
<ul style="list-style-type: none"> • Vijaydurg has many other attractions such as Historical fort, beaches, backwater, temples which will increase the footfall in future. • Good Road connectivity, distance from national highway and nearest railway station is 50 km and 61 km respectively. • Vijaydurg has MTDC's resort. • All scuba sites are near shore and 2 sites have less distance from boarding point making boat expenses less. Less fuel consumption so tariff of scuba diving will be lower • Presence of corals, sargassum and reef fishes etc. • Lack of currents and strong wave actions/swells make safer for diving. • Good population of youth which can be trained and employed in the scuba diving tourism industry. • Local community supports tourism industry 	<ul style="list-style-type: none"> • Present tourist footfall is minimal • Supporting amenities such as tourists jetty, sufficient restaurants, home stays, resorts are absent in the region. • The habitat is less diverse which might not create WOW factor among tourists • Exposed to northern wind (upara wara) thus visibility tend to get affected on regular basis which will have negative impact on scuba diving business • Due to easy accessibility, tourists may venture for snorkeling without guides • Exposed to northern wind (upara wara) thus visibility tend to get affected on regular basis which will have negative impact on scuba diving business • Negligible population is involved in tourism. • Establishment of scuba diving would require professional training in scuba diving and boat operation.

Opportunities	Threats
<ul style="list-style-type: none">• Other attractions will enhance experience for tourists• Low cost scuba diving will attract more tourists• Due to easy accessibility, the boat travel time will be reduced which will create more opportunity for business• Other projects such as Angria Bank will boost tourism prospectus of the region enormously in near future.• Once scuba diving manages to attract tourists, the other associated sectors tourism such as waters sports, restaurants, resorts/ home stay will get boost thus resulting in additional employment and revenue generation among local community.	<ul style="list-style-type: none">• Shallow and small area for diving poses threat to marine life if tourism is not managed• The proposed tourism destinations such as Angria Bank will impact diving business.

3.2.2 SWOT analysis of Devgad and Kunkeshwar

Strength	Weakness
<ul style="list-style-type: none"> • This site is close to Devgad and Kunkeshwar which are established as tourism destinations. Devgad and Kunkeshwar have many other attractions such as historical fort, windmills, beaches, backwater, temples, wax museum which has potential to boost tourism in the region. • Kunkeshwar has famous Shiva temple and every year over 5 lakh people visit Kunkeshwar, thus providing good opportunity for business once scuba diving facility is established. • Devgad and Kunkeshwar have amenities such as restaurants, hotels, B & B units, MTDC's new resort etc. which will sustain increased tourism in near future. • These sites have boarding facility at Taramumbri which is safe. This exit area is surrounded by bay, thus making exit and entry in Taramumbri backwater safe. • Taramumbri/Mithmumbri backwater beautiful which has lush mangroves which will provide opportunity for mangrove safari and water sports in the area. • It is well connected to coastal highway • Both Scuba diving sites are easily 	<ul style="list-style-type: none"> • The habitat is less diverse which might not create WOW factor among tourists • Due to easy accessibility, tourists may venture for snorkeling without guides • Exposed to northern wind (upara wara) thus visibility tend to get affected on regular basis which will have negative impact on scuba diving business • There are no other recreational activities in the area. • The local youth doesn't have appropriate experience or training in tourism. Therefore, establishment of scuba diving activity would require training, mentoring and infrastructure development. • Negligible population is involved in tourism. • Establishment of scuba diving would require professional training in scuba diving and boat operation.

<p>accessible from the shore with maximum duration of 15 minutes for boat drive. Therefore there will be less fuel consumption so tariff of scuba diving will be lower.</p> <ul style="list-style-type: none"> • Kunkeshwar site has rocky structure with abundant and diverse fish community. • From land, both sites are visible thus making scuba diving more visible and safe • Good population of youth which can be trained and employed in the scuba diving tourism industry. • Local community supports tourism industry 	
<p>Opportunities</p> <ul style="list-style-type: none"> • Presence of other attractions in the regions will enhance experience for tourists and it will ensure that this region will have good potential for tourist growth in near future. • Low cost scuba diving will attract more tourists • Due to easy accessibility, the boat travel time will be reduced which will create more opportunity for business • Other projects such as Angria Bank will boost tourism prospectus of the region enormously in near future. • Once scuba diving manages to attract 	<p>Threats</p> <ul style="list-style-type: none"> • The identified sites are merely substitute for scuba diving in Malvan region. • Once new destinations opens such as Angria Bank then, the scuba diving tourism may shift to Vijaydurg. • Site along the coast of Devgad is situated close to creek mouth. This affects the visibility at the site, thus scuba diving will more focused along the coast of Kunkeshwar. • Unlike Malvan coast which is bordered by rocky outcrops that minimize the adverse impact on underwater visibility, the coast of Kunkeshwar and Devgad doesn't such

<p>tourists, the other associated sectors tourism such as waters sports, restaurants, resorts/ home stay will get boost thus resulting in additional employment and revenue generation among local community.</p>	<p>a barrier which may result in great fluctuation in visibility. It may affect the satisfaction factor of tourist.</p>
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3.2.3 SWOT analysis of Ekicha Dhonda

<p>Strength</p> <ul style="list-style-type: none"> • Diverse marine habitat & high abundance of fish • Easily accessible from Malvan Jetty, Dandi, Wayari and Tarkarli • Established tourism in the vicinity • Lack of currents and strong wave actions/swells make safer for diving. • Over 25 certified dive masters and 6 PADI Scuba Instructors are present in the region thus it may give professional, environment friendly and safe experience to tourists. 	<p>Weakness</p> <ul style="list-style-type: none"> • The depth is high for novice divers • It is relatively distant from existing scuba diving sites • Current tend to be strong • Exposed to northern wind (upara wara) thus visibility tend to get affected on regular basis which will have negative impact on scuba diving business • Due to large number of operators, there is price war which will discourage scuba diving operator to take further which will incur more expenditure. • At present there are no other recreational activities.
<p>Opportunities</p> <ul style="list-style-type: none"> • Once the carrying capacity restrictions are imposed in over populated scuba diving sites, this site has good potential to absorb tourist pressure • The interesting rocky feature will be popular among tourist in the future. 	<p>Threats</p> <ul style="list-style-type: none"> • This sites falls in open sea, thus scuba diving operator would require proper boats which will lead to higher cost. • Once the Angria Bank tourism is established, this site's popularity may erode in the future.

3.2.4 SWOT analysis of Sargassum Forests

<p>Strength</p> <ul style="list-style-type: none"> • Diverse marine habitat, presence of corals and sargassum forests. High diversity and abundance of fish. • Diverse scuba diving sites which are comfortable for novice divers as well as certified diverse/course students. • Easily accessible from Wayari and Tarkarli • Established tourism in the vicinity • This area has less underwater current, thus site is safe for scuba diving. • The boarding points such as Tarkarli, Devbag and Bhogwe have jetty facilities. • Good number of scuba diving operators exists in the region. • Over 25 certified dive masters and 6 PADI Scuba Instructors are present in the region thus it may give professional, environment friendly and safe experience to tourists. • At present, some scuba diving operators have already started taking tourists for diving here. 	<p>Weakness</p> <ul style="list-style-type: none"> • Most of the diving area falls in shallow area thus diving without proper training and overcrowding will be major threat to corals and associated flora and fauna • Exposed to northern wind (upara wara) thus visibility tend to get affected on regular basis which will have negative impact on scuba diving business • The river mouth at Devbag is increasingly becoming dangerous for tourists due to high wave action caused by increase of sand depositions in the river mouth. It makes river mouth turbulent in windy weather which makes water dangers for navigation. It will affect the business in windy weather.
<p>Opportunities</p> <ul style="list-style-type: none"> • This site being close to popular tourist destinations, It have potential to be one of the most preferred and popular scuba diving site for novice divers. • The diverse features of habitat and 	<p>Threats</p> <ul style="list-style-type: none"> • This site is relatively further from existing popular scuba diving sites in Sindhudurg Fort, which will result in high fuel consumption. It will affect pricing of the product which is already under tremendous pressure due to

<p>biodiversity in the sites will make these sites popular and good replacement to overcrowded sites along Sindhudurg Fort.</p>	<p>price war.</p> <ul style="list-style-type: none">• Have a threat of overcrowding in near future, thus posing great threat to corals and associated flora and fauna.• Once the Angria Bank tourism is established, these sites's popularity may erode in the future.
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3.2.5 SWOT analysis of Vengurla Rocks

Strength	Weakness
<ul style="list-style-type: none"> • Diverse marine habitat, high abundance of fish, presence of oceanic fish makes scuba diving at these sites most spectacular compare to rest of the sites in the Sindhudurg. • Vast distribution of sites enhancing the carrying capacity of scuba divers. • Diversity of habitat, depth allows diving for novice, course student and certified divers. • During winter, islands are bird roosting/nesting areas • During boat trip to diving sites, si • High aesthetic value of islands making boat trip to diving memorable • Sighting of Indo-pacific dolphin is frequent during boat trip to the island is frequent. • Have accessibility from maximum gram Panchayats compared to other diving regions. 	<ul style="list-style-type: none"> • The distance from mainland is high and is exposed to oceanic weather. The depth is high for novice divers • It is relatively distant from existing scuba diving sites which requires specialized boat which are certified to take passengers to Vengurla Rocks. Thus the initial investment for setting up diving center will be higher to cater scuba divers to Vengurla Rocks. • Since the waters are deep at Vengurla Rocks, the novice divers need to be given pool training. Therefore, there is need of integrated scuba diving school with training pool facility in Vengurla. • In Vengurla taluka, tourist can board boat from Bhogwe, Nivati and Navabag Jetties. However, the mouth of river all three areas are filled with sand thus navigation during low tide is difficult. • Current tend to be strong and visibility varies from 1 to 20 meter. Therefore, well trained and experienced dive professionals are important requisite. • Exposed to northern wind (upara wara) thus visibility tend to get affected on regular basis which will have negative impact on scuba diving business • Due to large number of operators, there is a

	<p>price war which will discourage tourists to opt for these sites.</p> <ul style="list-style-type: none"> • At present there are no other recreational activities in the area.
<p>Opportunities</p> <ul style="list-style-type: none"> • Once the carrying capacity restrictions are imposed in over populated scuba diving sites, this site has good potential to absorb tourist pressure from other areas. • The interesting rocky feature will make these sites popular among tourist in the future. • The sites at Vengurla Rocks have maximum revenue potential compared to other sites. 	<p>Threats</p> <ul style="list-style-type: none"> • Higher cost for fuel to travel the distance would affect the pricing making most expensive scuba diving compared to diving elsewhere in Sindhudurg. Thus tourists may opt for cheaper scuba diving. • Once the Angria Bank tourism is established, these sites' popularity may erode in the future.

3.2.6 SWOT analysis of sites near Shiroda and Redi

<p>Strength</p> <ul style="list-style-type: none"> • High fish diversity makes scuba diving attractive. • Sites are closer to the boarding point. • High number of foreign tourists in the region • Sites are relatively shallower and are near shore thus making scuba diving safer. • Good awareness of tourism industry among local community. 	<p>Weakness</p> <ul style="list-style-type: none"> • Presence of Redi Port in vicinity may have restrictions on scuba diving in the area especially two sites near port. • Coral growth is very sporadic or absent in most of the sites. • The impact of mining and influx of Terekhol River affects visibility. • There is only one jetty at Shiroda but during low tide, boats cannot reach to the jetty making operation difficult. • Shiroda creek mouth is filled of sand making navigation difficult in back water during low tide. • There is no trained manpower for scuba diving operation, therefore there is need to carry out carrying capacity.
<p>Opportunities</p> <ul style="list-style-type: none"> • Due to less distance, scuba diving can be given to tourist at most competitive tariff. • Due to high influx of foreign tourists in the region, there is potential to grab domestic as well as foreign tourist market. • There may be discoveries of more scuba diving sites in the region which will attract tourists from another popular tourist destination Morjem in Goa to the region. 	<p>Threats</p> <ul style="list-style-type: none"> • Visibility fluctuates widely thus may affect scuba diving quality and may • Have a threat of overcrowding in near future, thus posing great threat to corals and associated flora and fauna. • There could be potential restriction from Port Management Authority for scuba diving in the region due to barges movement.

4. Tourism Development Plan for selected sites that to be developed under alternate tourism destination development

For the successful implementation of alternate tourism destination, it is important to scientific Development of Tourism Plan for identified sites.

Following are the major objectives of Tourism Development Plan.

- Establishing carrying capacity of identified sites for sustainable tourism
- Assessment of potential of each finalised site, development of business model, required linages, action plan and budget estimates
- Assessment of critical gaps in infrastructure, interventions required and cost thereof.
- Assessment of human resources required
- Assessment of monitoring required for sites, mechanism for monitoring, identification of stakeholders, agencies and modalities of monitoring (i.e. by whom and how) and the cost thereof.
- Marketing strategy to be made for successful implantation and publicity of proposed business plan

4.1 Carrying capacity of identified new sites

The term carrying capacity derives from ecological science, where it indicates the number of organisms the resources of a given area can support over a given time period. Adapted to tourism management, it has a similar meaning: the number of people who can use a given area without an unacceptable alteration in the physical environment. In this case, the concept of an unacceptable alteration has ecological and social aspects. That is, under too much pressure from visitors, a site or ecosystem can degrade, thus making it less attractive as a tourism destination. In the framework of dive tourism management, carrying capacity can be defined as: the maximum number of people who can use a site without an unacceptable alteration in the physical environment and without an unacceptable decline in the quality of the experience gained by the visitors. This definition already indicates that in the framework of the dive industry there are two types of carrying capacity (apart from the capacity to physically 'fit' a number of divers at a site): The first is a 'social' carrying capacity, or the amount of crowding divers will accept before seeking an alternative destination. The second one is 'ecological'

carrying capacity, or the extent to which a site can be used before the reef starts to degrade or until disruption of ecological function occurs.

Diver carrying capacity is usually expressed as a maximum number of divers per site per year that a site can sustainably support without being degraded. In order to minimize the impact of divers on marine environment, the concept of diver carrying capacity has been developed. Estimates of the maximum annual number of SCUBA divers that can be sustained at a dive site without damaging corals vary by an order of magnitude from 500 to 4,000 to 6,000. In selected areas the number of SCUBA divers could be as many as 10,000 to 15,000 per year. The large range in the number of divers per year that can be sustainably accommodated is related to a number of factors including site characteristics, coral type and species, and the behavior of individual divers. Therefore, studies elsewhere in the world suggested 5,000 to 6,000 dives per site per year as a good rule of thumb in the absence of site specific data.

Though there is no thumb rule for calculating carrying capacity for scuba diving sites as it is depend on many factors. Most of the studies on carrying capacity in scuba diving destinations are conducted in most famous and pristine coral reef areas. There are no studies conducted in scuba diving areas which are parallel to scuba diving sites in Sindhudurg. The carrying capacity estimation is based references of other studies that carried out in coral reef region. Considering, the study elsewhere and characteristics of scuba diving sites, it is estimated that, the identified sites have capacity of providing scuba diving experience for 1,02,000 tourists annually with maximum capacity of about 510 tourists per day at all identified 17 sites.

Table 3: Details of diving sites with dive site rating (maximum rating is 10, rating is given as per local conditions and not with comparisons with dive sites elsewhere in the country or world) with carrying capacity per day and per year with respective sites

Diving Region	Sr. No.	Diving Location	Maximum depth (m)	Dive Site Rating (Out of 10)	Carrying Capacity			Recommended Scuba Diving Cost (Rs. in year 2017)	Potential revenue Rs. Per year	Recommended number of for Scuba Diving centers with respective of sites
					Max. Divers at given point of time	Divers per day	Dives per year			
Vijaydurg	1.	Vijaydurg Fort	4	4	6	20	4,000	750	90,00,000	2
	2.	Rameshwar Bay	5	4	6	20	4,000	750		
	3.	Girye Bay	5	4	6	20	4,000	750		
Area Between Devgad and Kunkeshwar	4.	Taramumbri Bay	5	4	6	20	4,000	750	60,00,000	1
	5.	Kunkeshwar Edge	8	4	6	20	4,000	750		
Ekicha Dhonda	6.	Ekicha Dhonda	15	6	8	40	8,000	2,500	2,00,00,000	4
Sargassum Forests	7.	Sargassum forest	8	6	8	40	8,000	2,500	4,00,00,000	
	8.	Sargassum Reef	8	6	8	40	8,000	2,500		
Vengurla Rocks	9.	Fansa	15	7	8	40	8,000	3,500	17,50,00,000	
	10.	Unnamed Island	18	7	8	40	8,000	3,500		
	11.	Portuguese Lighthouse	28	7	6	30	6,000	3,500		
	12.	Vengurla Rock Light House Bay	19	7	10	50	10,000	3,500		
	13.	Vengurla Rock Light House	12	7	10	50	10,000	3,500		
	14.	Trigger Island	9	8	8	40	8,000	3,500		
Water Near Redi	15.	Twin Rock A	6	4	6	20	4,000	1,000	40,00,000	2
	16.	Twin Rock B	6	4	6	20	4,000	1,000	40,00,000	
Area Between Redi and Terekhol	17.	Mama Bhache Rock	9	5	8	40	8,000	1,500	1,20,00,000	
Total						510	1,02,000		27,40,00,000	19

4.2 Recommended use of sites for diving

Scuba diving business oriented towards either experience of scuba diving that is called as Discover Scuba Diving (DSD) or scuba diving education (Course Diving/Diving by certified tourists –CD) or diving by certified divers. As per PADI's rules and regulations, discover scuba diving can be done in water not deeper than 12 meters. Therefore, 1 site is eliminated from DSD. For CD, water required open sea condition and minimum depth of 8 meter to qualify as open water diving, therefore, 9 sites qualify to conduct scuba diving education. Only 8 sites qualifies to be used for both discover scuba diving and course diving. Following tables indicate the recommended use of new identified diving sites.

Table 4. Recommended use of sites for diving (DSD = Discover Scuba Diving, CD = Course Diving)

Sr. no.	Diving Site Region	No. of Site	Number of Diving Sites	Maximum depth (m)	Diver/Diving Type
1.	Vijaydurg	1.	Vijaydurg Fort	4	DSD
		2.	Rameshwar Bay	5	DSD
		3.	Girye Bay	5	DSD
2.	Devgad-Kunkeshwar	4.	Devgad/Taramumbri	5	DSD
		5.	Kunkeshwar Edge	7	DSD
3.	Ekicha Dhonda	6.	Ekicha Dhonda	15	DSD/CD
4.	Sargassum Forests	7.	Sargassum forest	8	DSD/CD
		8.	Sargassum Reef	8	DSD/CD
5.	Vengurla Rocks	9.	Fansa	15	DSD/CD
		10.	Unnamed Island	18	DSD/CD
		11.	Portuguese Lighthouse	28	CD
		12.	Vengurla Rock Light House Bay	19	DSD/CD
		13.	Vengurla Rock Light House	12	DSD/CD
		14.	Trigger Island	9	DSD/CD
6.	Water Near Redi Area Between Redi and Terekhol	15.	Twin Rock A	6	DSD
		16.	Twin Rock B	6	DSD
		17.	Mama Bhache Rock	9	DSD

4.3 Business Potential

It creates substantial opportunity for employment for local youth through development of alternate scuba diving destination. Considering the potential business and accessibility of numbers of divers, it is estimated that, the newly identified alternate scuba destinations will provide opportunity for 19 scuba diving centers. It will provide maximum benefit to Vengurla Taluka.

Considering the potential of scuba diving as per recommended carrying capacity and use of dive sites, it is estimated that, newly identified sites have a revenue potential of Rs. 27 Crore (Table no. 3) only through scuba diving business if these sites used in sustainable manner.

However, when tourist's come for scuba diving activities, it also spend considerable amount on local travel, accommodation, food, purchase of souvenirs etc. Therefore, it is anticipated that after establishing these alternate scuba diving destinations, there will multiplier economic benefits in the identified villages/municipal councils.

4.4 Accessibility to the sites

To conduct scuba diving business, it does require safe and comfortable boarding point to get into the boat which travels to particular scuba diving sites. The safe boarding point also helps to load and unload the heavy scuba diving gears conveniently. Newly identified 17 sites can be accessed from 10 safe boarding points (Table 5.)

Table 5. Safe boarding points to access newly identified alternate scuba diving sites

Sr. No.	Diving Location	Benefiting Gram Panchayat/Municipal councils	Safe Boarding Point
1.	Vijaydurg Fort	Vijaydurg	Vijaydurg Jetty/Beach
		Rameshwar	
	Area Between Vijaydurg fort and Girye	Girye	
2.	Area Between Devgad and Kunkeshwar	Devgad, Mithumbri and Kunkeshwar,)	Taramumbri Jetty (Devgad)
3.	Ekicha Dhonda	Malvan	Malvan Jetty
		Wayari	Dandi beach

		Tarkarli	Tarkarli Jetty
4.	Sargassum Forests	Wayari	Dandi Beach
		Tarkarli	Tarkarli Jetty
		Devbag	Devbag Jetty
		Bhogwe	Bhogwe Jetty
5.	Vengurla Rocks	Tarkarli	Tarkarli Jetty
		Devbag	Devbag Jetty
		Chipi	Bhogwe Jetty
		Bhogwe	Bhogwe Jetty
		Kochara	Nivati Jetty
		Medha	Nivati Jetty
		Mhapan	Nivati Jetty
		Wayangani	Navabag Jetty
		Vengurla	Navabag Jetty
		Ubhadanda	Navabag Jetty
6.	Water around Shiroda and Redi	Shiroda	Velagar backwater
		Redi	Velagar backwater

4.5 Human Resource

To establish scuba diving center that qualifies to be recognized as a PADI diving center or equivalent which would be legally approved center that would require at least one PADI or equivalent certified Instructor and 7 assistant instructors (Dive Master and above) to give scuba diving experience, education and a certified boat driver. There will be requirement of trained 19 scuba diving instructors and 133 dive masters (Table 5).

Table 6. Human resource requirement for 19 centers

Type of Manpower	No. of staff required per scuba diving center	Human resource requirement for 19 diving centers
Receptionist	1	19
Scuba Instructor	1	19
Scuba Dive Master	8	133
Boat Diver	1	19
Total	11	190

In the absence of required and trained manpower such as Instructors, dive masters and certified boat drivers in Sindhudurg district, it is recommended to carry out capacity building program for minimum 152 (133 + 19) dive masters, 19 Instructors and 19 boat operators with appropriate training and sustainable tourism practices approach.

4.6 Financial feasibility

Estimated funds needed for the establishment of this business is estimated at a value of about Rs. 54,12,00/- (Table no 7 and 8). These costs are used shop rental costs, purchase of machinery and diving equipment, purchasing office equipment and supplies, making of branding materials, and arranging the legality of a business license and location.

Table 7. List of minimum requirement of equipments to run one scuba diving center professionally

Sr. no.	Particulars of equipment	Nos.	Approximate rate (Rs.) for the year 2017	Total (Rs.)
1.	Mask	20	2,000	40,000
2.	Snorkel	20	500	10,000
3.	Buoyancy Control Device	20	20,000	4,00,000
4.	Regulator	20	20,000	4,00,000
5.	Wet Suit	30	10,000	3,00,000
6.	Dive Knife	20	2,000	40,000
7.	Depth, Air Pressure, Compass, Computer Gauge	20	6,000	1,20,000
8.	Weight belt	20	1,000	20,000
9.	Weights	100	100	10,000
10.	Booties	30	2,000	60,000
11.	Handheld Depth finder	2	20,000	40,000
12.	Underwater camera	2	20,000	40,000
13.	Dive torch	10	10,000	1,00,000
14.	Air Cylinders	30	20,000	6,00,000

15.	Breathing Air Compressor	1	5,00,000	5,00,000
16.	Dive bouys	4	5,000	20,000
17.	Lift bag (100 kg)	2	10,000	20,000
18.	Scuba diving equipment repair tool kit	1	10,000	10,000
19.	Dive Ger mesh bag	4	5,000	20,000
20.	Emergency Oxygen Supply	1	20,000	20,000
21.	Fiber Boat	1	7,00,000	7,00,000
22.	OBM (25 HP)			4,00,000
Total				38,70,000

Table 8. Component of One Scuba Diving Centre

Sr. no.	Particulars of items	Cost (Rs.)
1.	Land/shop rental cost	1,00,000
2.	Interiors with furniture, computer, printer	4,00,000
3.	Diving Equipments including air compressor , dive boat, OBM etc. (Table 7)	38,70,000
4.	Course material	1,00,000
5.	Licensing fees	50,000
6.	Branding & website	4,00,000
A	Subtotal	4,920,000
B	Contingencies (10% of total cost)	492,000
	Total (A+B)	5,412,000

4.6.1 Expenses

For estimation of expenses, there could be many models which are dependent on geographic locations of site/place. As the major component of expenses is salary which contribute to over 60% of expense, salary and number of staff will vary as per locations.

The scuba diving center will have minimum workforce of 11 people. For employment, the direct cost of employee salaries is at Rs. 21,84,000/- per year considering 8 months of diving business for conservative calculations (Table 9). The salary can be increased at the rate 10% every year if there is steady growth in tourist's footfall.

Table 9. Human resource salary expenses per year

Sr. no.	Manpower	Salary per month	Year I	Year II	Year III	Year IV	Year V
1.	Receptionist	7,000	56,000	61,600	67,760	74,536	81,990
2.	Boat Driver	20,000	1,60,000	176,000	193,600	212,960	234,256
3.	Instructor	35,000	2,80,000	308,000	338,800	372,680	409,948
4.	Dive Master	15,000	9,60,000	1,056,000	1,161,600	1,277,760	1,405,536
Total			14,56,000	16,01,600	17,61,760	19,37,936	21,31,730

The fuel expenses are also dependent on the location of site. The diving sites around Vijaydurg fort, Sargassum forests and near Redi area will have minimum fuel expenses due to the near proximity of the diving location so the diving costs will also be less. In contrast, the diving sites around Vengurla Rocks and surrounding area will have more fuel consumption and will also costs more for tourists. The major component of the expenses is salary of the staff which ranges from 70 to 77% of total expenses (Table

Table 10. Expenses per year for one scuba diving centre

Sr. No.	Expenses Heads	Year I	Year II	Year III	Year IV	Year V
1.	Salary	21,84,000	24,02,400	26,42,640	29,06,904	31,97,594
2.	Fuel	3,93,750	4,33,125	4,76,438	5,24,081	5,76,489
3.	Maintenance/replacement of equipment	80,000	88,000	96,800	1,06,480	1,17,128
4.	Electricity bills	36,000	39,600	43,560	47,916	52,708
5.	Stationary	24,000	26,400	29,040	31,944	35,138
6.	Licensing fee	0	55,000	60,500	66,550	73,205
7.	Rental cost	0	1,05,600	1,16,160	1,27,776	1,40,554
8.	Course material	0	1,10,000	1,21,000	1,33,100	1,46,410
A	Subtotal	27,17,750	32,60,125	35,86,138	39,44,751	43,39,226
B	Contingencies (5%)	1,35,888	1,63,006	1,79,307	1,97,238	2,16,961
	Total (A+B)	28,53,638	34,23,131	37,65,444	41,41,989	45,56,188

4.6.2 Income analysis

As estimation of expenses, the income analysis can be complex due geographical locations of site diversity/abundance of marine life and point of origin which will have impact of costs to the tourists for diving experience. The estimated diving cost for tourists varies from Rs. 750 to Rs. 3500 per person. It is also assumed that, the cheaper cost for diver will have more chances to grab bigger market and more cost will attract tourists who prefer bigger adventure of diving in open sea such as area around Vengurla Rocks. For estimation purpose, average cost of Rs. 2000 per person is considered with very conservative estimates. For Vijaydurg region, diving cost would be Rs. 750 per person but it has opportunity to attract more tourists than assumption.

Table 11. Estimated Revenue Vijaydurg, Devgad Kunkeshwar

Particulars	Year I	Year II	Year III	Year IV	Year V
Discover Scuba Diver	4,000	4,400	4,840	5,324	5,856
Discover Scuba Diver	30,00,000	33,00,000	36,30,000	39,93,000	43,92,300
Underwater photography	8,00,000	8,80,000	9,68,000	10,64,800	11,71,280
Total	38,00,000	41,80,000	45,98,000	50,57,800	55,63,580
PBT	19,12,888	16,69,608	18,66,100	20,82,241	23,19,996

4.6.3 Investment analysis

If the present value of net cash proceeds in the future is greater than the present value of the investment, the project profitable. However, if the value is smaller in the future (negative NPV), then the project should be rejected because it is not profitable. The amount of the interest rate used is based on the interest rate attractive Minimum Rate of Return (MARR) whose value can be obtained by knowing the value of the bank deposit rate which provides the maximum interest rate on deposit in India as of October, 2016, maximum interest over deposit is 8.25% (f). While the average inflation rate of last five year (2012 to 2016) is 7.68% (i). MARR calculation is as follows:

$$\begin{aligned}
 \text{MARR} &= i + f + (i \times f) \\
 &= 0.0825 + 0.0768 + (0.0825 \times 0.0768) \\
 &= 0.1656 \\
 &= 16.56\%
 \end{aligned}$$

After value of MARR calculated, the next step is to calculate Net Present Value and IRR. Here is the value for study period 5 years, summarized in following table:

Table 12. Calculation of NPV and IRR for Vijaydurg and Devgad/Kunkeshwar Sites

Initial funds	-5,412,000
Cash flow Year I	1,912,888
Cash flow Year II	1,669,608
Cash flow Year III	1,866,100
Cash flow Year IV	2,082,241
Cash flow Year V	2,319,996
Net Present Value (NPV)	62,54,758
IRR	22.86%

From the calculation, it was found that the rate of IRR was 22.86%, higher than the value of MARR is 16.56% interest and total NPV value (Rs. 62,54,758) obtained is positive, so that it can be stated that with very conservative estimates Scuba Diving business in Vijaydurg region is profitable. While comparing to other regions, where scuba diving quality is either equivalent to Vijaydurg region or much better will have equivalent or better IRR. This indicates that scuba diving business in all selected alternative diving site is profitable.

Table 13. Percentage of tourist foot fall with respective of diving location to make IRR close to 22.86%.

Diving Sites (Pulled with region)	Recommended diving cost for tourists per person (Rs.)	Carrying capacity for DSD (No. of tourists)	Tourist required for competitive IRR of 22.86% for one scuba diving center	% of Carrying capacity

Area around Vijaydurg Fort	750	12,000	4000	33.33
Area between Devgad and Kunkeshwar	750	8000	4000	50
Ekicha Dhonda	2,500	8,000	1,225	15
Sargassum Forest	2,500	16,000	1,225	8
Area around Vengurla Light House	3,500	18,000	900	5
Area around Redi	1,000	8,000	2,750	34
Area between Redi and Terekhol	1,500	8,000	1,950	24

Above table indicates that, the number of tourists required to make profitable sound business of scuba diving would require considerably less tourists with respect to carrying capacity as well as the potential of respective area. It is expected that, tourists number will increase once these dive sites become popular which will result in much higher IRR and it will make scuba diving business very profitable.

4.7 Sustainability strategy

The possible impacts of SCUBA diving are of especial concern in areas such as coastal areas of Sindhudurg, where corals and fish diversity are a highly prized part of the natural heritage but where the dive industry is also an important part of the local economy.

The recreational use of certain goods such as dive sites is in fact consumptive beyond a certain point. Not only do the activities inadvertently degrade the environment as mentioned, but there is a level of 'rivalry' that sets in due to 'congestion' at the dive locations. There would be two options for mitigating these effects. The first is to directly impose limitations on diver numbers, as well as excluding these activities from certain areas. The second is to restrict numbers using financial instruments such as the imposition of user fees. The most effective means of reducing what are in essence external costs on the environment is through a combination of both regulation and financial instruments. To this, diver education as one of the most important factors in reducing the potential for negative impacts. Educating tourist and local divers on the ecology of the area and ways to approach it will help increase awareness of potential negative impacts.

The principle of scuba diving is to experience beautiful underwater world and appreciate its existence. It is core value of scuba diving business fundamental principle of any scuba diving education. It is observed that, in Sindhudurg, very little is done by local scuba diving operators to create awareness about preserving marine life and cause minimum damage to corals and other life due to bad scuba diving practices.

Due to absence of awareness and bad scuba diving practices, it is now evident that marine life is deteriorated. At present, there are no rules and regulation for recreational scuba diving which would have created good base for sustainable and safe scuba diving practices. Therefore, it is recommended that, rules and regulations for recreational scuba diving must be drafted and implemented to ensure safe and sustainable tourism practices along with creation of awareness among scuba diving business operators, stakeholders including tourists and among schools. The implementation of rules and regulation for recreational scuba diving will ensure that all professionals are appropriately qualified, accountable to government, tourists, respective scuba diving governing body like PADI and give them exposure to safe and environment friendly diving practices around the world.

Following are the recommendations for sustainability to scuba diving business and marine conservation in Sindhudurg:

- a. Draft Rules and Regulations for recreational scuba diving for Maharashtra with focus on safe scuba diving practices, professionalism with adequate education for dive business staff, marine environment protection etc. and implement them as earliest as possible after wide consultation with local stakeholders
- b. Create scuba diving rules and regulations implementation strategy through cross sector representation in regulatory mechanism
- c. Develop carrying capacity numbers for every scuba diving site and implement it in right spirit.
- d. Carry out pilot project at few identified locations where the profit of scuba diving industry can be distributed among the respective gram panchayats/municipal councils
- e. Install anchoring buoys at all existing and potential diving sites with appropriate rules and regulations and prohibit anchoring by diving boats in coral areas.
- f. Create awareness about importance of marine environment, biodiversity, relate it to their economy survival among local stakeholders, students and tourists for their responsibility to protect environment through various media

4.8 Assessment Strategy

In recent years some studies have been undertaken to gain quantitative information on damage done by SCUBA diving and it is well documented elsewhere in the world except India.

There have been various discrepancies between these studies suggest that more work needs to be done to establish the effect of diving at different dive locations. With this in mind and considering present and future impact of scuba diving on corals and marine biodiversity, there is need to have spatial and temporal studies on impact of scuba diving on marine life especially corals, benthic flora and fauna and fish diversity and abundance. Before initiation of such study, it is important to prepare baseline information on diversity and abundance of coral, associate flora and fauna.

4.8.1 Objectives of the assessment

Therefore, to assess the impact of scuba diving on marine environment, following should be objectives of the program:

- a) Develop standard methodologies to collect the data and analytical methods so that data can be standardized and analyzed which can be compared at regional and global level.
- b) Prepare baseline information Sindhudurg's coastal marine biodiversity especially diversity, distribution, and abundance of corals, benthic macro invertebrates, fish and flora
- c) Establish monitoring areas with GPS and permanent markings for easy search of the site.
- d) Periodically monitor physical and chemical parameters such as salinity, temperature, dissolved oxygen, biological (BOD) & chemical oxygen demand (COD), primary & secondary productivity through permanent sensors and analyzing the samples in laboratory.
- e) Monitor all sites annually and whenever there is significant event of change in local or global marine environment such as oil spills or *El Niño* or *El Niña*.
- f) Prepare report on the same and submit to Mangrove Cell, Department of Forests, Government of Maharashtra and Ministry of Environment, Forests and Climate Change, Government of India annually.
- g) Give appropriate publicity to the findings of study in popular media such as print, electronic or social media.

4.8.2 Identified organizations to conduct the studies

Assessment of impact of scuba diving on marine environment require expertise with good experience of scuba diving and institution which has adequate infrastructure and trained manpower required to carry out vast assessment through scuba diving. Since, the water quality of Sindhudurg is pretty challenging due to visibility and currents compared to Andaman & Nicobar or Lakshadweep Islands, it is important to identify institution who has expertise with experience of carrying out underwater research by self in Sindhudurg. The assessment of one area on long term period, needs Institutional commitment and scientific expertise to have enough experience in carrying out such studies. This is very important as such studies are very specialized which require well trained and expertise with local experience and also with Institution which has strong presence with adequate infrastructure in Sindhudurg. It is recommended that, only one institution carry out such studies to ensure standardized assessment and analytical methods are adopted to have consistency in the information collected.

Following institutions are recommended to carry out such monitoring on regular interval

- a) National Institute of Oceanography, Goa (Government of India)
- b) Bombay Natural History Society, Mumbai (NGO)
- c) Zoological Survey of India, Kolkata (Government of India)

- d) Indian Institute of Scuba Diving and Aquatic Sports, Sindhudurg (Government of Maharashtra)

4.8.3 Sites to be monitored

After consideration of existing and potential scuba diving sites, 20 sites are recommended for establishing baseline information and long term monitoring to assess the impact of scuba diving

Table 14. Recommended sites for long term monitoring to study the impact of tourism on marine biodiversity and habitat

Sr. No.	Location of sites for monitoring	No. of Sites
1.	Area around Vijaydurg Fort	3
2.	Area between Devgad and Kunkeshwar	2
3.	Chiwala beach	1
4.	Sindhudurg Fort	2
5.	Ekicha Dhonda	1
6.	Sargassum Forests	2
7.	Area around Vengurla Rock	6
8.	Area around Redi	3
	Total	20

4.7.3 Financial provision

To carryout underwater studies and assessment require highly technical infrastructure such as underwater sensors to record periodical water temperature, dissolved oxygen, laboratory equipments and chemicals to analyze chemical and biological parameters, software to analyze data, scuba diving gears, underwater cameras, ocean going boats, plenty of fuel for boat which is very expensive affair compared to carry out studies on terrestrial wildlife and its habitat.

Financial model for 5 year monitoring has been prepared while taking into consideration of capital cost for equipments, maintenance, diving gears rental, boat, fuel etc.

Particulars	Amount (Rs.)				
	Year I	Year II	Year III	Year IV	Year V
Equipments					

Sensors and laboratory equipments	5,00,000	0	0	0	0
Assessment equipments	100,000	0	0	0	0
Software	200,000	0	0	0	0
Sub Total (A)	300,000	0	0	0	0
Principal Investigator	300,000	330,000	363,000	399,300	439,230
Assistants (Divers & Researchers)	300,000	330,000	363,000	399,300	439,230
Boat Driver	90,000	99,000	108,900	119,790	131,769
Scuba Gears Rental	240,000	264,000	290,400	319,440	351,384
Fuel for boat	350,000	385,000	423,500	465,850	512,435
Boat charges	150,000	165,000	181,500	199,650	219,615
Report Preparation and Printing	100,000	110,000	121,000	133,100	146,410
Travel	100,000	110,000	121,000	133,100	146,410
Subtotal (B)	1,630,000	1,793,000	1,972,300	2,169,530	2,386,483
Sub total (A+B)	1,930,000	1,793,000	1,972,300	2,169,530	2,386,483
Contingencies (10%) of B	193,000	179,300	197,230	216,953	238,648
Total	2,123,000	1,972,300	2,169,530	2,386,483	2,625,131
Administration charges (15%)	318,450	295,845	325,430	357,972	393,770
Gross Total	2,441,450	2,268,145	2,494,960	2,744,455	3,018,901

The net value of create baseline information and monitor 20 sites for 5 years would be Rs. 1.3 crore with Rs. 24.5 Lakh for first year studies to carry out studies on baseline information. The amount required for annual monitoring expenditure would be 2% of potential scuba diving business of newly identified diving sites and merely 0.5% of total diving business potential of Sindhudurg including existing business.

4.9 Marketing Strategy

The marketing strategy should be with the vision of Dive Sindhudurg aspires to make Sindhudurg the most economically, environmentally and socially sustainable destination for scuba diving in India. It should be aimed to be recognised as a leader in sustainable scuba diving tourism development, not just within India but at an Asian and World level. It should aim to make Dive Sindhudurg the sustainable scuba diving tourism operation, recognized for efforts to reduce the environmental impact, and maximize the economic and social benefits, of best scuba diving practices.

4.10 Capacity building of local communities in Scuba Diving, Boat operation, Hospitality Management and in marine interpretation

Table 15. Number of local youth to be trained in respective field with status

Sr. No.	Capacity Building program	No. of people to be trained	Duration of the training (days)	Status
1.	PADI Open Water Diver Certification	24	4	Completed
2.	Hospitality Management	40	6	To completed by 30 th September
3.	Boat Operation	50	5	To completed by 30 th September
4.	Marine Interpretation and Safety	50	5	To completed by 30 th September
Total		164		

Scuba diving business is developed in Malvan, Wayari, Tarkarli and Devbag area and also capacity building program in professional scuba diving (Open Water Diver to Dive Master) is underway and all beneficiaries are from these areas. Therefore, for present capacity building program, no participant from these areas are recommended.

4.10 DEVELOPMENT OF TRAINING MODULE: To be completed by 15th October, 2017

- a. One training module both in English and Marathi on marine life conservation and sustainable marine eco-tourism for schools and colleges will be developed
- a. Pilot testing of the training module in one school and one college in the project area will be carried out.
- b. Refinement and finalisation of the training module will be based on feedback received during the pilot testing.

4.11 Marketing : To be completed by 15th October 2017.

Marketing strategy will be formulated and action plan prepared for promotion of alternative tourism destinations. The following publicity activities will be conducted as a part of the tourism plan for four selected sites based on the following parameters:

- a. Creation of a new website which should be linked to the Maharashtra Tourism Development Corporation (MTDC) website.
- b. Identification of locations for advertising new tourism destinations and creation/design of display materials (such as signage, flyers, banners, boat/wall paintings etc.).
- c. Display of safety rules and eco-friendly practices in the form of Do's and Don'ts at the selected sites.