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مصلحة المساحة الجيولوجية الأمريكية
DEPARTMENT OF THE INTERIOR
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المملكة العربية السعودية
وزارة البترول والثروة المعدنية
KINGDOM OF SAUDI ARABIA
MINISTRY OF PETROLEUM AND MINERAL RESOURCES

أبحاث جيولوجية مختلفة
خريطة رقم I - ٢٢٠ A
MISCELLANEOUS GEOLOGIC INVESTIGATIONS
MAP I-220 A

GEOLOGY OF THE SOUTHEASTERN RUB AL KHALI QUADRANGLE, KINGDOM OF SAUDI ARABIA

By
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خريطة جيولوجية للوحة الربع الخالي الجنوبي الشرقي بالمملكة العربية السعودية
وضع
ليون رامريز وادوارد إلبرج وهانز هللي

GEOLOGIC EXPLANATION

QUATERNARY

Qes — Eolian sand
Mostly mobile. (See legend for description of sand terrain types)

Qsb — Sabkhah deposits
Silt, clay, and muddy sand, commonly saline, underlying coastal and inland playas

Qs — Silt
Silt and associated fine sediments including some caliche-like and gypsiferous deposits in undrained depressions

TERTIARY AND QUATERNARY

QTgs — Gravel and sand
Fossiliferous raised beaches, reefs, and river terraces in coastal area, Pliocene(?) and Pleistocene in age; inland, fluviatile terraces, very localized lacustrine deposits, loess flats, and alluvium, gravel and sand, in part Recent in age

MIOCENE AND PLIOCENE

Tsm — Sandstone and limestone
White and gray, fine-grained, soft, chalky fossiliferous limestone with Clementia papyracea; includes some white to light gray silty to sandy marl, and sandstone. In northern part of map Tsm mapped with Tdr

OLIGOCENE AND MIOCENE(?)

Ts — Shihr group and equivalents
A thick series of marl, sandstone, and conglomerate with subordinate limestone, for the most part of Miocene age. In southeast corner of quadrangle consists almost entirely of chalky limestone, for the most part of Oligocene age but may include units of doubtful Miocene age.

MIDDLE EOCENE

Tha — Habshiya formation
Yellow and variegated shale and marl with interbedded chalk and limestone. Exposed mainly on the northern plateau of the East Aden Protectorate and extending into Dhufar; equivalent to the Dammam of Saudi Arabia

LOWER AND MIDDLE EOCENE

Tdr — Dammam and Rus formations, undivided
White, buff, light yellow, gray and tan, fine-grained, hard, dense to vuggy limestone; locally recrystallized and dolomitized with siliceous zones of tan, white and reddish-brown, commonly nummulitic chert; siliceous limestone and chert in places weathered to tripolite. Rus formation incompletely known in Rub'al Khali; includes limestone and evaporites. In northwestern part of map Tsm *mapped with* Tdr, Tsm / Tdr

Tr — Rus formation and equivalents
Massive gypsum with occasional chert bands and marly horizons; limestone bands may occur near top and base; equivalent to the Rus formation of Saudi Arabia

Thaj — Habshiya and Jeza' formations, undivided
Mapped only where intervening Rus formation is absent

PALEOCENE AND LOWER EOCENE

Tj — Jeza' formation
Yellowish-green, calcareous shale with thin beds of marine foraminiferal limestone, in places, becomes chalky with slightly massive bedding; includes some marl. Partly equivalent to the upper part of the Umm er Radhuma formation of Saudi Arabia

Tu — Umm er Radhuma formation
Thick bedded, massive, cliff-forming, hard, compact, microcrystalline limestone; buff and white weathering, nodular, in places includes dark brown weathering dolomitic limestone. In southeast includes the limestone facies equivalent of the Jeza' formation of the East Aden Protectorate

CRETACEOUS

Km — Mahra group
Limited occurrence along southeast coastal area. Elsewhere in the East Aden Protectorate this group is confined to coast and South Al Mahrah; in south Al Mahrah at Ra's Fartak the uppermost Cretaceous consists of limestone underlain by sandstone of Maestrichtian to Senonian age; the middle part of the Cretaceous consists of limestone with marl interculations, probably of Albian to Turonian age; the lower part of the Cretaceous is incompletely exposed and consists of limestone of Aptian or Barremian age. In Wadi al Masilah the uppermost Cretaceous consists of marl underlain by sandstone of Maestrichtian to Senonian age; this is underlain by a sequence consisting of an upper limestone with corals, mollusks and other fossils of probable Turonian age, a middle unit of shale with subordinate sandstone and limestone, and a lower limestone, shale, and marl unit of Cenomanian age; below follows a succession of fossiliferous shale, marl, and sandstone grading downward into shale with thin limestone of Albian to Cenomanian(?) age, probably equivalent to the Nahr Umr formation of the Persian Gulf region. The lowermost Cretaceous consists of marl, limestone, and marly limestone with a basal conglomerate of Aptian to Barremian age overlying Jurassic sedimentary rocks. Westward in the Hoqfa mas-et the entire Cretaceous is represented by a dominantly clastic facies of the Tawilah group. The Mahra and Tawilah groups are lateral equivalents and represent equivalents of the Biyadh, Nahr Umr, Wasi'a, and Aruma formations. The Cretaceous of the East Aden Protectorate rests unconformably on Jurassic or basement rocks

PRE-JURASSIC

pJEhs — El Hota-Ain Sarit groups, undivided
Thick series of contorted, highly cleaved sandstone, graywacke, shale, mudstone, with quartz veins; occurrences at Al Hauqah and 'Ayn Sarit in Dhufar. Believed equivalent to the Ghariah and Ghabar groups of southwest Qafra mas-et; possibly lower Paleozoic in age

CONTACTS, FAULTS, FOLDS

Geologic contact
Dashed where approximately located; short dashed where indefinite

Fault
Dashed where approximately located

Anticline, showing plunge
Dashed where approximately located

Syncline, showing plunge
Dashed where approximately located

MAP LEGEND

POPULATED PLACES
- Village or town
- Village or town, name not given
- Fort
- Ruins

TRANSPORTATION
- Road of questionable permanency
- Khalif *(see glossary)*
- Landing field

HYDROGRAPHIC FEATURES
Only isolated wells are shown
- Dug well
- Drilled water well
- Dahl *(see glossary)*
- Intermittent stream
- Sabkhah
- Silt flat
- Bathymetric contour in meters *(geologic interpretation; not intended for navigational purposes.)*

HYPSOGRAPHIC FEATURES
- Generalized relief
- Prominent topographic features
- Sand
  Dense stipple represents mobile sand cover consisting primarily of dunes; open stipple, or other individual sand forms, that are shown where map scale permits; moderately dense stipple represents more stabilized or continuous sand cover; open stipple represents discontinuous sand cover.

TYPES OF SAND TERRAIN
- Transverse. *Predominantly simple and compound barchan dunes in areas of more mobile sand, and/or simple rounded ridges, both oriented transverse to the prevailing wind direction.*
- Longitudinal. *Primarily dikdikah and various types of undulating sand sheets, in general characterized by elongation of the individual topographic forms parallel to the prevailing wind direction, often partially stabilized by sparse vegetation.*
- 'Urûq. *Various forms of long, nearly parallel, sharp-crested narrow sand ridges and dune chains separated by broad sand valleys usually including elements of type I sand terrain. These are the resultant of a system of two dominant wind directions and are identical to the sayf dunes of North Africa.*
- "Sand mountains." *Dominated by large sand massifs commonly exceeding 50 to 300 meters above the substratum, often with superimposed dune patterns consisting of various types of sand terrain. Individual dune forms are giant barchans spanning several kilometers from horn to horn; giant bisymmetrical and pyramidal sand peaks as well as other less common peak forms; and giant oval to elongate sand mounds.*

MISCELLANEOUS FEATURES
- Abandoned oil well
- Spot elevation

INDEX MAP OF ARABIAN PENINSULA

GLOSSARY

'Abl	Sand area with many 'abl (shrubs)
'Ayn	Spring, solution pit, or well
Bi'r	Dug well
Dahl	Deep sink hole or solution cavity
Ghâr, pl., Ghîrân	Sheltering recess of overhang in the side of any steep elevation
Ghubbah(t)	Gulf or deep water bay
Hâdh	Sand area with many hâdh (shrubs)
Hasî (Hâsî), pl., Hisâ'	Dug well, seasonal
Hijn	Fort
Irq, pl., 'Urûq	Long linear sand ridge
Jabal	Hill or mountain
Khalîf	Motorable pass
Khashm	Headland or promontory along a cliff or mountain front
Khuflah(t)	Sand area with sparse brush including 'abl and others, but lacking hâdh
Qa'îdah(t)	Raised sand area
Qârah(t)	Flat-topped hill, usually rounded
Qatn	Crest or summit of a mountain or mountain range
Qarn, pl. of Qarn	Prominent mountain front
Ramlah(t)	Sand area
Ra's	Tip of cape or headland protruding into the sea
Sabkhah(t)	Silt, clay, and sand flat, often with saline incrustations
Sahl	Equivalent to sayh; or the lower and broader portion of a sayh as it approaches the Rub' al Khali sands
Sayh	Small, poorly defined wâdî channel; more broadly, the southern steppe desert, as opposed to that of the sands
Sha'b	Same as wâdî, often a tributary
Shaqrah(t)	Valley or depression between 'urûq
Tawf	Escarpment or often the raised bank of a wâdî
Wâdî	Valley or dry water course

SOURCES OF BASE COMPILATION

Compilation and topographic representation by the Arabian American Oil Company; A, Controlled aerial photographic surveys, 1954-55; B, recompilation from ground surveys; C, recompilation from various published sources partly modified and amended from reconnaissance ground surveys; and D, bathymetric lines interpolated from published U.S. Hydrographic Office and British Admiralty charts. Photographic representation by E. L. Elberg, Jr., Arabian American Oil Company. Translation, transliteration, calligraphy and Arabic typography by S. H. Kfoury, C. D. Matthews, and M. H. Kfoury.

SOURCES OF GEOLOGIC COMPILATION

Geologic mapping by the Arabian American Oil Company compiled from: A, photogeologic interpretation based on limited reconnaissance ground surveys. Southern part of photo compiled and extended from area B sources; and B, "Synopsis of the Geology of East Aden Protectorate" by Z. R. Beydoun published by the 1960 International Geological Congress in Copenhagen, and "The Stratigraphy and Structure of the East Aden Protectorate", Doctorate of Philosophy Thesis, Oxford University, 1961, (pending publication) by Z. R. Beydoun.
Translation of the geologic explanation edited by Harold W. Glidden, U.S. Department of State.

Scale 1:500 000

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Lambert conformal conic projection; standard parallels 17° and 33°

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This map printed in two sheets: Sheet A, geology and geography combined; Sheet B, bathymetry and geography. Available at the Ministry of Petroleum and Mineral Resources, Jiddah and Ad Dammâm, Saudi Arabia, and at the U. S. Geological Survey, Washington, D. C., U. S. A.

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