



**International Journal of Biology, Pharmacy
and Allied Sciences (IJBPAS)**

'A Bridge Between Laboratory and Reader'

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**FACIESES AND SEDIMENTARY ENVIRONMENT OF PERMIAN SEQUENCES IN
NORTH EAST OF SHAHIN DEZH IRAN**

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ABSTRACT

Permian deposits (Doroud and Ruteh formations) have significant outcrops in steep hillsides of north east highlands of ShahinDezh. Ruteh formation, with 320 m thickness, have been formed of carbonate strata. This sedimentary sequence is located as parallel disconformity on clastic strata of Doroud formation with the age of lower Permian and ends into lower Triassic carbonate strata (Elika formation) by intermediary of Laterite – Bauxitic horizons. Field and laboratory studies of serial sampling of carbonate sediments of Permian in north east of ShahinDezh has resulted in identification of 9 facieses zone. The results of present study show that the study sedimentary sequence has been deposited in a shallow marine environments which are, in general, representative of shallow sea of homoclinal ramp type. These facieses as the sedimentary sequences specify transgressive and regressive of Permian sea in north east region of ShahinDezh. Based on sea level changes, at least 4 retrograde sequences have been distinguished. Relative decrease of sea level in the Late Permian has caused the expansion of Chert – Laterite discontinuity at permotriassic boundaries.

Keywords: Permian, Ruteh Formation, Stratigraphy, Sedimentary Facies

INTRODUCTION

Permian deposits which have outcrops in broad scope of Alborz, is formed of three formations: Duroud (lower Permian), Ruteh

(middle Permian) and Nessen (upper Permian). The geographical spread of Nessen formation is limited to northern hillsides of Alborz and in southern hillsides

only two formations, Duroud and Ruteh, have been developed [1], The outcrops of – carbonate deposits of lower and middle Permian (Ruteh formation) with 320 m thickness in north east of Shahin Dezh and in 3 km distance of Hacheh Su in N 36°40' latitudes and E 46°34' longitude have been sampled and studied (Figure 1). This sedimentary sequence is located on clastic strata of Duroud formation which has the age of lower Permian and is covered by deposits of limestone and dolomite of Elika formation (Figure 2). Based on serial

samplings, microscopic studies, identification and separation of microfossiles, formation and concluding about the sedimentation condition and environments has been performed. classification of carbonate rocks has been done based on Dunham [2], method. Facieses, reviews and presentation of sedimentary model is according to Walter's law (Walter, 1894), classification of facieses is according to Flugel [3], method and review of lateral and vertical changes of facieses is based on Wilson [4], method.

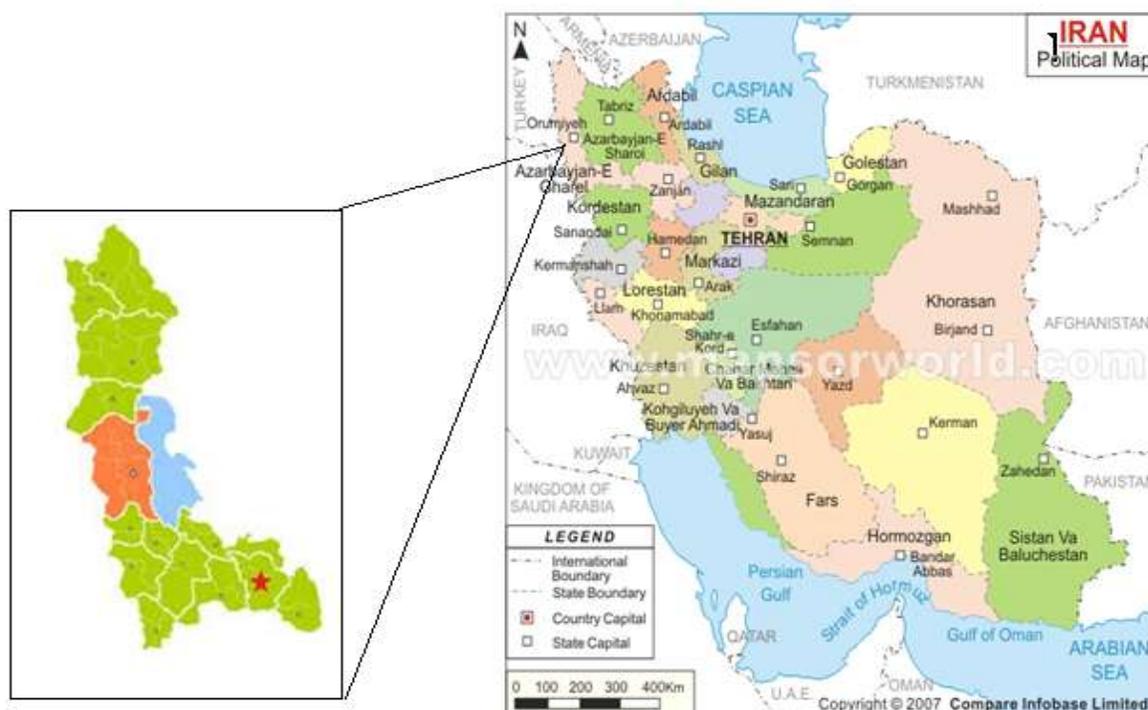


Figure 1: Geographic position of studied section in north east of Shahin Dezh



Figure 2: Lower boundary of studied sequence with Duroud formation (Right) and upper boundary of Ruteh sequence with Elika formation (left).

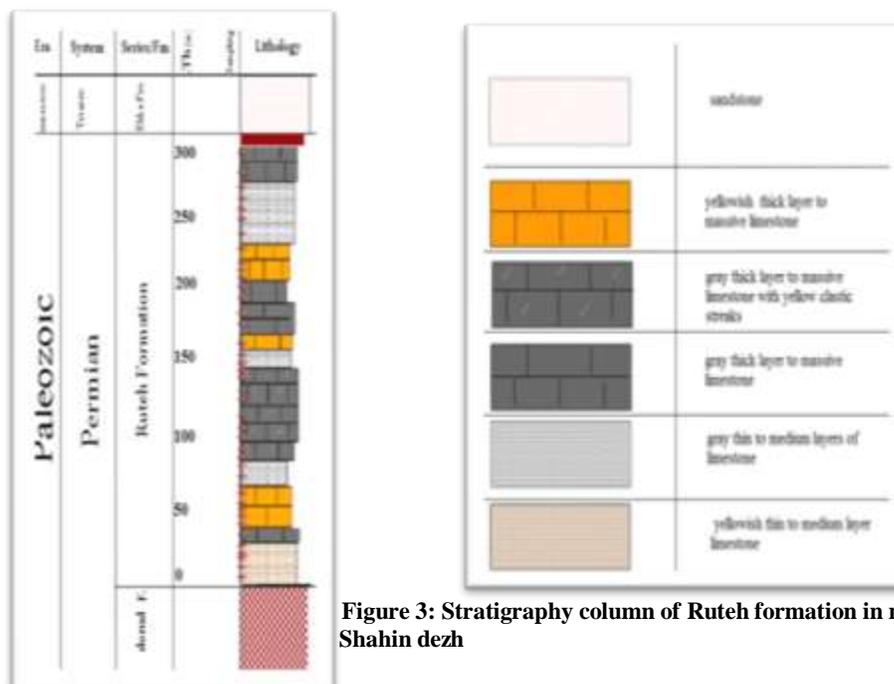


Figure 3: Stratigraphy column of Ruteh formation in north east of Shahin dez

Stratigraphy of Ruteh Formation in Studied Section

Ruteh formation in studied section is formed of thin ,medium and Thick to massive beds, and sometimes sequence with calstic streaks which is located as parallel disconformity on clastic strata of Duroud formation with the age of

lower Permian and from the upper boundary is located under the Elika formation as erosional disconformity (Figure 3). This formation includes dark gray to light yellow limestone and according to its fossil content, the age that is attributed to Ruteh formation is morghabian of middle Permian. In Shahin Dezh region, Ruteh

formation is formed of 5 subunits as bellow: gray thin to medium layers of limestone, gray thick layer to massive limestone, yellowish thin to medium layer limestone, yellowish thick layer to massive limestone, gray thick layer to massive limestone with yellow clastic streaks.

Facieses' Zones of Ruteh Formation in Shahin Dezh

Based on 50 microscopic section sampling Ruteh Formation's outcrop in north east of Shahin Dezh region has been studied, the identified facieses has been classified in 9 facieses zone.

FZ-1 Facies Zone

The facieses related to FZ-1 are mudstone and pelletic wackestone which are often laminated and associated with repeated pressure dissolution levels that are parallel with sedimentary surfaces which reflect great depth of sedimentation basin and weight of water column. Sporadically, echinoderm fragments, allochems and radiolaria are also visible (Figure 4).

FZ-3 Facies Zone

The facieses related to FZ-3 are bioclastic wackestone - grainstone. The existing allochems of these facieses are sporadically in size of at most few present of ostracode, ammonites, radiolarians and echinoderm fragments (Figure 4).

FZ-4 Facies Zone

This facies is foraminifera and algal bioclastic packstone. The allochems of this facies includes paleotextularia foraminifera, deckerell foraminifera, gloivalvulina foraminifera, paleotextularia foraminifera, Vermiporella alga that the largest volume of alga is devoted to it, pellet, radiolarian, echinoderm fragments, ostracode and some other skeletal parts are visible that are located in muddy carbonate context.

Accompaniment of open marine and lagoon organisms shows that this facies is formed in back of bar environment (Figure 4).

FZ-5 Facies Zone

This facies is poorlywashed biosparite in which intraclastic allochems that are well sorted and rounded, brachiopods, deckerella foraminifera, calcisphere, radiolarian and fosoline as few percent are visible in this facies. Geopetal fabric can be seen in sample sections of this region.

This microfacies shows the back bar environment and well sorted intraclasts suggest this subject (Figure 4).

FZ-6 Facies Zone

This facies is poorlywashed biosparite and its allochems include gastropoda, aragonite needles. Another feature of this facies is high density bioclasts (Figure 4).

FZ-7 Facies Zone

This facies is algal bioclastic wackestone – packstone. The allochems of this facies include significant amount of Vermiporella alga, foraminifera, fusulinida (Cornospira sp.),

ostracode, intra-clast and pellet with expansion of carbonate mud and cement. In the studied sections of this region *Vermiporella* alga allocate the largest algal volume to itself. Geopetal fabric is seen in this facies (Figure 4).

Fz-8 Facies Zone

This facies is pelloidal intraclastic grainstone . The existing allochems in sections of this region include pellet, very few approximately few percent intraclasts which are neoformed allochems.

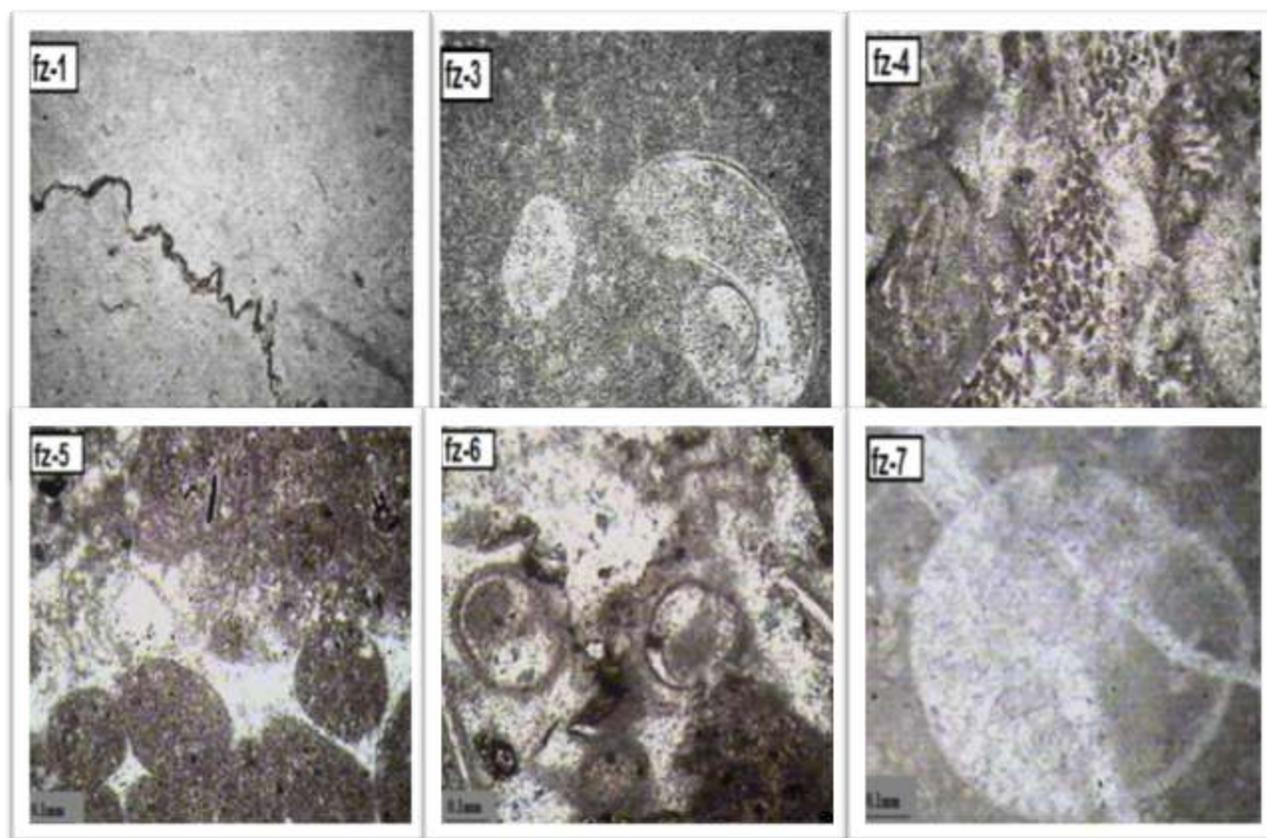
The environment energy of this facies is high that is verified by existing cement (Figure 4).

FZ-9 Facies Zone

This facies is pelloidal mudstone in which intraclast can be rarely seen (approximately few percent). Fenestral fabric is visible in sections of this region that indicates its closeness to coast. This facies shows the low energy of the environment and existing significant amount of carbonate mud is proof of this subject (Figure 4).

FZ-10 Facies zone

This microfacies shows the micritic limestone pieces that are connected together by matrix and this is the indicative of sea coast (Figure 4).



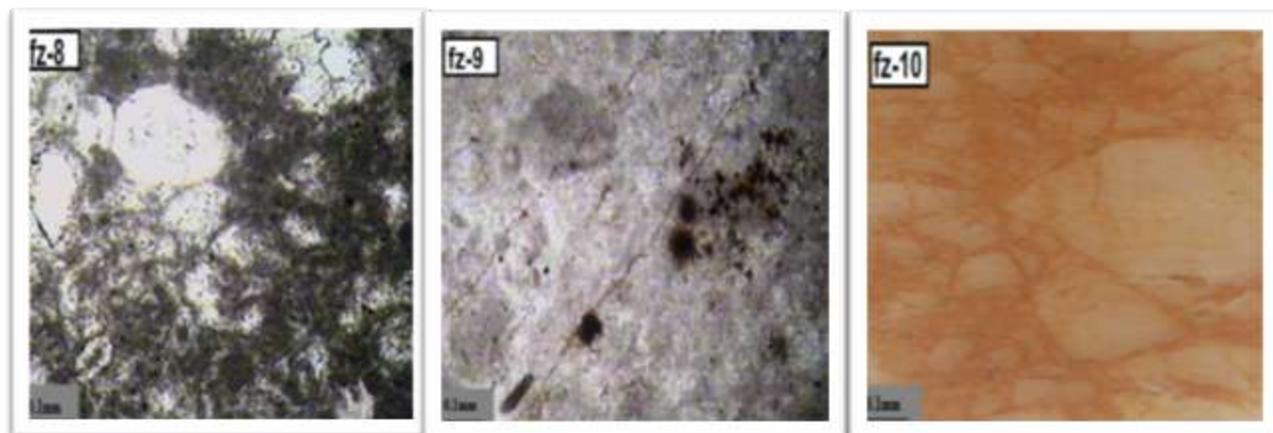


Figure 4: FZ-1: Pressure dissolution fabric which are formed in relatively deep basin. FZ-3: Ammonite and wackestone skeletal allochem. FZ-4: Pellet in matrix with dense fabric. FZ-5: well sorted and rounded intraclast in a spary cement. FZ-6: Coexisting of matrix and cement. FZ-7: Fabric geopetal. FZ-8: Neoformed allochems. FZ-9: Fenestral fabric. FZ-10: Pseudo-breccia and forming of nodule shapes in mudstone facies

Sedimentation environment and condition

Permian sequences in north east region of Shahin Dezh is formed of different carbonate facieses which are often deposited in shallow seas. Fz-1 facies zone is related to deep parts of sea in which carbonate sedimentation is possible. FZ-3 facies zone shows the end of continental slope location. FZ-4 facies zone indicates back reef environment and basin slope. FZ-5 facies zone is representative of reef location at end of shallow parts of carbonate seas. FZ-6 facies zone represents the tidal flat

or coastal dunes environments. FZ- 7 facies zone shows lagoon, bay and coastal strait environments. FZ-8 facies zone indicates coastal lagoon environment which is limited in relation with open marine. FZ-9 facies zone is representative of tidal zone environment and FZ-10 facies zone represents border of coastal environment and coastal plains. Putting together the above mentioned sub environments, sedimentation environment model is evoked for all Permian sequences as deep carbonate sea of homoclinal ramp type (Figure 5).

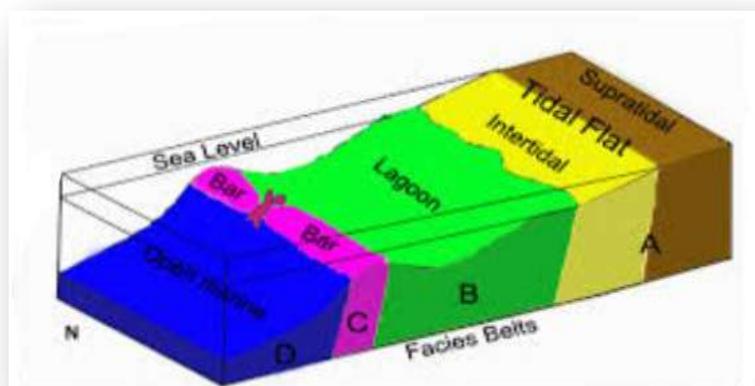


Figure 5: Suggested sedimentation model for Permian sequences in north east of Shahin Dezh

Vertical Changes of Facies or Sedimentary Sub-Environments' Changes:

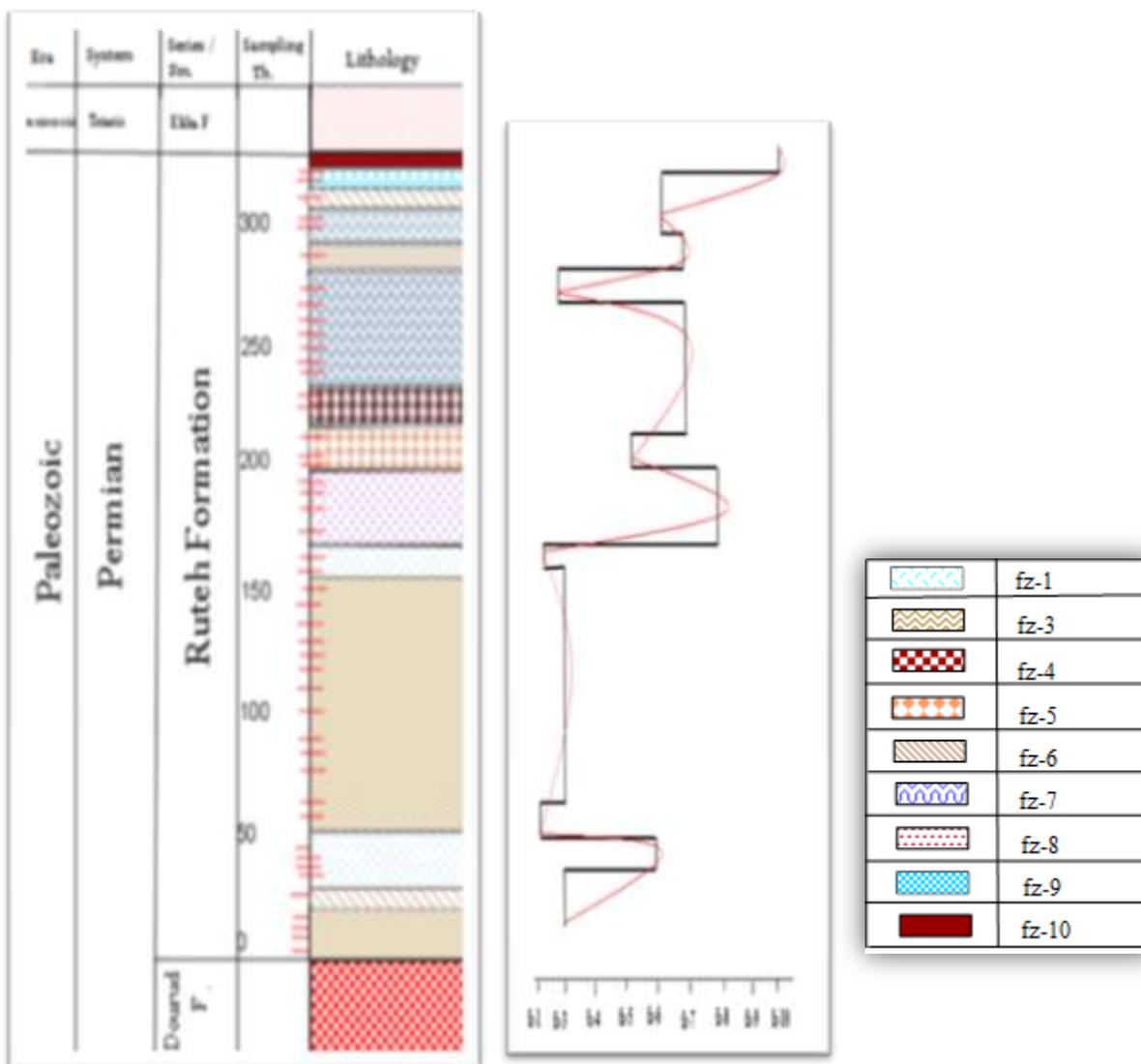


Figure 6: Vertical Changes of Facies or Sedimentary Sub-Environments' Changes

According to the drawn microfacies column, Ruteh formation in north east region of Shahin Dezh is consist of at least 4 regressive sequences which its beginning is open marine and with transgressive, it has changed to back reef and lagoon environments. Then precession has been

made and it has changed to open marine. This process has continued until the time that with sudden and fast transgressive, the depth of sea has decreased and has changed to tidal basin and again precession has been made so that reef and prograde sequences of

shallow marine are made on tidal basin deposits.

After that a little sequence has been made because of fast transgressive and shows a final regressive sequence that is continued to coastal environments.

CONCLUSION

- Permian sedimentary strata in studied section include Doroud and Ruteh formations.
- Carbonate sequences of Permian (Ruteh formation) in north east region of Shahin Dezh are discontinuously located on Doroud formation with the age of lower Permian and is cover by dolomitic Elike limestone with the age of Triassic.
- The thickness of Permian sea sequences in north east region of Shahin Dezh is measured 320 m.
- In Shahin Dezh region, Ruteh formation is formed of 5 subunits as bellow: gray thin to medium layers of limestone, yellowish thin to medium layer limestone, gray thick layer to massive limestone, gray thick layer to massive limestone with clastic streaks, yellowish thick layer to massive limestone.

- According to microscopic studies, the most common micro facieses in Permian limestones of this region are: pellet mudstone – wackestone, Bioclastic wackestone – grainstone, Algal and Foraminifera Bioclastic Packstone, poorlywashed biosparite, Algal bioclastic wackestone – grainstone, Intraclastic grainstone with, pelloidal mudstone, Pseudo-breccia.
- Carbonate sequences of Permian in north east region of Shahin Dezh is classified in 9 standard facies zones.
- According to lateral and vertical expansion of standard facies regions, carbonate sea of homoclinal ramp type is distinguished for sedimentation of carbonate sequences of Permian.
- Based on sea level changes and drawn facies column, at least 4 regressive sequences are identified.

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