

Geomorphological Features, Sediment Distribution and Transport Along Ash Shuqayq-Al Huraydah Coastal Area, Southern Red Sea, Saudi Arabia

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Abstract. The coastal area under investigation stretching from Al Huraydah in the northwest to Itwad in the southwest. It lies about 600 km south of Jeddah on the southern Red Sea coast. It extends inland more than 40 km and is bordered by the shield escarpment. The geomorphologic features, shoreline configuration, sediment characteristics and dynamics has been established for understanding the processes that influence the coastal environments. The shoreline of the studied area is not linear and smooth, instead it is complexed by arcuate beaches, sharms, inlets, lagoons, barriers and rocky hills. The width of the coastal plain varies widely, it is wide and featureless towards south of Ash Shuqayq while being narrow and bounded by resistant sea cliffs towards the north.

Ash Shuqayq coastal landforms include; marsh system, inlet and swamps, wave swash, dunes, shoreline processes, beach bars, spit system, wadi systems and sabkha systems. Conditions on such beaches change rapidly.

In conclusion, the coastal area of Ash Shuqayq can be divided into two principal geomorphic zones: (i) The northern zone stretching from Al Huraydah is characterized by rocky highlands, very rugged with high sea cliffs and small pocket beaches that disrupt wave induced longshore sand transport. (ii) The middle and southern zone stretching from Ash Shuqayq to Itwad southward, is generally broad low relief depositional coastal plain. The shore zone profile is featureless-wide beaches backed by extensive and longitudinal foredunes fixed by coastal vegetation. Sediment cover is thick with numerous wadis drained in the area and contributed the vast majority of the total input of sediments to the coastal zone.

Introduction

In general, little attention has been paid towards the geomorphology of the coastal stretch in the eastern Red Sea coastal plain, among the researchers interested in mapping of the coastal area of the Red Sea were Brown and Jackson (1960). The coastal plain towards the southern Red Sea coast has more than 40 km wide shelf, and extremely vast coastal plain, and even wider further south to the Yemen. North of Ash Shuqayq, the coastal plain is interrupted, where the basement occurs, represented by a large area of plateau basalt and Pleistocene alluvial terraces.

Limited information is available from the published papers dealing with the geomorphologic features and sedimentologic aspects of coastal area of the Red Sea (Jado & Zotl, 1984; Tag, 1986; Tag *et al.*, 1990; Abou Ouf & El Shater, 1992; Gheith & Abou Ouf, 1996; Basyoni, 1997 and Gheith, 1999). Brown (1970) and Brown *et al.*, (1962) have dealt with the geomorphology and geology of the shield area of western Saudi Arabia, geology of the Arabian Peninsula and coastal structures in Saudi Arabia. While Coleman (1993) reported on the geologic evolution of the Red Sea. He described the shelf segments of the Red Sea as shallow and flat. South of 21°N, the shelf merges imperceptibly with the coastal plain, however, north of this latitude the shelf becomes narrower and is interrupted by rather sharp topographic breaks. Onshore, the coastal plain broadens south of 21°N, reaching a width greater than 50 km, and in restricted areas may be covered by recent lava flows. North of this latitude, the coastal plain is narrower and contains raised terraces that represent older shoreline. These features indicate emergence (or uplift) in the north, and submergence combined with rapid deposition in the south.

Red Sea relief is related to tectonic movement resulting from the opening of the Red Sea. The climate is arid and the erosional processes play a dominant role in the development of the present landscape (Coleman, 1993). The marginal shelf of the Red Sea is composed of coral banks and reef limestone that is covered by a veneer of carbonate sand. The morphology of the Red Sea shelf in the western coast of Saudi Arabia has been controlled mainly by the effect of coral growth. Separating the shelf from the coastal plain along most of the coastline is a 3 m raised littoral surface of reef limestone. This littoral depositional surface between Yemen in the south and the vicinity of Al Wajh in the north is almost continuous band of emergent reef terraces between 0.5 km and 10 km wide. In land from the coast, the plain rises into an eastern plain consisting largely of a pediment with alluvium and outwash sands and gravels on Tertiary or crystalline rocks and hence to the basement hills. In the south, there is no relief to the flat coastal plain other than the Jizan salt dome, which rises 50 m above sea level and the volcanic lava flow between Hali and Ash Shuqayq.

So the study of local geology helps the authors to understand how coastal geomorphology, lithology and tectonics influence the distribution and transport of littoral sediment in the nearshore along low topography shoreline.

Area of Study

Ash Shuqayq-Al Huraydah coast is situated about 600 km south of Jeddah. It is about 40 km wide bordered by flat narrow beach 10 m wide followed by sand dune ridges, swamps, tidal flats and sabkhas. In general, the coast of Ash Shuqayq is flanked to the east by high hills and mountains with peaks more than 2000 m high. The bed rock consists of mainly metamorphic and igneous rock types in addition to many basaltic volcanic rocks. The area covered during this field work was approximately 80 km², stretching from Al Huraydah in the northwest to Itwad in the southeast (Fig. 1).

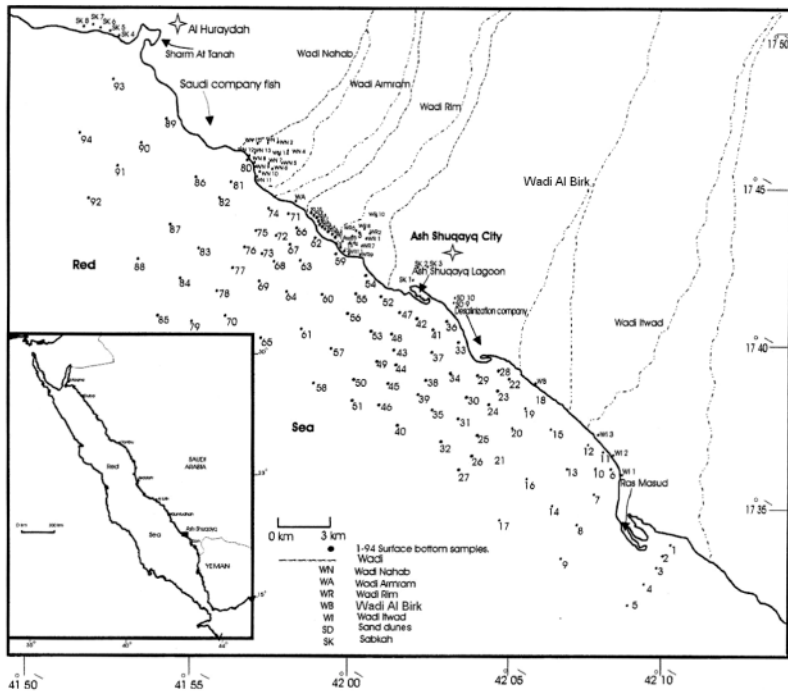


Fig. 1. Location map of Ash Shuqayq coastal area and samples collected.

Objectives

The objective of the paper is to describe the geomorphic coastal features and to delineate sediment transportation and its distribution along the Ash Shuqayq-Al Huraydah coastal area in the southern Red Sea.

Sample Collection and Methods of Study

A reconnaissance survey of the Ash Shuqayq coastal area was carried out to collect and describe different geomorphic environments characteristic of the coastal zone. These include; nearshore, shoreline, beach, beach bars, sand dunes, tidal inlets and flats, sabkhas, lagoons and wadis. From these environments samples were collected and landforms were classified and described and photographed. Influence of geology and coastal morphology on sediment distribution and transport are interpreted. Sediment samples from various geomorphic environments between Al-Huraydah (north of Ash Shuqayq) and Itwad (south of Ash Shuqayq) have been collected. A summary of this collection is given in Table (1). Samples collected were texturally analyzed and classified. Sand fraction has been mechanically analyzed by sieving technique adopted by Folk (1962). Graphic grain size parameters were computed by following Folk & Ward (1957).

Table 1. Samples collected from different geomorphic environments of the Ash Shuqayq coastal area.

Environment	Station numbers	Collected samples
1 – Nearshore	1 - 94	94
2 – Beach	B1 - B10	10
3 – Sabkha	SK1 - SK6	6
4 – Wadis		12
i – Wadi Itwad	WI1 - WI3	
ii – Wadi Al Birk	WB	
iii – Wadi Rim	WR1 - WR2	
iv – Wadi Aramram	WA1 - WA3	
v – Wadi Nahab	WN1 - WN3	
5 – Lagoons		
i – Ash Shuqayq	L1 - L5	
ii – Masud	ML1 - ML3	
iii – Sharm At tanah	Shi1 - Sh5	
6 – Sand Dunes	D1 - D10	10
7 – Sand spit	SP1 - SP3	3

Results and Discussion

General Description of Ash Shuqayq-Al Huraydah Coastal Area

Ash Shuqayq coast is about 40 km wide and bordered by complex sand dunes, swamps, tidal flat and sabkhas on the north eastern side. The shoreline north and south of Ash Shuqayq is not linear and smooth, but instead comprises arcuate beaches, sharms, inlets, rocky hills, barrier, spits and lagoons. Moreover, Ash Shuqayq coastal plain is also cut across by many wadis, lagoonal outlets, tidal inlets and tidal channels, which act as protected areas, where mainly

coarse-grained material is deposited. North of Ash Shuqayq near Al Huraydah region lies Sharm At Tanah and Jabal Al Raqabah while south of Ash Shuqayq lies Ras Suwad and Ras Masud.

Ash Shuqayq coast can be describe as a broad, low relief depositional coastal plain, while Al Huraydah coast (north of Ash Shuqayq) is an emergent shore-line with rocky headlands giving rise to pocket beaches and disrupts wave-induced longshore sand transport or littoral drift in the surf zone. Along the low-lying Ash Shuqayq coast sediment cover is generally thick, the distribution of the littoral sediments on the shoreface provides important information regarding not only the sources of the sediments but also the modes and pathways of transport. However, some parts of the beach consist of low-lying hard coral reef platform, have a very thin to non-existent sediment cover.

In general, the geomorphology of Ash Shuqayq-Al Huraydah coastal area has complex landforms, these include sand dune processes, marsh and inlet systems, sabkha systems, carbonate systems, wadi systems, sea cliffs and wave swash processes. Conditions on such beaches change rapidly. Coastal marshes and inlets as well as sand dunes are common components of Ash Shuqayq coast. The location of the studied landforms characteristic for the studied coastal area is represented in a geomorphologic map shown in Fig. (2).

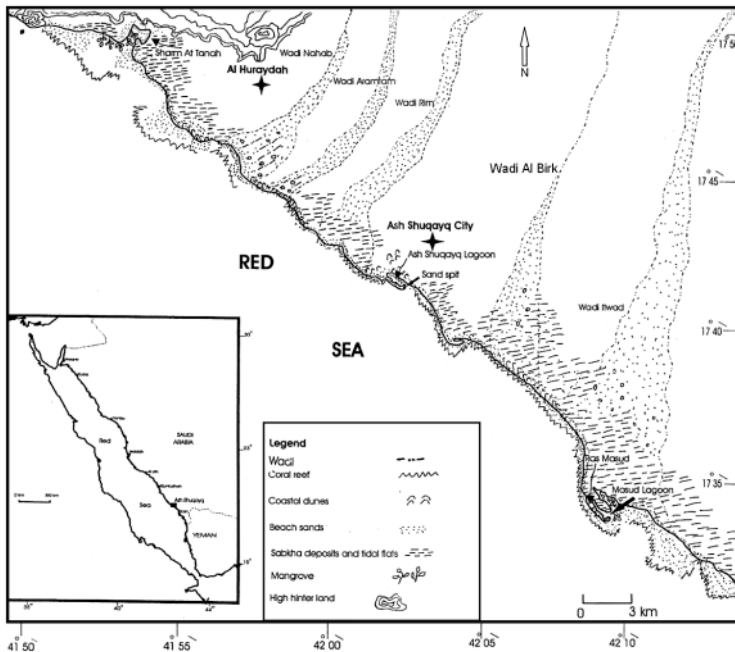


Fig. 2. Constructed schematic map showing the different geomorphic environments along Ash Shuqayq area.

Generally, the beach sediments in most part of the Ash Shuqayq coast are backed by eolian sands arranged in the form of complex sand dunes or in the form of longitudinal bar or ridge parallel to the shore and constitute the youngest recent material in the study area. It is well known that the energy input by waves, currents and tides is linked to the landforms of the coast by coastal sediments. The shape of the various coastal landforms is a response to the energy inputs (Pethick, 1984). Coastal landforms reflect the materials from which they are made. On the other hand, the rate of the sea level change has an important effect on the stability and survival of many coastal forms. Two other strong factors control these coastal changes; sediment availability and the intensity of wave processes (Carter, 1991).

Inland, the coastal plain of Ash Shuqayq is characterized by vast areas of low-lying table lands which are thought to be remnant of flood plain deposits of clayey silt composition.

The width of the coastal plain varies widely, it looks wide toward south of Ash Shuqayq (Fig. 3A) and narrow towards north of Al Huraydah and is bounded by resistant headlands as sea cliffs (Fig. 3B).

It was observed that many wadis were drowned in the coastal area and contributed the vast majority of the total input of sediments to the coastal zone probably during the Late Quaternary period at the time of lowered sea level. Many of the paleo-drainage of these wadis stopped to carry significant discharge or sediments due to the heavy road and building construction in the area. Thus the majority of the drainages observed have since been infilled, thus retarding local erosion and decreasing the supply of sediments to the beaches.

Coastal Landforms Characteristics of Ash Shuqayq-Al Huraydah Area

1) The Beach

Beaches are accumulation of sediment deposited by waves and currents in the shore zone and extend from the upper most limit of wave action to the low-tide mark. They are typically composed of sand and/or pebbles. In general, sandy beaches are formed from the material partly eroded from adjacent parts of the coast, partly by fluvial sediment and partly by sand carried shoreward from the sea floor (Bird, 1984). The topographic configuration of Ash Shuqayq beach includes the following units; backshore, foreshore and sand dunes. North of Ash Shuqayq, pocket beaches are noticed. South of Ash Shuqayq the beach is much wider and longer and is distinguished by lower gradient shore-face and low-lying marine reef platform.

Sediment on the beach is coarser than the intertidal sediments as fine sediments are dispersed seaward due to wave action in that area. There is a wide

range in sediment texture exhibited by the Ash Shuqayq beach, which reflects varying energy conditions in the study area. Further, variability in the sources of the sediments and the reworking processes operative in the littoral zone have also been observed in grain size.

The coarse-gravelly sand bed material (Fig. 3C) results as runoff down the wadis, during flash floods (Al Sayari and Zotl, 1978). These flash floods are highly localized and of variable intensity. The terrigenous sediments from the wadis are mixed with *in situ* available skeletal carbonate material in varying proportion in the beach and littoral zone, such mixing and subsequent reworking by the near-shore processes gave rise to the variation in texture. Generally, along the whole beach zone foredune ridge sands are arranged in the form of complex sand dunes parallel to the shore and constitute the youngest recent material in the study area.

2) Beach Ridge

A beach ridge is a continuous linear mound of coarser sediment near high water line (Reineck & Singh, 1975). In front of a beach ridge a sandy beach is always present. Ash Shuqayq beach ridges are made up of sand and gravel. They developed mainly during rainy storms and deposited at the mouths of the wadis then redeposited by wave processes. It is mainly horizontally laminated sand and gravel layers (Fig. 3D).

3) The Shorelines

In general, the shoreline of Ash Shuqayq area can be divided into three principal geomorphic zones namely: (i) The northern zone stretching from Al-Huraydah area is characterized by rocky headlands (Fig. 4A); is very rugged with high sea cliff formed of basaltic rocks and alluvial terraces with small pocket beaches. (ii) The middle zone is generally wide containing sandy to coarse-grained beaches backed by dunes. The coarse-grained laminated beach sediments may be considered as recent most features that formed by modern periodic fillings. Numerous wadis are responsible in contributing the vast majority of the total input of sediments to the coastal zone. Hence Ash Shuqayq has the thick sediment covered shoreline. (iii) The southern zone of the shoreline which starts just south of Ash Shuqayq and includes wide sandy beach interrupted in some parts by coralline platform as low-lying terraces (Fig. 4B).

4) Sand Dunes

Ash Shuqayq coast is distinguished by extensive and various coastal sand dunes. In general, the occurrence of dunes on the coast is directly related to sand supply and a favorable wind regime (Davis, 1985).



Fig. 3(A). Wide low-lying coast, south of Ash Shuqayq.



Fig. 3(B). Narrow, short and rugged rocky beach with pocket boulders-sandy beach north Al Huraydah coast.



Fig. 3(C). Coarse-grained sandy beach north of Ash Shuqayq coast.



Fig. 3(D). Beach bar or ridge consists of conglomeratic sandy layers.



Fig. 4(A). Rocky coastal hills shoreline north of Al Huraydah.



Fig. 4(B). Transgressive shoreline formed of coarse grained biogenous materials disrupted by coral reef platform.



Fig. 4(C&D). Low-lying foredunes set along the beach and fixed by abundant coastal vegetation.

The foredunes set along the beach are continuous and fixed by abundant coastal vegetation (Fig. 4C&D) with low-lying relief, whereas others show evidence of movement with high topographic relief and include seif and barchan dunes.

In general, it was observed that along most coastline of Ash Shuqayq, active dune systems are common, where the foredune marks a boundary between hydrodynamics and aeolian environments. Initiation and evolution of these dunes and their interactions with the processes include vegetation influences that act upon them.

5) Tidal Inlets

Tidal inlets along the Ash Shuqayq coast cut across through weak beach zones and points of the mouths of the ancient wadis and they are maintained by tidal currents. During high tide, salt marshes are common in the Ash Shuqayq plain as a short term process at the scale of tidal cycles. In general, the inlets join the lagoons of Ash Shuqayq to the Red Sea and are merely a gap in a weak section of the low-lying shore known as tidal inlets (Fig. 5A).

6) Tidal Sediments

They are formed in coastal backwaters where they form a sort of dumping ground for the detritus collected on open coast and transported into these sheltered bays (Fig. 5B). These backwaters may be loaded with mud and constitute only ephemeral coastal landforms.

7) Salt Marshes and Sabkhas

Ash Shuqayq coastal plain is characterized by many vegetated mud flats, sabkha deposits and salt beds (Fig. 5C&D). The coastal sabkhas are characterized by the presence of evaporite minerals which have accumulated on the top to form a hard crust, followed by a soft or loose soil zone. In general, the sabkha surface is very flat with no physical obstacles. These sabkhas extend for approximately more than 1 km from the waterline. In general, Ash Shuqayq coastal sabkhas are mainly siliciclastic in origin due to the dominance of quartz and feldspar over carbonate (Nabhan, 2004).

8) The Wadis

Ash Shuqayq coastal plain is traversed by many ancient wadis named as Itwad, Al Bark, Rim, Nahab and Aramram (Fig. 6A&B) from south to north. They extend several kilometers inland ranging from 29 to 52 km in length.



Fig. 5(A). Tidal inlet connects Ash Shuqayq lagoon with the Red Sea.



Fig. 5(B). Submerged wadi Rim during high tide and deposition of collected fine detritus in sheltered bays.



Fig. 5(C&D). Deposition of mud flats and sabkha deposits in a wide low-lying coastline south of Ash Shuqayq.



Fig. 6(A&B). Submerged wadi Nahab and wadi Aramram during high tide. Concentration of heavy minerals (placer deposits) is due to sorting processes (tidal backwash).

These drowned valleys were formed during lowered sea level events of the Late Quaternary time. The wadis are ephemeral and active sediments supply channels only during flash floods (Al-Sayari and Zotl, 1978). These seem to be localized and of variable intensity which can transport even gravel sized sediments noticed in the beach zone.

9) The Reef Limestone Platform

Some parts of Ash Shuqayq area exhibit low lying reefal limestone platform (Fig. 6C) which extend from the nearshore zone toward the beach, and sometimes are covered by alluvial deposits of sand and mud materials. These reef limestones were formed in the Late Pleistocene and are associated with the last period of higher sea level in the western coast of Saudi Arabia (Skipwith, 1973 and Behairy1983).

10) The Nearshore Shelf Zone

The nearshore shelf zone of the Red Sea coast is considered an active carbonate depositional region with wide spread fringing coral reefs, Ash Shuqayq nearshore zone represent a dynamic basin which receives detrital constituents.

The shallow nearshore zone surface gently slopes seaward up-to the edge of reefal flat. It is covered by thin fine to coarse grained sediments. These terrigenous materials are composed mainly of sandy mud to gravelly sand mud with little fragments of coral, coralline algae and mollusks. Eolian activity may have contributions of some fine sediments to the shelf from the adjacent landmass.

11) Rocky Cliff and Pocket Beaches

This type of beach is common in north Ash Shuqayq, at Al Huraydah. It consists of nearly 60 m high hills of basaltic rocks on the shoreline (Fig. 6D). In between, pocket beaches are also noticed. These rocky hills indicate volcanic eruption which built up a thick succession of lava associated with the tectonics of the Red Sea region.

12) Lagoons

Ash Shuqayq lagoons are considered as shallow depressions which remain water filled even at low tide. Few of the lagoons developed at the mouth of the ancient wadis, while others in the tidal regions which gradually develop into tidal flats. Small part of the coastline is changed to a barrier coastline which opens into Red Sea by inlet. However, the size and number of inlets of a lagoon depends upon the quantity of water, which flows through it during a given time



Fig. 6(C). Low lying reefal limestone platform in the nearshore zone south of Ash Shuqayq.



Fig. 6(D). Ash Shuqayq lagoon separated from the Red Sea by sand barrier.

(Reineck & Singh, 1975). The amount of water is controlled by tidal range, number of tides per day.

Some of the coastal lagoons of Ash Shuqayq are hypersaline, as no fresh water comes into the lagoons except mouths of the wadis, which are flooded during rainy storm by fresh water drained into the lagoon, causing decrease in salinity. Most of the lagoons with normal salinity show faunal similarity with those of the open sea (Abou Ouf, 1996), however, with change in salinity, fauna get impoverished. Mangrove vegetation are present due to the tropical climate, along with algal mats. During dessication, mud cracks are usually developed.

Sediment Characteristics of Coastal Landforms

Analyses of sediment samples from coastal landforms are important for any geomorphologic work in the study area. Along low-lying Ash Shuqayq coast, beaches received considerable sediments influx through many ancient wadis (Aramram, Nahab, Rim, Al Beark and Itwad) as indicated by the dominant terrigenous materials. Texture variation and transportation of the sediment is discussed in the following:

1 – The Nearshore Sediments

The nearshore sediments of Ash Shuqayq can texturally be classified as dominantly muddy sand, along with gravelly muddy sand at few places. Carbonate content varies between 2 and 93% with an average of 21%. Carbonate concentration appears to be very low near the shore, especially in front of wadi mouths, due to dilution by the terrigenous material. In the extreme north gravel content shows an increase.

The nearshore sediment sources appear to be a combination of material eroded from the basaltic cliffs and alluvial terraces by wave action, relict sediment originally from the ancient wadis in the area and transported onshore by north-westerly waves or wind during sea level low stands. Littoral source for this sediment is supported by its calcareous composition character and similarly to coral reef sediments. Under high energy or storm conditions, part of the beach sediments typically is eroded and carried to offshore.

2 – The Beach Sediments

Beach or shore landforms include well developed foreshore and backshore. Beach bar or ridge is common and consists of coarse-grained gravelly sands. This bar occurs between mouths of wadi Aramram and wadi Nahab as remnant or more recent shore feature that formed by modern filling.

Beach sediments are mainly composed of sand fraction, however, gravel size fragments of well rounded and flatty shape are seen every where besides the mouths and wadi channels. Reworking of ancient wadi deposits by marine processes is probably a more important contributor to the gravel coarse fraction in the beach zone. Graphic grains-size parameters determined by Nabhan (2004) indicate that the beach zone is composed mainly of medium to fine-grained sand especially in the intertidal zone and sometimes gravel, with moderately sorted to moderately well sorted sediments in the backshore zone.

The processes of coastal sediment transport are evaluated where by the energy input by waves, currents and tides are linked to the landforms of the coast by coastal sediments. The shape of the various coastal landforms reflects the material from which they are generated either detrital grains (clastic sediments) or calcium carbonate grains (chemical and/or biogenic). In addition the wide range in sediment texture along the beach stretch of Ash Shuqayq reveals varying energy conditions in the different environments. Further variability is recorded in the sources of the sediments due to the different composition.

3 – Sand Dune Sediments

Sand dunes are identified as high coastal seif and barchan dunes which move landward side. Extensive low dunes field, scanty vegetated and parallel to the shoreline as a foredune ridge is the characteristic feature of the beach zone. Aeolian material transported as a drag from local sources and as a suspended load from regional sources is another important source. Graphic grain size parameters determined by Nabhan (2004) proved that M_z varies between medium-grained and fine-grained. While sorting values fit into moderately well sorted to well sorted. It is concluded that sorting is related to dune morphology; where the dune ridge has better sorted coarse-grained sand than the inland barchan and seif dunes indicating sediment derivation from the beach zone.

4 – Wadi Sediments

Ash Shuqayq coastal area is cut across by five wadis, namely from south to north; Itwad, Al Bark, Rim, Aramram and Nahab. These wadis affect the deposition in the shelf marine environment, since they provide the area by huge amounts of detritus material derived from the adjacent high fringing Tertiary mountains. These wadis get occasionally flash floods at a time when the rainfall is extensive in the region.

The texture analyses of selected samples from these wadis show that they are mainly composed of muddy sand, sand and sandy mud. Gravels constitute low amount however, one can see many boulders, cobbles and pebbles everywhere

at the mouths and in the channels especially at wadi Nahab probably due to proximity of rocky hills on the path way of the wadi.

5 – Lagoon Sediments

Ash Shuqayq, At Tanah and Masud lagoons were formed due to the presence of gap in weaker sections of the shore through tidal inlet. Their sediments analyses exhibit various textural range; muddy sand, muddy gravelly sand, gravelly sand and sand. At Tanah have relatively finer sediments (sandy mud and sand).

Conclusion

The study area of Ash Shuqayq can be divided into the following units; fore-shore, backshore, swamps, tidal inlets, tidal flats and sand dunes. Sea cliffs, coral reef platform, ancient wadis are the major factors controlling the development and changes in the area. Sometimes, the beach appears as ridge. This make shoreline marked as sand bar which was formed by the flooding of wadis through rainy seasons. Patches of gravels are present near mouths of wadi Nahab and wadi Aramram. Along the low lying Ash Shuqayq coast, sediment cover is generally thick and the distribution of littoral sediments on the shore-face provides important information regarding not only the sources of the sediments but also the modes and pathways of transport.

Ash shuqayq coastal area can geomorphologically subdivided into northern and southern geomorphic provinces:

1 – The northern province (includes Al Huraydah area): Study area tends to be narrow short and poorly developed beaches, rocky cliffs of volcanic basalt with pocket beaches. Erosion and abrasion of these rocks fill material and rocks by waves and currents are believed to represent the most important source on the intertidal sediments, especially the coarse fraction.

2 – The southern province (include the middle and south of Ash Shuqayq area): Beaches are much wider and longer with low-lying topography and cut across by many wadis. The wadi sediments are generally muddy to gravelly sand. Most wadis contribute much terrigenous sediments to the coastal zone as evident from the long stretches of sand, that overlies the fringing reefs. The terrigenous sediments from the wadis, mixed with locally produced carbonate in the littoral zone are subsequently affected by reworking, due to the near-shore processes. The fine grained sediments were dispersed seaward by wave energy.

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الظواهر الجيومورفولوجية وتوزيع وحركة الرواسب على طول المنطقة الساحلية للشقيق والحريضة بجنوب البحر الأحمر - المملكة العربية السعودية

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المستخلص. تقع منطقة الدراسة الساحلية بين الحريضة والشقيق على بعد ٦٠٠ كم من جدة على الساحل الجنوبي للبحر الأحمر. اتساع المنطقة يصل إلى حوالي ٤٠ كم وطول قدرة ٣٥ كم ، يحفها من ناحية اليابس سلسلة جبال البحر الأحمر.

لقد تم استنباط كل المعلومات الخاصة بالظواهر الجيومورفولوجية ، وشكل خط الشاطئ وحركة ومميزات الرواسب ، لفهم العمليات المؤثرة على البيئة الساحلية. ولقد لوحظ أن خط الشاطئ غير مستقيم ولا ناعم ، بل معقد بواسطة شواطئ منحنية. هذا ويختلف عرض السهل الساحلي اختلافاً واضحاً ، فهو يبدو متسعاً ومستويًا ناحية جنوب الشقيق ، بينما يضيق ويحاط بالجروف البحرية في الشمال.

وتشمل الأشكال الأرضية الساحلية كلاً من: نظم المستنقعات ، والمداخل والإحوانات ، وغسيل الأمواج ، والكثبان الرملية ، وعمليات خط الشاطئ ، والحواجز والألسنة والأودية والسبخات ، وهذا وتتغير الظروف سريعاً في تلك الشواطئ.

ولقد تم تقسيم المنطقة الساحلية للشقيق إلى منطقتين جيومورفولوجيتين أساسيتين:

١- المنطقة الشمالية للشقيق ، وهي تمتد من الحريضة ، وتمتاز بالرؤوس الأرضية المرتفعة الوعرة ، التي تشمل الجروف البحرية ، والجيوب

الشاطئية الصغيرة ، مما يؤدي إلى إعاقة نقل الرواسب على طول الشاطيء .

٢- المنطقة الوسطى والجنوبية للشقيق ، وهي تمتد من الشقيق حتى عتود جنوباً ، حيث يتسع ويعرض الشاطيء ، فيبدو عديم الظواهر ، كما يتميز بوجود تراكمات من الكثبان الرملية المتصلة ، والمثبتة بالنباتات على طول الشاطيء . الغطاء الرسوبي بوجه عام سميك نتيجة لوجود الأودية التي ذودت المنطقة الشاطئية بكميات هائلة من الفتاتيات .