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Contents

3 Bar Al Hikman
Roeland Bom

8 Duqm Rock Garden: A Hidden Natural
Ali Akaak

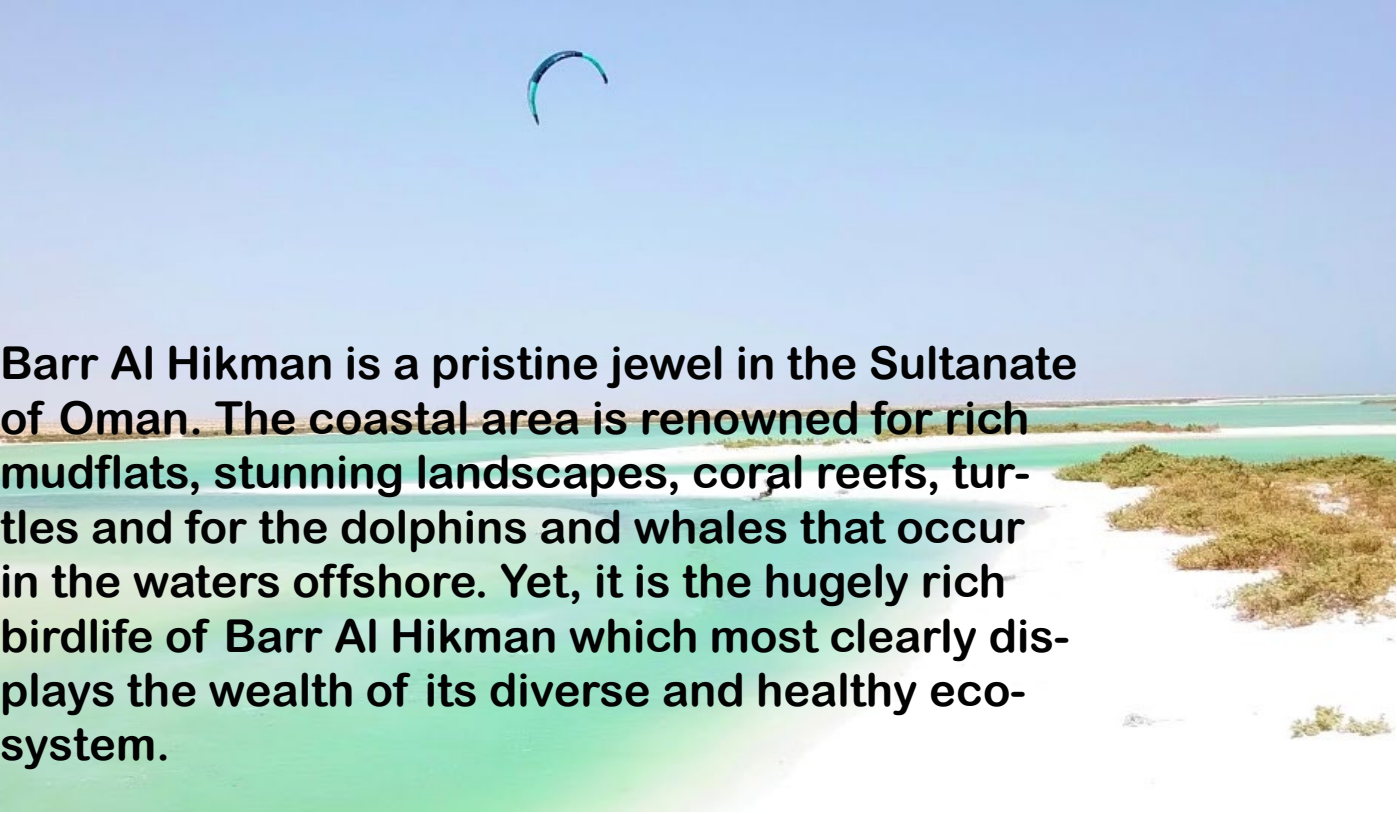
11 Economic Development in Duqm
Amna Al Sinani

17 The Duqm Landing
Michael Quentin Morton

Bar Al Hikman

Roeland Bom





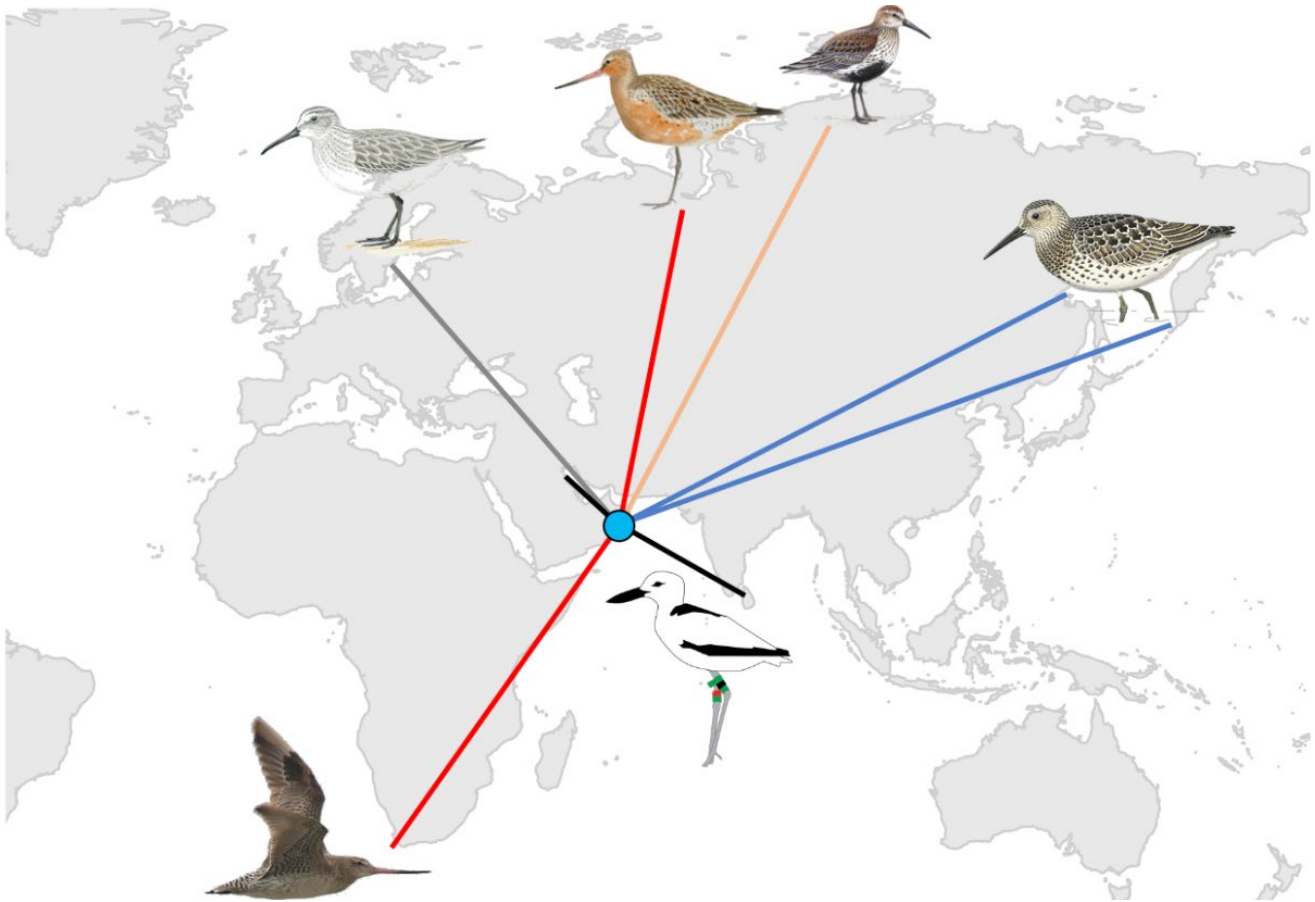
Barr Al Hikman is a pristine jewel in the Sultanate of Oman. The coastal area is renowned for rich mudflats, stunning landscapes, coral reefs, turtles and for the dolphins and whales that occur in the waters offshore. Yet, it is the hugely rich birdlife of Barr Al Hikman which most clearly displays the wealth of its diverse and healthy ecosystem.

A recent survey shows that the area supports more than half a million waterbirds, which suggests that the area is the single most important site for shorebirds on the flyway between western Asia and East Africa. Indeed, the number of species for which Barr Al Hikman hosts an important part of its total flyway population is unmatched, even in global terms.

A hub in the Global Flyway Network

Most of the birds that can be seen at Barr Al Hikman do not live here throughout the year. They are travellers from northern breeding areas that come to Oman to benefit from benign wintering conditions, such as favourable weather, plentiful food and relative safety. In spring, they return





to their breeding sites to nest and to raise their chicks. At Barr Al Hikman, birds with very different breeding origins flock together in winter. Ornithologists have been tracking birds in the area and this has shown that some species come all the way from the Arctic tundra, stretching from Europe to eastern Asia at the northern edge of the continent (see the above map). Others move only quite short distances and spend their whole

year within the Middle East. There are also birds that spend the winter still further south, for example on the east coast of Africa, and visit Barr Al Hikman in autumn and spring to refuel. Barr Al Hikman therefore represents a key node in a worldwide network of breeding, wintering and stopover sites.



Crab Plovers: A Regional Celebrity

The Crab Plover is one of the most charismatic and easily recognisable of the world's shorebirds. Unusually among migrant birds, the young ones travel to the wintering grounds alongside their parents and still depend partly on them for food after arrival. A striking peculiarity is that, unlike other shorebirds, they do not nest on open ground but colonially in burrows on sandy offshore islands. Crab Plover colonies are found only in the region surrounding the Arabian Peninsula. As their name suggests, Crab Plovers mainly eat crabs! Their big eyes and powerful bill are well suited for hunting them down. Whenever crabs emerge from their burrows to feed or to display, there may be a Crab Plover waiting silently to strike. Small crabs are swallowed whole. They also catch larger crabs swimming in the shallow waters but these cannot be swallowed until their dangerous claws have been detached.

Life at the Edge of the Desert

Visiting Barr Al Hikman can be a stirring experience. Narrow strips of sand dunes mark the transition from land to sea. The contrast between the sparsely inhabited desert and the astonishing abundance of marine life on the intertidal mudflats cannot be greater.

The shallowly sloping coast is hugely transformed by the twice-daily advance and retreat of the sea. As the tide drops, the richness of life at Barr Al Hikman becomes visible at low tide. Sea snails glide over the surface and small crabs emerge from their burrows. In shallow pools, anemones wave their tentacles, and sponges and sea squirts pump water through their bodies. In addition, a hidden world of animals exists within the mud itself, revealing its presence only by burrows in the sediment and casts left on the surface. The small animals, including sea snails, clams, worms and small crabs, are food for shorebirds.

At high tide, the mudflats will be underwater and the shallow waters teem with fish and swimming crabs. These marine animals also feed upon the invertebrates hidden in the muds, but they also hide themselves from larger marine predators, that refrain from going in the shallow waters. The mudflats are not only a shorebird paradise, they also form a nursery ground for several quarry species of economic value and so underpin the fisheries sector of the Omani economy.





Conserving a Paradise

The importance of Barr Al Hikman for local people, regional fisheries and global biodiversity is well recognized in Oman and the site has therefore been declared as a Wetland Reserve by Royal Decree. However, nowadays, the remoteness of the area has helped preserve Barr Al Hikman in the past. Nowadays, however, the area is in serious peril. Threats include plastic pollution, disturbance from tourists, the development of potential shrimp farm industries, overfishing and climate change. Active protection of this relatively untouched area is of utmost importance.

About Roeland Bom

Roeland Bom is a marine biologist from the Netherlands with a special interest in intertidal areas. For his PhD, Roeland studied the Barr Al Hikman ecosystem with a strong focus on shorebirds. To find out how shorebirds can winter at Barr Al Hikman in such large numbers he looked at what they eat and measured how much of this food is available. Roeland hopes to continue his work at Barr Al Hikman in the near future, particularly the studies on birds. Birds respond quickly when conditions become less favourable, for example by moving away to seek alternative sites, so they are indicators of a healthy ecosystem and, on a wider scale, can be considered as sentinels of our changing world.

Most of the text in this article is adapted from the book “Barr Al Hikman, Shorebird paradise in Oman”.

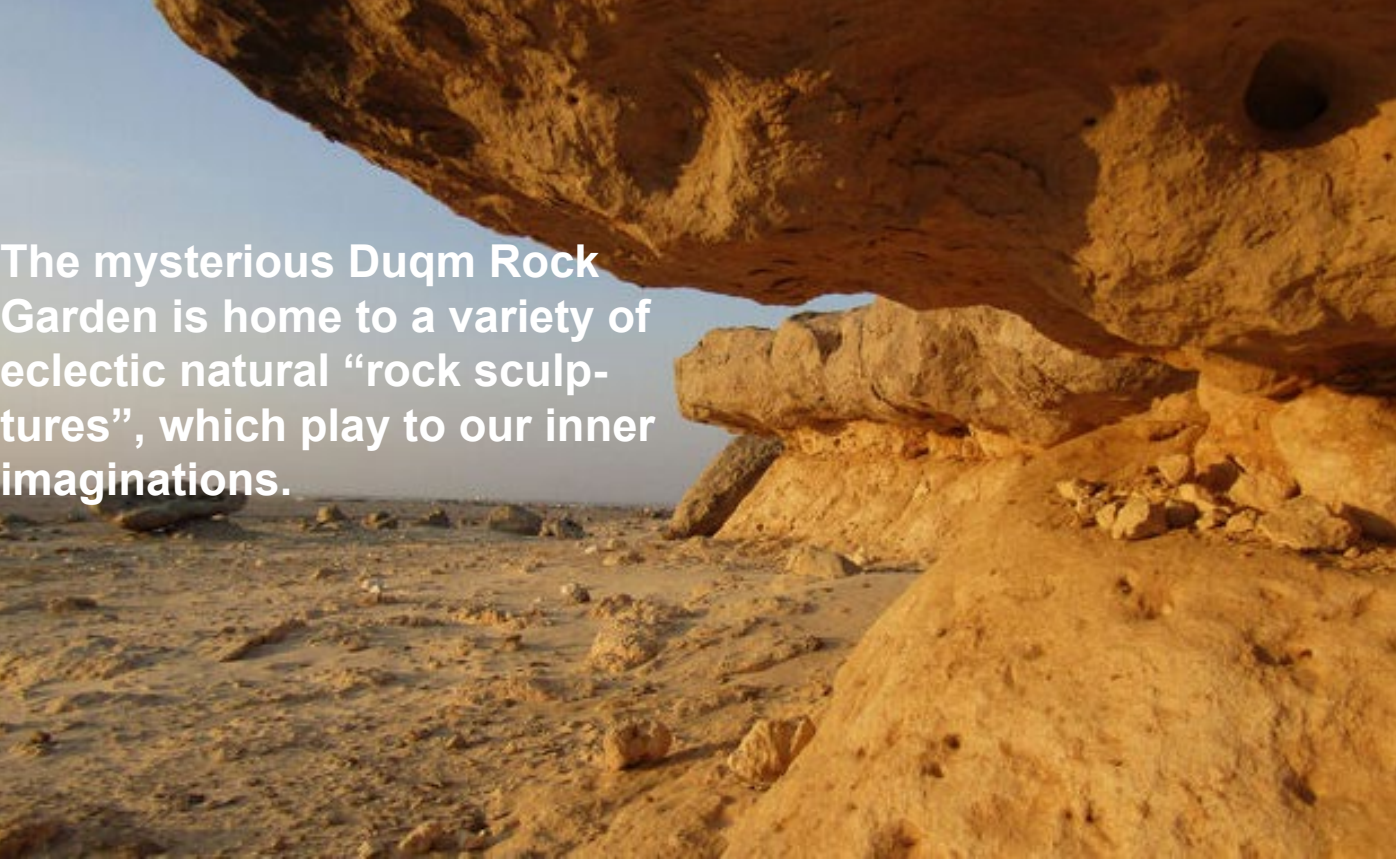
The book can be visited here: https://issuu.com/tvgdesign/docs/bah_binnenwerk_issuu_pages?e=35379482/65601566

Duqm Rock Garden

A Lesser Known Natural Wonder

Ali Akaak





The mysterious Duqm Rock Garden is home to a variety of eclectic natural “rock sculptures”, which play to our inner imaginations.

In the past, natural rock formations have been important to humankind as both strategic navigational tools and as elements of mythology and folklore. In modern times, these same rock formations, though barely unchanged over the millennia, now act as destinations for scientific research and tourism. The Garden is recognized globally as one of the more significant geological sites in the Sultanate of Oman and it is considered one of the country’s greatest natural treasures. In 2009, the remote and barely accessible location was discovered by an expedition conducted by the Earth Secrets Company (ESC) in cooperation with the World Habitat Society. The Garden is located in the Wilayat of Duqm, which is situated in the Al-Wusta Governorate, an isolated part of Oman approximately 600 km from Muscat, the capital. The Garden stretches across three square kilometres of terrain and is roughly one kilometre to the northeast of Duqm, a burgeoning port city.

The geology of Oman has already been considered uniquely fascinating to the global research community, and the recent discovery of the Duqm Rock Garden also shows considerable potential for the tourism market, that is if utilised correctly. The site consists of many rocks and boulders of different sizes, formations, colours, positionings, and groupings. Most of these present unique im-

ages to the viewers—much like looking at clouds—that could take the forms of animals, people, and everyday objects. These rocks and boulders are composed of solidified limestones that have been shaped by natural erosion from wind, water, and even frost for at least 46 million years!

Interestingly, the rocks in the site present the geological history of the development of marine organisms and plant life in the Sultanate. The Lonely Planet Guide mentioned that the Garden is “scattered across the plain between Hwy 32 and the port, the wind-eroded rocks of Duqm are a striking feature that is well-deserving of a visit. The soft sandstone has been whittled away by the wind, leaving curious round boulders, desert mushrooms and formations that appear to defy gravity.”

Oman is home to many other diverse natural sites, many of which appeal to local, regional, and international tourists, and the Duqm Rock Garden is no exception. Since its discovery, the Garden has become Al-Wusta’s most valued attraction for visitors, tourists, researchers and geologists. Though the Garden has been known for more than a decade and is classified as one of the most important sites of geological interest in the Sultanate, the site still requires more



focused attention from the government and the local community in terms of services and marketing. Crucially, the lack of services can adversely impact tourists' decisions to visit any tourist site, including the Garden. The Garden suffers from a lack of both essential tourist services and basic infrastructure, such as paved roads, parking, toilets, an information desk, and educational signage. The absence of these services is also attributed to a lack of site management associated with an absence of awareness and promotion.

In order to fulfil the local and tourist needs and overcome the site challenges, the Ministry of Heritage and Tourism (MOHT) and the local community must work together to develop and promote the site locally and internationally. The availability of tourist facilities, educational signage, and staff presence should both entice potential visitors and meet their demands. Also, the presence of site management is strongly required to further develop the Garden for its own protection for the present and future generations. Moreover, the Garden is a good investment opportunity for the private sector, where the investment would strengthen the number of tourist sites, thus providing employment jobs and experience to the locals in Wal the Wilayat of Duqm.

As part of its efforts in developing geological tourist sites in Oman the Ministry of Heritage

and Tourism has recently developed a strategy to turn Duqm's Rock Garden into a geological park (Geopark) as part of future investments in Al-Wusta Governorate. The Geopark can be utilized as an economic generator to provide funds for natural protection along with economic benefits for the local community. Strengthening the quality and distribution of local tourism products will likely position the Garden among the sites registered in the UNESCO World Heritage Site.

About Ali Akaak

Ali Akaak is an academic and professional in sustainable tourism. He has a doctorate's degree in Management Studies (Tourism Management) from the University of Exeter Business School in the United Kingdom. He has over 15+ years of experience in academic and administrative positions in universities. Currently, Ali is a lecturer of business administration at the University of Technology and Applied Sciences-Salalah. Previously, he worked as a lecturer and Assistant Director of Admissions and Registration at Dhofar University (DU). He has published and presented papers in conferences about strategic planning, destination management, tourism development, labour unions, social entrepreneurs.



Economic Development in Duqm

Amna Al Sinani

Duqm is a coastal district in the Al Wusta region, 550 kilometres from Muscat. Between the years 2010 to 2020 the population rose by 5.5% each year. Resulting in a population of 19,221 as of the end of 2020.



Its location, bordered from the east by the Indian Ocean and from the west by the desert oasis, along with Oman's stability and neutrality, make Duqm an internationally renowned hallmark in the maritime trade lines. Duqm has seen a major reform in the past decade, thanks to ambitious economic development goals and many megaprojects.

Economic development in its simplest definition is the creation of wealth from which its community benefits. This involves the allocation of limited resources—such as land, capital, and enterprises—to enhance business and trade activities, employment, local community welfare and fiscal solvency.

Oman's government has employed several tools to foster Duqm economic development, most notably, the 'Long-term Master Plan' of Duqm SEZ, which was thoughtfully planned with residents' needs in mind, to promote a wide spectrum of economic activities, while maintaining focus and benchmarking success.

The grand development strategy and the megaprojects plans in Duqm, showcase the strategic vision of His Majesty the Late Sultan Qaboos Bin Said, who issued the Royal Decree No.119/2011 to establish The Special Economic Zone Authori-

ty (SEZAD) to promote the economic development of Duqm.

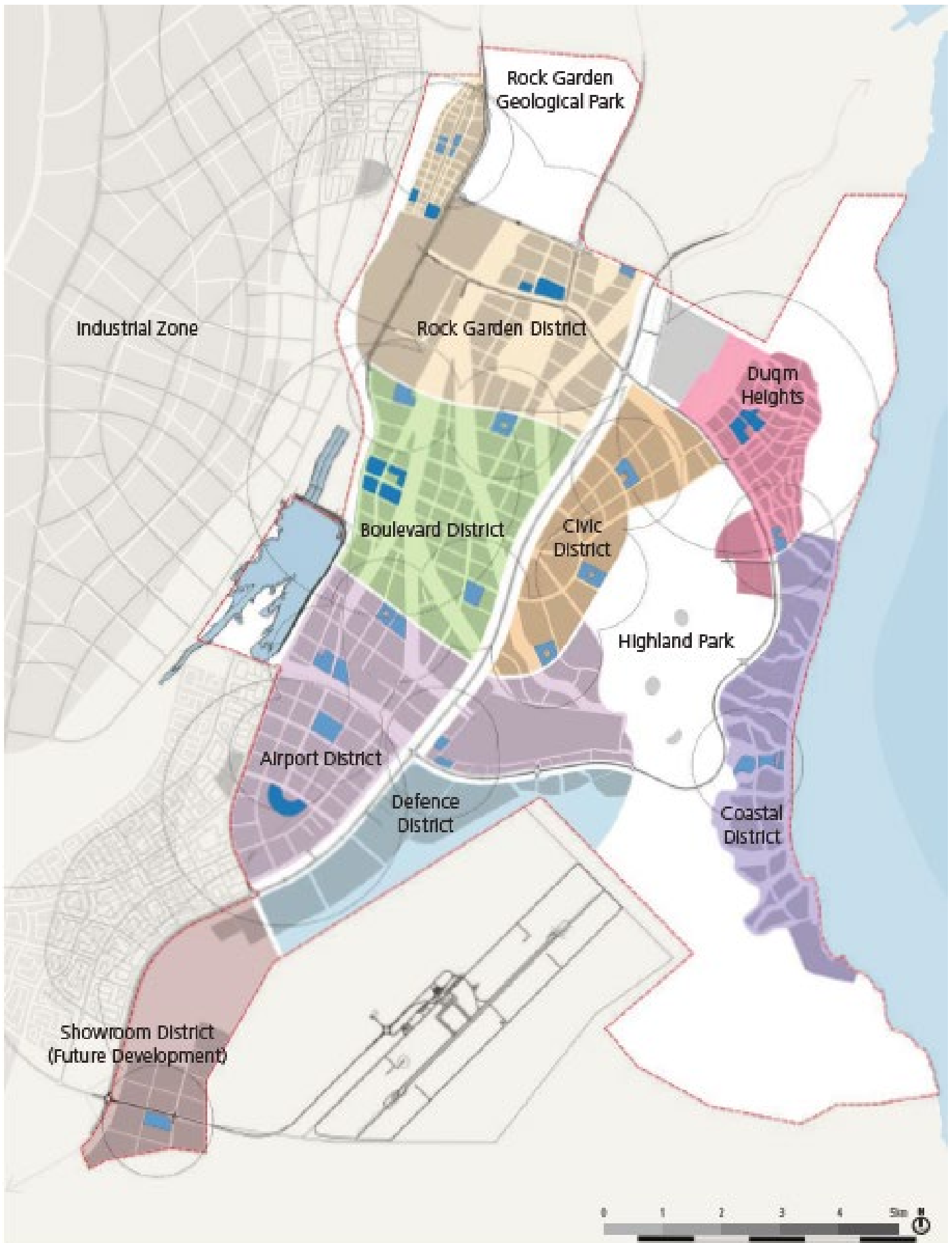
The authority is the governing body of the infrastructural development, investment, and all economic activities in Duqm. Through an online portal, SEZAD provides a one-stop station for investors to register their businesses, and obtain all the required permits, licenses, and visas. They can track their progress in permitting, increasing certainty and transparency, and ensuring legal compliance and faster turnaround on permit requests. The authority incentivizes investors with a package of tax exemption, 100% of project foreign ownership, and duty-free imports, amongst many others. By streamlining permitting processes, cities ensure that the economic development initiatives are not derailed by bureaucratic hurdles.

Another economic development tool that was successfully implemented in Duqm SEZ is the provision of adequate and public infrastructure that caters to the needs of residents and businesses.

Also, zoning and land assembly is an important tool for encouraging economic development, where a Special Economic Zone (SEZ) is an area within a country's national borders, in which

the business and trade laws are different from the rest of the country. The SEZ aims to increase trade balance, employment, investment, job creation and effective administration. Indeed, by zoning, the city increases the value of the land,

the city may then use that increased value as leverage to negotiate community improvements with developers interested in the land and its offerings.



The Duqm SEZ is the largest in the Middle East and North Africa, with a coastline stretching 70 kilometres along the Arabian Sea and an area of 2,000 square kilometres, zoned into eight sub-zones, each dedicated to a specific type of investment and activity; namely, an industrial and logistics zone, a dry-dock complex, a multi-purpose port, a fishery harbour, a residential zone, a regional airport, a governmental services zone, and a tourism zone.

This article features development initiatives in some of these zones.

Industrial and Logistics Zone

Duqm Industrial is 260 square kilometres divided into light, medium and heavy industrial zones with proximity to logistics facilities, such as stores, warehousing, and showrooms. The area is well-connected by a modern transportation system to accommodate all needs of the Duqm economic zone, including a two-way street with three lanes in each direction as well as ports and an airport.

The region is blessed with mineral resources; such as silica, limestone, marble, gypsum, and basaltic rocks. The Duqm Quarries Company provides a mining map to appeal to investors from Oman and beyond. This, with the minerals abundance and the SEZ incentives, are the right combination to contribute to the development of the Omani mining sector[3]. The proposed Mineral Railway line aims to transport minerals, oilfield equipment industrial goods, general products, including foodstuff and agricultural products, connecting Duqm to Dhofar, Muscat and GCC countries.

The industrial zone is designed according to environmental design standards with a clear direction towards deploying its promising wind and solar resources for its energy needs. For one, there is the Duqm 300 megawatt Wind Power Plant, expected to be realized in 2024, which envisages a world-scale capacity of 300 MW. There is also the green hydrogen plant in Duqm SEZ, which was announced as a joint project between OQ Alternative Energy and the Belgium Concessions DEME group, in cooperation with The Public Authority for Special Economic Zones and Free Zones (OPAZ).



A Regional Airport

Since its opening in 2019, Duqm Airport has been contributing towards boosting Al Wusta's economic, commercial and tourism activity. Duqm Airport accommodates nearly half a million travellers, with future expansion plans. Its total area of over 273,000 square meters, encompasses a passenger terminal, a 37-meter-high air control tower, an air cargo terminal, a 4-kilometre runway and a 4-aircraft parking area, including the Airbus A380[4].

A Multi-Purpose Port and a Dry-Dock Complex

The Port of Duqm serves as a multi-purpose deepwater port, it has a distinct advantage of the geographical location in the Arabian Sea and the Indian Ocean that interlinks Asia, Africa, and international ports. Its deep basins and spacious area make the port well-qualified to receive giant maritime vessels, thanks to its 19 meters deep channel. The land area of the port is 47.4 square kilometres, and its water area covers 140.5 square kilometres, making it one of the largest ports in the Middle East.

The port has two giant breakwater arms that extend for 4.1 kilometres and 4.6 kilometres, and it contains three berths:

- The commercial berth with 2 container terminals, a dry bulk terminal, and a multi-purpose terminal with huge annual capacities;
- The government berth provides readiness to manage the logistics operations of government entities and security services of the Port and Duqm SEZ as a whole;
- The oil berth; for export of refined liquid petroleum products.

The port contains a modern dry-dock complex for ship maintenance and repair yards for the world's largest vessels. Since its pilot launch in 2011, Oman Dry-dock Company has serviced more than 300 vessels. A dry dock is a large dock from which water can be pumped out; it is used for building ships or for repairing a ship below its waterline. The port also allows for wet-docking for the repair of 10 ships simultaneously.

A Fishery Harbour & Associated Facilities

Not far from the Port of Duqm, resides the modern Fisheries Industrial Complex of about 7.5 square kilometres and a fishing port of about 6.2 square kilometres water area. The port aims to optimize the traditional fishing industry and capitalize on the wealth of the resources in the Arabian Sea.

The Fisheries Zone provides:

An international standards quality assurance centre for fresh and processed fish exports;

- A marine research and studies institute with a training facility;
- Fish and shrimp farming;
- Commercial markets for retail, wholesale, and export.



Tourism Zone

Several tourist projects have been completed in the tourism area of 24 square kilometres, with its 18-kilometres-long shoreline overseeing the Arabian Sea.

Located at the eastern edge of the Duqm SEZ, the tourism area is certainly one of the high value-creation opportunities. A famous tourist attraction is the rock garden, which is 3 square kilometres with a variety of rocks and beautiful geological formations made by surface water more than 46 million years back. The natural beauty of the beaches at Ras Madraka, Ras Markaz, and a number of natural creeks attract a wide range of birds in migration. There are also many caves, dunes, wadis and springs, which attract tourists.

Duqm weather is sunny with moderate temperature all year round, pleasant winds sweep in from the Indian Ocean during summer. The tourism zone includes many hotels and resorts established to cater to the increasing number of tourists, among those, the international Crowne Plaza and Park Inn.

Duqm is a promising tourism destination. The Ministry of Tourism welcomes investors to provide the appropriate services to tourists, and establish tourism facilities to strengthen the local economy while preserving the natural purity, geological formations, and peculiar fishing villages.

With so many developments going on at many ends, the Duqm stands tall for its motto, the Area of Promising Investment Opportunities.

About Amna Al Sinani

Amna Al Sinani holds the position of EJAAD platform lead, at the Ministry of Higher Education, Research and Innovation. The platform links research projects between the industrial and academic sectors in the Sultanate and abroad. Amna has contributions in knowledge management and communication, and has published a book on Oman's energy and the disruptive technologies impact on the sector's jobs .

Amna worked at the Research Council as a system administrator, international relations and external communications specialist and an ICT research specialist, she was in charge of the conference support program.

Before joining TRC, she worked as a research assistant within the strategic project "Developing Training Networks Infrastructure" at the College of Engineering at Sultan Qaboos University, and she holds a master's degree in Network and Computer Engineering from Sultan Qaboos University.

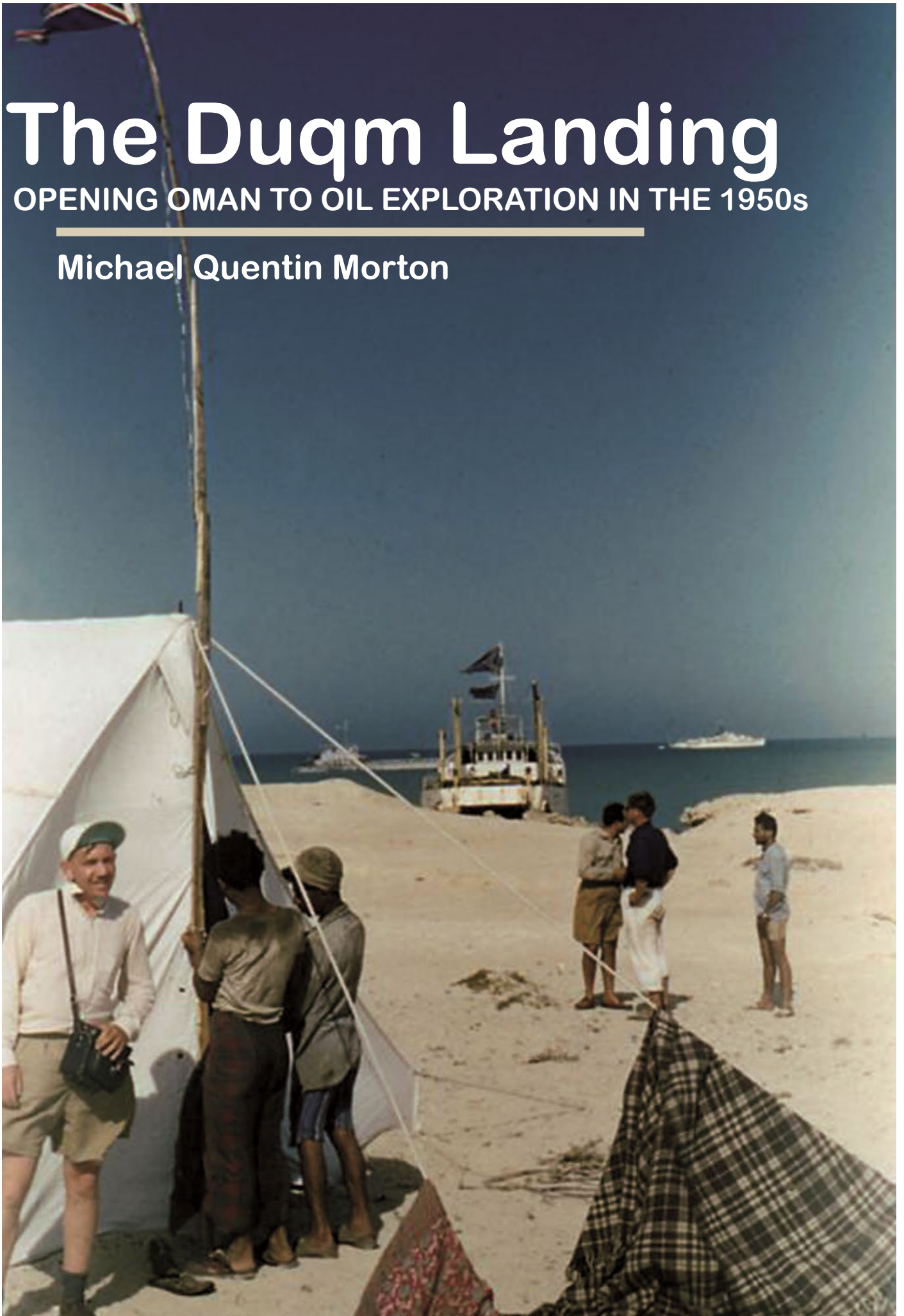
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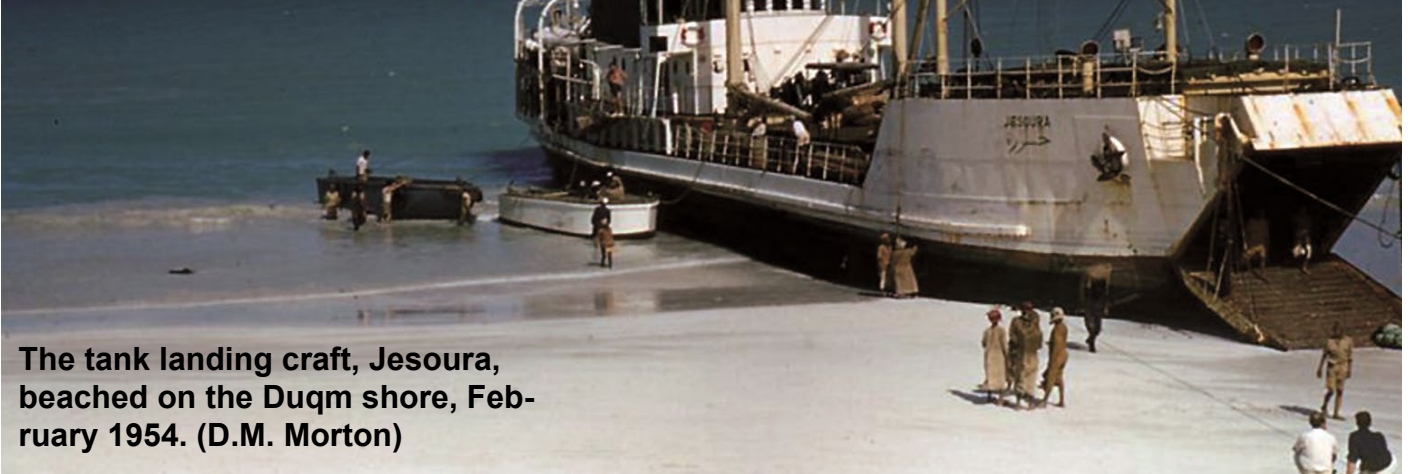
The Duqm Landing

OPENING OMAN TO OIL EXPLORATION IN THE 1950s

Michael Quentin Morton



In that part of the world, as indeed in any other, the appearance of three ex-World War II tank landing craft (TLCs) and a British frigate offshore was an exceptional event. But it was 15 February 1954 and the operation known as DEF was in full swing.



The tank landing craft, *Jesoura*, beached on the Duqm shore, February 1954. (D.M. Morton)

Today, no one is sure why DEF, an operation to find oil in central Oman is so named. Some say it was because the oil company's last notable project, the construction of an oil pipeline in Syria, was titled ABC, so it was logical that the next one should follow alphabetically; others say it was the acronym of Duqm Expeditionary Force, referring to the bay where the expedition was to be landed.

The latter explanation at least hints at the military flavour of the landing. Unusually for a geological survey party, the geologists were accompanied by 100 men of the Muscat and Oman Field Force (MOFF). It is interesting to note that this number was considered a bad omen due to an ancient Omani belief that a force of less 400 men invited ill fortune.

The force was funded by the Iraq Petroleum Company (IPC), the parent company of Petroleum Development (Oman) Ltd (PDO), a consortium of British, Dutch, French and American oil companies, with a five percent stake held by the oil magnate, Calouste Gulbenkian. It was a measure of IPC's determination to penetrate central Oman that it should have paid for the troops and equipped the force with the latest mod-cons, such as the fleet of Land Rovers and trucks now lined the shore. Quite what effect they might have

effect they might have on the local tribes was anyone's guess. As the geologists reflected, they were entering a world where tyre marks had never been seen before.

Exploring the Hinterland

My father, geologist D.M. ('Mike') Morton, took part in the original landing, being the leader of the geological field party. He had travelled up from Aden on the third TLC, *Jawada*, which rendezvoused with the others just before the landing. The real object of the expedition was *Jebel Fahud*, a promising anticline some 300 kilometres to the northwest, but accessing the *jebel* would be easier said than done. Because of the political situation, the geologists' activities were initially restricted to below the latitude 20 degrees North, which effectively prevented them from reaching *Fahud*. For the remainder of that season, the geologists had to console themselves with exploring the surrounding area. There was the *Jiddat al-Harassis*, a vast waterless plain that stretched out before them, and the *Hugf*, 'a lunar-like landscape devoid of human life', as one of my father's colleagues described it.



Tribesmen gather on the Duqm shore to greet the Sultan of Oman, Said bin Taimur, in March 1954. (D.M. Morton)

And so the geologists kept themselves busy. There were no problems with security, and relations with the local Janubah tribesmen were cordial. Mike carried a box of Maria Theresa dollars around with him, kept safely in the toolbox of his Land Rover. One problem was establishing a reliable water supply for the tented camp. Although drinking water could be drawn from sea distillation units, the monsoon broke the sea-line and supplies had to be found elsewhere. Water wells were sunk in the vicinity and these would be later handed over to the local tribes, providing them with a valuable source of water to be used for drinking and agriculture. Another problem was finding a suitable place for an airfield. A short landing strip was established along a patch of sabkha a few hundred metres from the camp. This was adequate for small De Havilland Doves, except when the ground water level rose with the tides. On one occasion, one of the aircraft had sunk into the mud and needed full power to get airborne. As a result, landings were restricted to low tide until a new site could be found.

Marooned Pilgrims

Among the uninvited guests at the Duqm camp were shipwrecked mariners and pilgrims heading for Mecca. Among them were men, women and children who had been abandoned by un-

scrupulous captains and told to find their way by foot – bearing in mind that Mecca was almost a thousand miles away across some of the most inhospitable terrain on Earth, this was tantamount to a death sentence. Indeed, they lived in nearby caves and, without the supplies cadged from the company camp, they most certainly would have died. While the oil men were happy to accommodate them for a while, there came a time when their rising numbers put too much pressure on their resources. They arranged for trucks to take them all – about 50 to 60 souls – to a watering hole up the coast, from where they could make their way to safety. However, things did not go to plan and they were robbed of their food as soon as they arrived. They traipsed back to Duqm camp and stayed there until the end of the monsoon season, when they departed in dhows.

The Alphabeticals

The Dhofar concession in the south was operated by a rival oil company, Dhofar-Cites Services, but the boundary was ill-defined and the geologists, being curious folk, made a beeline for it, heading south for a set of geologically interesting features known as the 'Alphabeticals' which straddled the two areas. It was hard work mapping them in the blistering heat – the geologists worked early and late in the day, spending the

hottest part in what little shade they could find on the desert plain, most following Mike's example of finding a space beneath a parked truck and passing their time by reading a book – in Mike's case it was Tolstoy's *War and Peace*. 'We were all slightly unbalanced,' wrote Don Sheridan, one of the geologists in the party.

The Move on Fahud

The Sultan lifted the ban on travelling north in October, and the expedition set off for Jebel Fahud. The subsequent story of the Fahud well is perhaps better known than the Duqm landing, nevertheless the latter is important for several reasons; it was from Duqm that the Sultan's men

set off to liberate the Duru villages and sparked an armed conflict that ended five years later with the British Special Air Services (SAS) defeating the Imam, thus laying the foundations of the modern state of Oman; it was from here that oil exploration in central Oman began, providing the launch pad for the subsequent wildcat well at Jebel Fahud. But the geologists' hopes of finding oil were dashed after the well was abandoned at a depth of 14,000 feet with no significant shows. It was only later – after Shell had taken over the concession – that oil was struck at Fahud less than 100 metres from IPC's dry well. It has been described as the 'unluckiest' in the history of Middle Eastern oil.



The expedition to Jebel Fahud, October 1954.

Duqm Lives On

Duqm remained an important supply depot base until 1960 when the interior of Oman was safer and a more modern facility could be opened at Azaiba near Muscat. Today, it is an industrial city and major port at the forefront of Oman's drive to develop and diversify its economy. In 2006, I was fortunate enough to visit the area with geologist Alan Heward and his wife before

construction of the dry dock began, and we saw the bay in an almost pristine state. Sure enough, there were fishermen with 4x4's and trailers drawn up along the shore, but it was essentially unchanged from the days when my father first landed there. And, as if to remind us that life at Duqm was not always a tale of hardship and woe, we found nearby a rubbish dump of discard glass bottles and IPC blue-rimmed china, and inland the old Fahud derrick, standing alone and

strangely defiant in its desert fastness. In future time, these artefacts will – like the rock carvings and stone-age tools of old – tell the story of oil exploration in Oman.

About Michael Quentin Morton

Michael Quentin Morton grew up in Qatar, Bahrain and Abu Dhabi in the 1950s and 1960s. After qualifying as a barrister, Quentin spent over 30 years in a legal career before becoming a full-time author.

Since 'In the Heart of the Desert' was first published in 2006, he has written eight books about various aspects of Middle East history: Black Gold and Frankincense, Buraimi, The Third River, Keepers of the Golden Shore, The Petroleum Gulf (all which have been translated into Arabic), Empires and Anarchies and his latest book, Masters of the Pearl, which was published in August 2020.

Duqm Bay in 2006.



This is an abridged version of an article originally published in the American Association of Petroleum Geologists Explorer magazine in May 2020.