

Marine Ecosystems in the Arabian Gulf: Services and Threats

An Example from Bahrain



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INTRODUCTION

People of the Arabian Gulf are related economically, culturally and socially to the sea. Several ecosystems, including seagrass beds, coral reefs, mangroves, and mudflats contribute significantly to the productivity of marine resources and provide valuable ecological and economic services to humans. However, these ecosystems are under increasing pressure from anthropogenic activities that are associated with the rapid economic, social and industrial developments in the Arabian Gulf.

A sheltered bay in Bahrain is used here to exemplify 1) the range of environmental benefits derived from marine environments in the Arabian Gulf, and 2) anthropogenic threats affecting these environments.

METHODOLOGY

The adopted methodology in this case study is based on Hooper et al., (2014). It involves 1) characterizing the site, 2) identifying environmental benefits, and 3) identifying environmental pressures affecting environmental benefits.

RESULTS

1. Site characterization:

Tubli Bay is a sheltered low-energy coastal area located in northeast of Bahrain (Fig. 1). This bay hosts a variety of coastal habitats such as mangrove swamps, seagrass beds, mudflats and patches of rocky areas. A sheltered lagoon in the bay that hosts the last remaining mangrove ecosystems in Bahrain is designated nationally as a marine protected area (1995). The bay represents one of the most important sites for migratory and breeding birds in the country (Ramsar site since 1997). The bay is also a nursing ground for economically important shrimps and fisheries (Fig. 2,3,4, and 5).



Fig. 1: Tubli Bay in Bahrain



Fig. 2: Mangrove swamps



Fig. 3: Algal mats

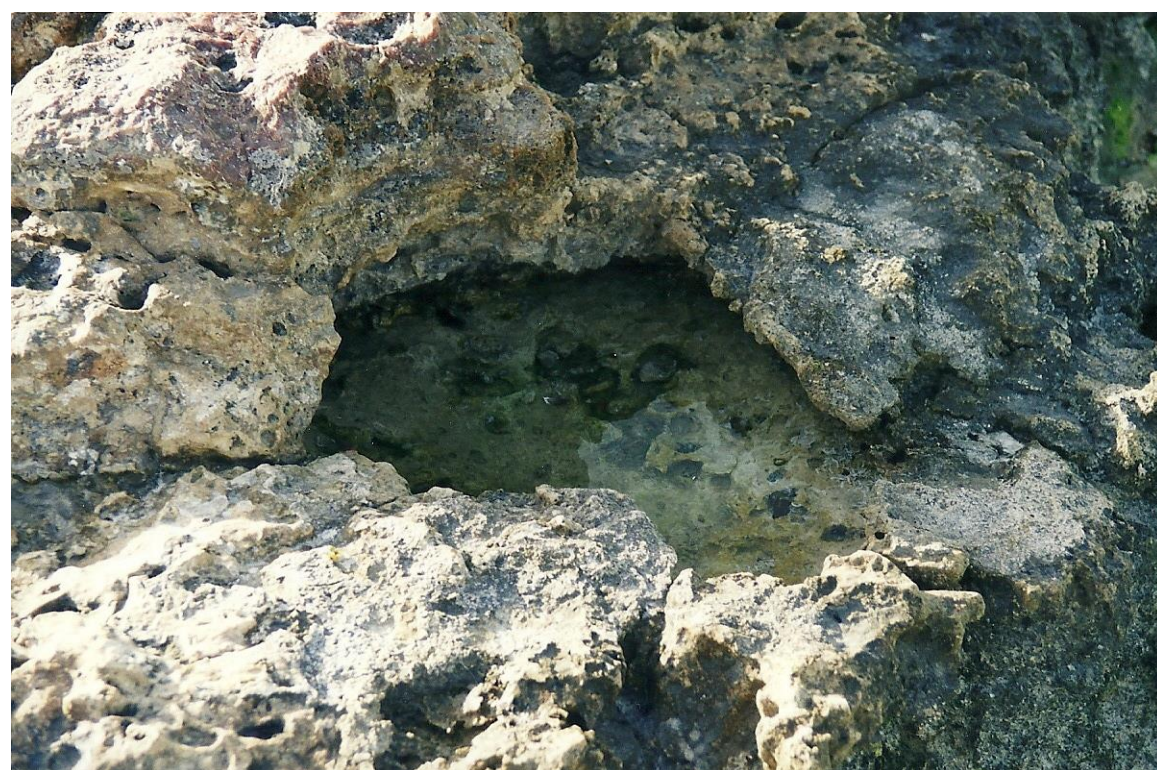


Fig. 4: Rocky areas and tidal pools



Fig. 5: Wader birds



Fig. 6: Reclamation activities



Fig. 7: Sewage effluents



Fig. 8 & 9: Widespread degradation in mangrove plants

2. Ecosystem services:

Type of value	Service type	Benefit/value category	Examples of specific benefits
Direct use (consumptive)	Provisioning	Food	Fish, shellfish
Direct use (Non-consumptive)	Cultural	Recreation	Bird watching (Ramsar site), traditional fishing
		Cognitive development	Education, research (hosts several types of habitats: schools and universities education and research)
		Heritage	The bay is surrounded by numerous water springs and wells (on land/in sea), which form part of the cultural heritage in Bahrain
		Psychological wellbeing	Visual and inspiration
Indirect use	Regulation	Contaminant control	Clean water and air (mangroves, seagrass beds)
		Disturbance prevention	Flood and erosion control (mangroves), climate regulation
Non-use		Existence, Bequest	Knowledge that several habitats are available locally and will continue to be so in future
Future use		Option	Availability for alternative future uses; genetic resources associated with mangrove ecosystems)

3. Anthropogenic stressors:

Several anthropogenic stressors have contributed to the continues degradation of ecosystems in Tubi bay, notably:

1. Coastal reclamation:

Coastal reclamation is extensively carried out in Bahrain to meet the demand of rapid coastal developments. Presently, reclamation activities have resulted in in decreasing the marine area of Tubli bay from 25 to 10 km² (Fig. 6). Such activities restricted the widely spread mangroves to only 0.3 km² in recent years.

2. Sewage effluents:

Around 160,000 m³ day⁻¹ of treated sewage discharges, are being discharged to the shallow marine environment of Tubli bay (Fig. 7). This resulted in frequent eutrophication events in the bay. Synergistic impacts of the several stressors have resulted in a significant degradation in mangrove and mudflat ecosystems (Fig. 8 & 9).

CONCLUSIONS AND RECOMMENDATIONS

Conclusions and recommendation

A small bay in Bahrain that encompasses most of the habitat types in the Arabian Gulf is used in this case study to explore the ecological services provided by ecosystems and the anthropogenic threats associated with coastal developments. Ecosystems in this bay provide several direct and indirect environmental values including, provisioning, cultural and regulation services. However, these services are adversely influenced by coastal reclamation and sewage discharges as indicated by reduction in mangrove areas, degradation in fisheries, frequent eutrophication events, and increased levels of pollutants. Effectively managed ecosystems provide a range of economic, social and cultural services. Therefore, conservation and management strategies such as marine protected areas, environmental assessment for coastal developments, environmental regulations, and holistic environmental monitoring may contribute to the protection of coastal and marine ecosystems in the Arabian Gulf.

References

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Acknowledgments

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