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Paleogene ostreoids (Bivalvia, Gryphaeidae, Ostreidae) from Northeast Iran

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Abstract

Three species of Paleogene ostreoids are reported for first time from the Chehel Kaman Formation Formation of North Iran. Although there are numerous specimens of ostreoids, only a few are preserved sufficiently well to enable a specific identification. The species include *Pycnodonte brongniarti* (Bronn, 1831), *Pycnodonte pharaonum* (Oppenheim, 1903) and *Turkostrea multicostata* (Deshayes, 1832), all of them previously reported from Paleogene deposits of Europe.

Keywords: Ostreoids, Paleogene, Khangiran Formation, North Iran.

Resumen

Tres especies de ostréidos del Paleógeno son reportadas por vez primera para la Formación Chehel Kaman en el norte de Irán. A pesar de existir numerosos ejemplares, solo algunos tienen una preservación adecuada para ser determinados a nivel específico. Las especies reportadas son: Pycnodonte brongniarti (Bronn, 1831), Pycnodonte pharaonum (Oppenheim, 1903) y Turkostrea multicostata (Deshayes, 1832), todas reportadas previamente para depósitos del Paleógeno de Europa.

Palabras clave: Ostreoideos, Paleógeno, Formación Khangiran, norte de Irán.

1. Introduction

The Kopet Dagh (or Koppeh Dagh) mountain range represents a NE-trending, about 650 m long and about 200 km wide, active fold belt at the border between Iran (this part is geographically located between 54°00′ to 61°14′E and 36°00′ to 38°16′N) and Turkmenistan, east of the Caspian Sea, stretching northwest–southeast from near the Caspian Sea in the northwest to the Harirud River in the southeast (Fig. 1). The active fold belt of NE Iran, Kopet-Dagh, was formed on a Hercynian metamorphosed basement, at the SW margin of the Turan Platform. The belt consists of about 10 km of Mesozoic (Kashafrud, Chaman Bid, Mozduran, Shourijeh, Tirgan, Sarcheshmeh, Sanganeh, Aitamir, Abderaz, Abtalkh, Neyzar and Kalat formations) and Paleogene sediments (Pestehligh, Chehel Kaman and Khanigiran formations), mostly of a carbonate composition. Like the Zagros mountains, it was rucked into long, linear NW-SE trending folds during the last Plio-Pleistocene phase of Alpine orogenesis. No magmatic rocks crop out in the Kopet-Dagh except those in the basement of the Aghdarband Window and some Triassic basic dikes (*e.g.*, Berberian and King, 1981; Afshar-Harb, 1994; Golonka, 2004; Taherpour-Khalil-Abad *et al*., 2010, 2013; Raisossadat and

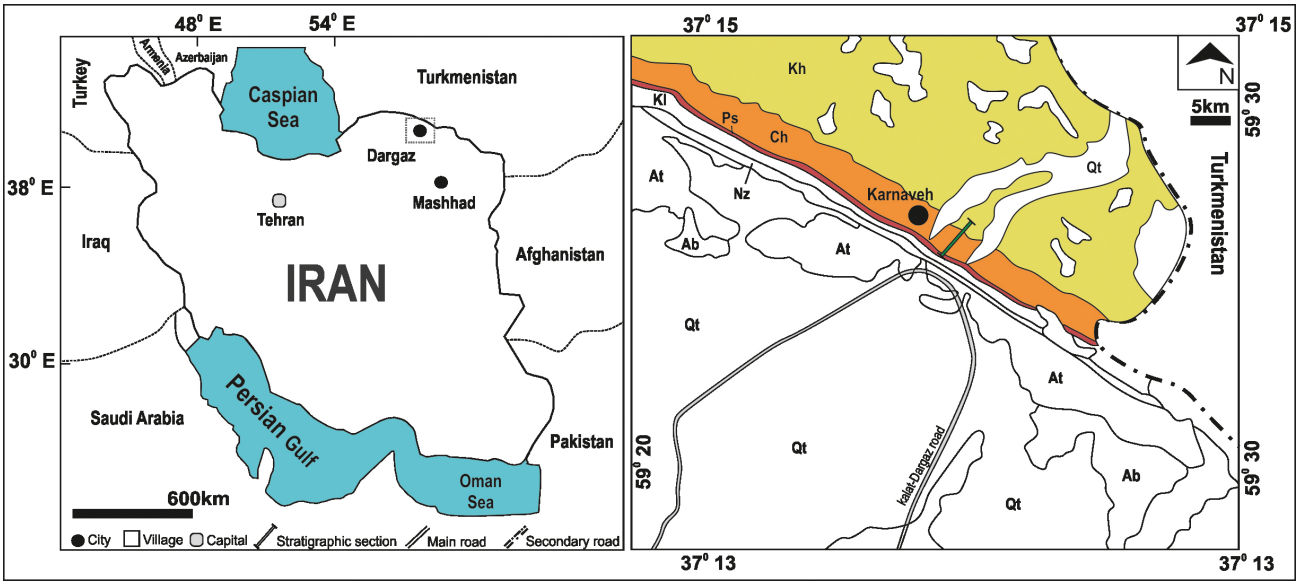

Figure 1. Location map of studied area in North Iran.

Shokri, 2011). The present report represents the first formal description for Paleogene ostreoids, previously described from the Tethyan Realm.

2. Paleogene in Iran

Regional folding in Late Cretaceous-Paleocene times produced a regional unconformity at the base of the Paleogene deposits throughout the greater part of northern, central and eastern Iran (Davoudzadeh and Schmidt, 1981, 1982, 1983, 1984, 1985; Davoudzadeh and Weber-Diefenbach, 1986, 1987; Davoudzadeh *et al*., 1997; Rivandi *et al*., 2013, among others). An exception to this is to be found in the Kopet-Dagh Range, where a short marine regression (Pestehligh Red Beds) but no important unconformity marks the boundary between Cretaceous and Paleocene, and in the border ranges between Iran and Pakistan and in some Coloured Melange zones (Turkish border area) where flysch-type and partly volcanic formations show more transitional relationships between Upper Cretaceous, Paleocene and Eocene (Stöcklin and Setudehnia, 1991).

Paleogene and Neogene deposits are entirely missing in eastern Central Iran (Tabas, Saghand, northern Kerman area), and in the adjoining western parts of the Lut Desert region of East Iran; here, the Paleogene is represented by conglomerates (*e.g*. Kerman Conglomerate), continental red beds and volcanic formations; these rocks are more or less arbitrarily divided into "Paleogene" and “Neogene” ones. In the remainder of Central Iran and in Northwest Iran, in the Alborz Mountains and in the eastern Lut Desert region, Paleogene marine deposits commonly start with thin limestones (Ziarat Formation in the Alborz) associated with conglomerates (“Eocene basal conglomerate", Fajan Formation) containing Alveolinids and Nummulitids of early-middle Eocene age (Fig. 2). These are followed by widespread volcanic and tuffaceous formations of largely submarine origin and of great thickness; in the Alborz, where they reach into 4 km in thickness, they represent mainly the Middle-Upper Lutetian (Karaj Formation), whereas in parts of Central Iran, particularly in the “ Urmia-Dokhtar zone" a volcanic belt crossing Iran diagonally from the Urmia Lake area in Azerbaijan to the Bazman volcanoes in Baluchestan, extend into the Upper Eocene and Oligocene “Paleogene volcanics” and into younger Tertiary levels. Southwest of the “Urmia-Dokhtar zone" the volcanic material decreases rapidly and the Eocene consists mainly of sandstone as well as sandy limestone. Entirely non-volcanic marine to brackish limestone, shales and sandstones characterize the Eocene and Oligocene strata of the Kopet-Dagh: thick flysch-type sandstones and shales (Eocene-Oligocene Flysch) prevail in the Paleogene of Baluchestan and, in partial association with volcanic rocks, in the ranges of easternmost Iran and in parts of Azerbaijan. Paleogene rocks are entirely missing on the northern side of the central and eastern Alborz (Stöcklin and Setudehnia, 1991).

3. Paleogene formations in the Kopet-Dagh sedimentary Basin

Like other regions of Iran, tectonic movements in early Paleogene, equal to Laramian, led to sea retrogradation from south to north in such a way that continental succession (Pestehligh Formation) is deposited in the south of Kopet-Dagh sedimentary Basin. During middle Paleocene, except in Sheikh area, fossiliferous limestone (Chehel Kaman

Formation) is deposited because of subsidence of the basin; but during early Eocene Sheikh area is also covered so that marine Eocene strata deposited also (Khangiran Formation). In late Eocene simultaneously with Ypresian event, Neogene continental environments deposited locally because of complete sea retrogradation from west to east (Afshar-Harb, 1994; Aghanabati, 2004). Paleogene successions in the Kopet-Dagh sedimentary Basin include of the Pestehligh Formation, which is mainly composed of brown to reddish shales, claystone, conglomerate and limy sandstone, the Chehel Kaman Formation, which is mainly composed of limestone, dolomite, marl and shales, the Khangiran Formation, which is mainly composed of olive shale, silts and sandstone (Fig. 3).

The Chehel-Kaman Formation (Paleogene) in the Kopet-Dagh Basin is mainly composed of limestone, dolomite and interbeds of marl, shale and evaporite sediments. It conformably overlies siliclastic sediments of Pestehligh and underlies the olive-green shales of the Khangiran formations. The Chehel Kaman Formation is named after the Chehel Kaman locality in the Sarakhs area, southeastern Kopet Dagh. This name is used by geologists of the National Iranian Oil Company (NIOC) (Afshar-Harb, 1969, 1970). Afshar-Harb used the name to designate a unit of dense or chalky, massively bedded, ridge-forming organodetrital limestone developed in the eastern Kopet-Dagh sedimentary Basin. In some other localities (such as Gonbadli oil well no. 3) there are some layers of sandstone as well as gypsum beds. In the type area (Chehel Kaman) the unit reaches a thickness of 350 m. It overlies conformably the Pestehligh Red Beds and is overlain with sharp limit but conformable contact by olive shales of the Khangiran Formation; the upper contact is marked by a coquina bed that is taken as base of the Khangiran Formation. In the upper part, the limestone contains echinoids, gastropods and large oysters. According to the fossil fauna and flora, introduced by Afshar

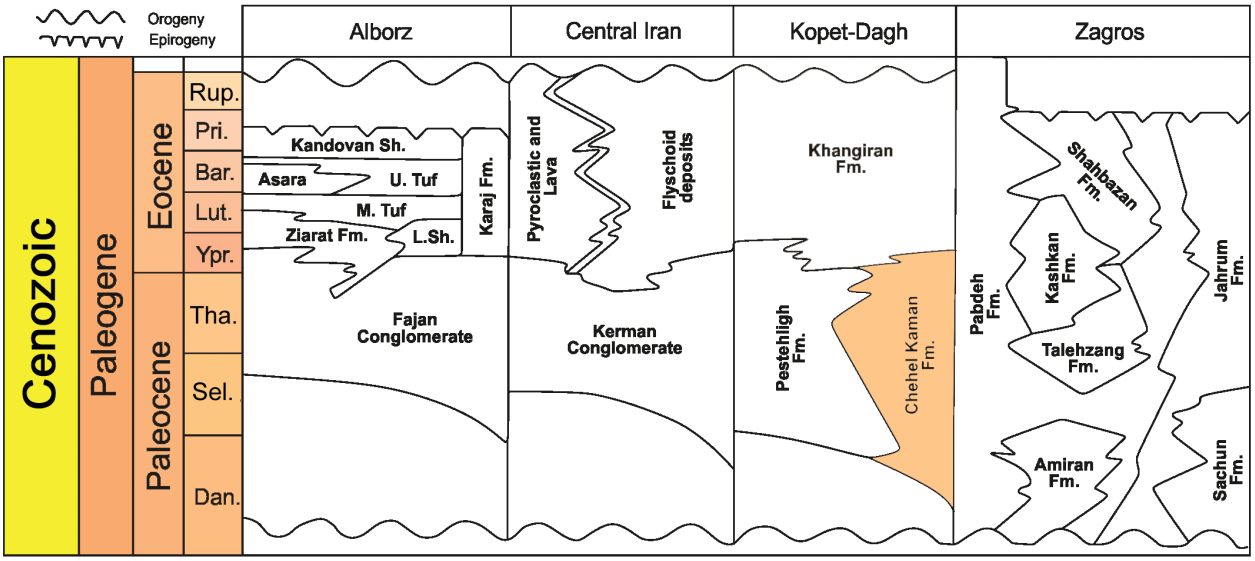

Figure 2. Paleocene-Eocene lithostratigraphic units of Iran.

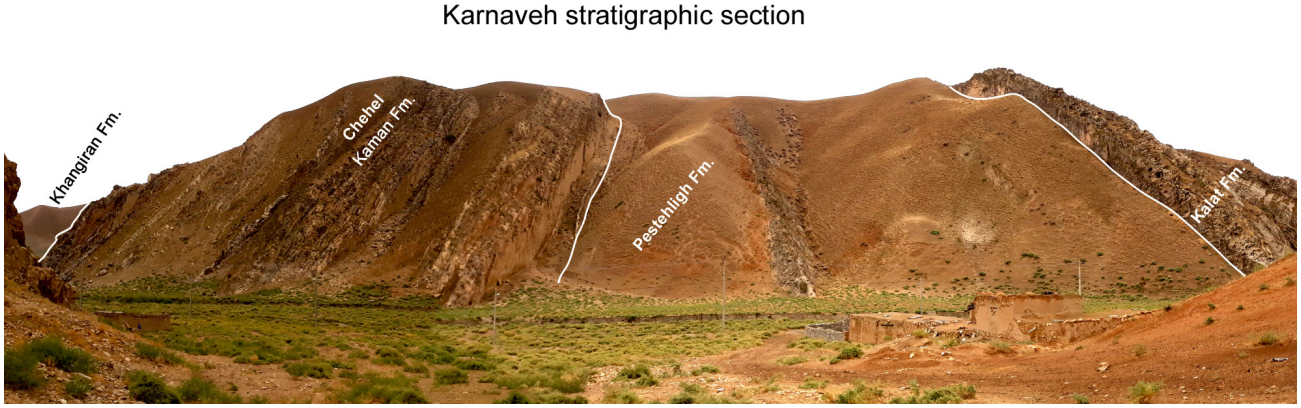

Figure 3. Karnaveh stratigraphic section (containing the Kalat, Pestehligh, Chehel Kaman and Khangiran formations).

Harb (1969, 1970), it is assigned to the Paleocene-Early Eocene (Stöcklin and Setudehnia, 1991; Aghanabati, 2004).

4. Location of oyster banks

The studied samples were collected from the Paleogene Chehel Kaman Formation, referring to the Chehel Kaman Valley in the eastern Kopet Dagh (NE Iran) (Fig. 1). The name, introduced by Afshar-Harb (1969), applies to a lithostratigraphic unit of bedded, limestone, dolomite and inter-bedded of marl, shale and evaporite sediments occurring throughout the Kopet Dagh mountain range.

The study area is located in the Northern Khorasan-e-Razavi province, NE Iran (Fig. 1), an area where several outcrops of the Cretaceous Aitamir, Abderaz, Abtalkh, Neyzar and Kalat formations as well as Paleogene Pestehligh, Chehel Kaman and Khangiran formations are present. The locality from which ostreoids were collected is named ''Karnaveh stratigraphic section'' (Figs. 2–4), located about 45 km west of Kalat township (37˚13′57′′N and 59˚27′07′′E). At the Karnaveh stratigraphic section (Fig. 4), the Chehel Kaman Formation is about 280 m thick and is exposed with both the under- and overlying formations. the Chehel Kaman Formation is underlaid by the Pestehligh Formation disconformably and is overlain by the Kahngiran Formation continuously.

5. Materials and methods

The material comprises 25 specimens, but only 11 are well preserved for a systematic identification. All of the studied samples collected by the authors are housed in the repository system of the Geological Survey of Iran and Geosciences Research Center, NE Territory, Geoscience Museum of Mashhad (Naeimeh Omidbakhsh collection) with prefix GMM (Geoscience Museum of Mashhad).

6. Systematic Paleontology

Suborder Ostreina Férussac, 1822
Superfamily Ostreacea Rafinesque, 1815
Family Gryphaeidae Vyalov, 1936
Subfamily Pycnodonteinae Stenzel, 1959
Genus *Pycnodonte* Fischer de Waldheim, 1835
Type species: *Pycnodonte radiata* Fischer de Waldheim, 1835

Pycnodonte brongniarti (Bronn, 1831)
Fig. 5.1a – 5.7c

Description: Irregular gryphaeiform shell of medium size, inequivalve, inequilateral, longer than wider; left valve strongly convex; umbo prosogyrate, prominent and recurved; radial posterior sulcus originating below umbonal area, leading to the development of a backwards-projected convex lobe; surficial ornament smooth; smooth interior of left valve; small subtriangular ligamental pit, rectilinear growth-lines; shallow resilifer; chomata small, perpendicular to edge of shell; commissure line well marked; small adductor scar, sub-circular, situated just posterior to the centre of valve. Smaller, opercular concave to flat right valve much smaller; ventral area semicircular; dorsal area narrower, umbo rectilinear; smooth ornamentation; ligament morphology similar to that of the left valve; chomata not very extensive; adductor scar semicircular, located just posterior to the centre of valve.

Material: Seven specimens with repository number GMM97FP339.

Measurements (in mm): Left valve of Fig. 5.1, length = 37.0, width = 31.0; left valve of Fig. 5.2, length = 34, width = 28.5; left valve of Fig. 5.3, length = 42.5, width = 38.5; left valve of Fig. 5.4, length = 39.0, width = 27.4; left valve of Fig. 5.5, length = 53.5, width = 37.0; left valve of Fig. 5.6, length = 62.4, width = 46.0; left valve of Fig. 5.7, length = 40.5, width = 27.0.

Comments: This species has a wide biostratigraphic and paleobiogeographic distribution, which includes Paleogene and Miocene deposits of north Africa to the south of Eurasia (Abad, 2001; Astibia *et al*., 2018). For complete synonymy and references, see Abad (2001, p. 548).

Pycnodonte pharaonum (Oppenheim, 1903)
Fig. 5.8a – 5.8c

Description: Irregular shell of medium size, robust and thick, inequilateral and inequivalve. Convex left valve larger than right valve, with a median, keel projection where the valve is thicker, deep groove parallel to keel, ending in a wing-shaped extension at posterior margin of shell; umbo variable in shape; surface ornamented by fine growth lines parallel to exterior edge of shell; small tubular, small spines found at mid length of shell, inner surface smooth, ligament area reducen and triangular, with numerous growth striae; from ligament area a series of grooves reach paleal zone; numerous short, strong vermicular chomata, perpendicular to lateral edges; adductor scar subcircular, weak. Right valve smaller, opercular, ornamented by fine growth lines, parallel to exterior margin of shell; inner surface smooth: ligament area reduced, subtriangular; well-developed resilifer with reduced margins; vescicular chomata, identical to those of left valve, are found on lateral margins of ligament area; muscle scar, as the one at left valve, weakly impressed.

Material: One specimen with repository number GMM97FP340.

Measurements: Left valve of Fig. 5.8, length = 43.0, width = 23.3.

Comments: The species is reported from the Middle Eocene of Egypt (Mekawy, 2012) and the Paleogene of Spain (Abad, 2001).

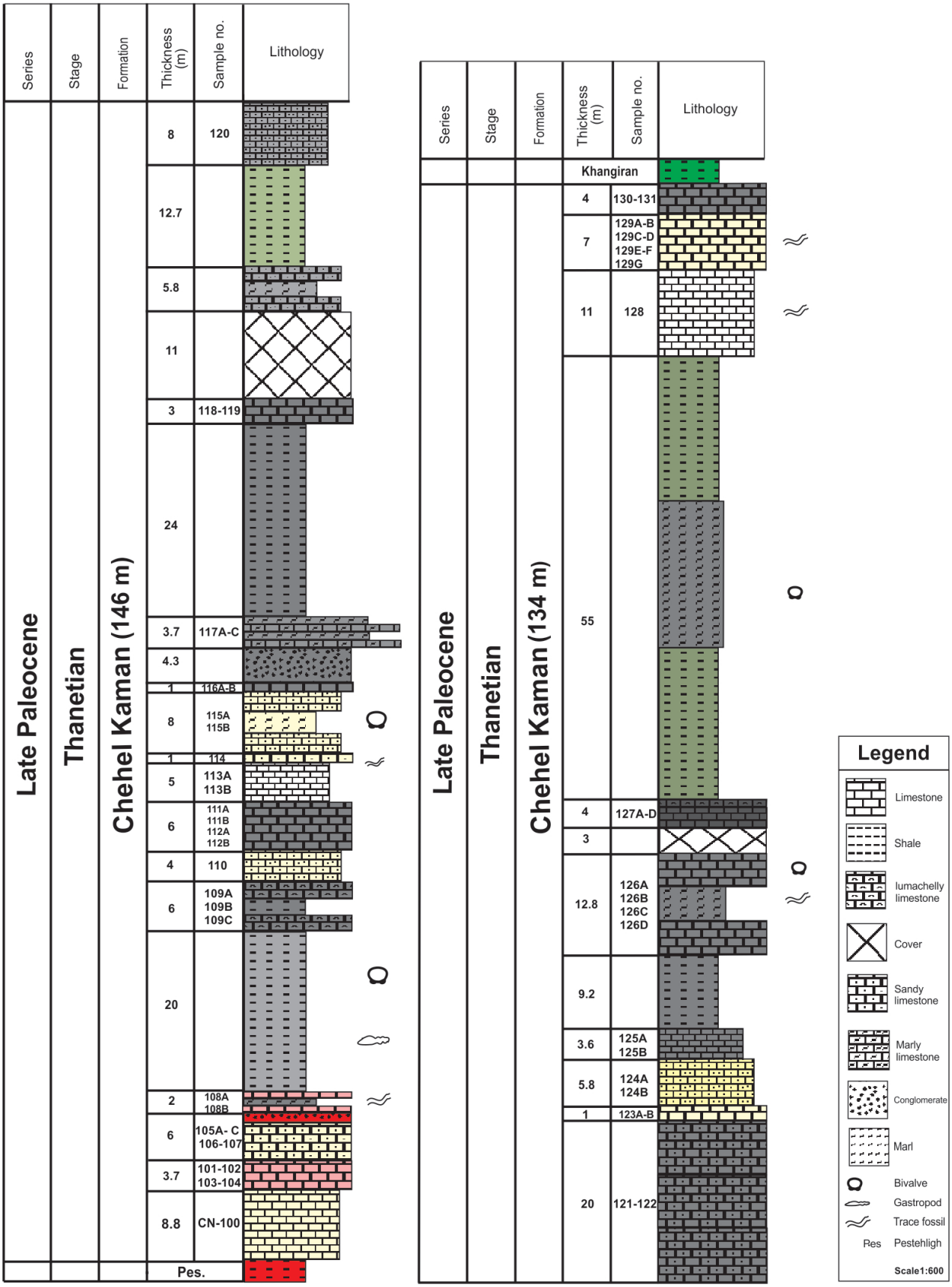

Figure 4. Stratigraphic column and the occurrence levels of Oyster samples in the studied stratigraphic section.

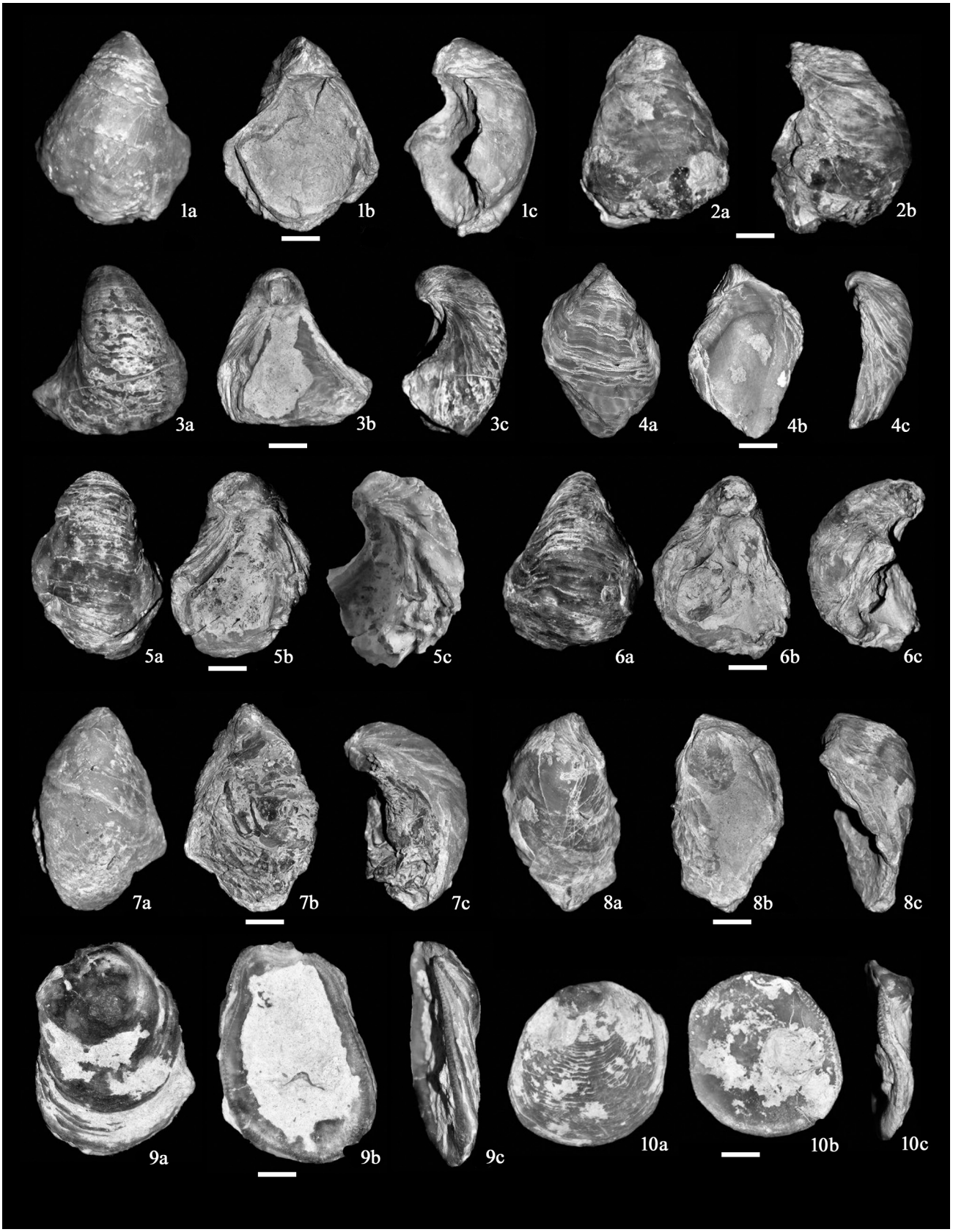

Figure 5. 1a–7c, *Pycnodonte brongniarti* (Bronn, 1831), GMM97FP339; 1a, 8a–8c, *Pycnodonte pharaonum* (Oppenheim, 1903), GMM97FP340; 9a–10c, *Turkostrea multicostata* (Deshayes, 1832), GMM97FP341. Scale bar equal to 1 centimeter.

Family Ostreidae Rafinesque, 1815
Subfamily Crassostreinae Scarlato and Starobogatov, 1979
Genus *Turkostrea* Vyalov, 1936

Type species: *Ostrea turkestanensis* Romanovsky, 1878, p. 112 (= *O. strictiplicata* Raulin and Delbos, 1855, p. 1158); by original designation.

Turkostrea multicostata (Deshayes, 1832)
Fig. 5.9a – 5.10c

Description: Shell inequivalve; left valve ovoid to sub-triangular, expanded towards ventral margin, convex and larger than right valve, surface carrying numerous lamellose commarginal growth lines, some specimens smooth but others with four or five rounded costae, beginning at one third the valve height and diverging towards ventral margin; crest of costae rounded, although most specimens are very worn; attachment area small, near the beak; beak opisthogyrous. Right valve ovoid to sub-triangular, slightly convex on dorsal half, flat towards ventral margin; outer surface with growth lines; ligament area wide, with flat central area; chomata on margins of both valves, with very conspicuous relict chomata along anterior and posterior dorsal margins of right valve; adductor muscle scar reniform, large, with convex lower margin; upper margin concave; quenstedt muscle scar on right valve strongly impressed.

Material: Two specimens with repository number GMM97FP341.

Measurements: Left valve of Fig. 5.9, length = 48.6, width = 34.5; right valve of Fig. 5.10, length = 31.5, width = 30.5.

Comments: This species has been reported from Paleogene deposits of north Africa (Tunisia and Algeria) (Strougo, 1976) and Spain (Abad, 2001).

7. Conclusions

Paleogene ostreoids of the Chehel Kaman Formation are reported for the first time from the Kopet-Dagh sedimentary Basin in NE Iran. According to the paleontological investigations on the Karnaveh stratigraphic section, a Late Paleocene age is assigned to the Chehel Kaman Formation in the studied stratigraphic section. Macropaleontological investigations of the Cenozoic successions in the previously-mentioned sedimentary basin, yield the numerous specimens of Paleogene ostreoids of the Chehel Kaman Formation, here reported for the first time from this region of Iran. The importance of the report of the ostreoid species is mainly represented by the extension in paleogeographic and biostratigraphic ranges for some of the reported species, including distribution from western Tethys (Spain) to the eastern Tethyan realm (Fig. 6).

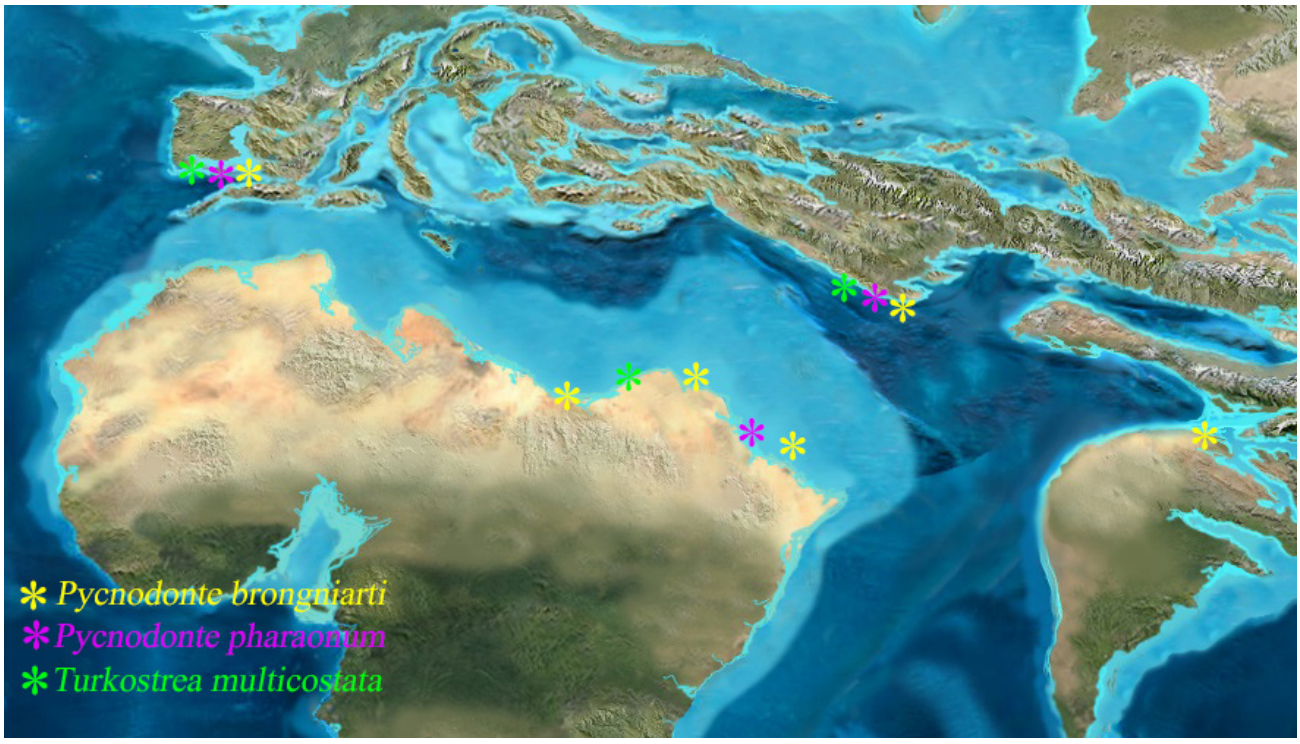

Figure 6. Paleogene paleogeographic map with distribution of ostreoid species studied. Image courtesy of Ron Blakey.

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References

Abad, A., 2001, Paleotaxodonta y Pteriomorphia del Eoceno del margen sur de la depresión Central Catalana: Universitat Autònoma de Barcelona, PhD thesis, 803 pp.

Afshar-Harb, A., 1969, History of oil exploration and brief description of the geology of the Sarakhs area and the anticline of Khangiran: Bulletin Iranian Petroleum Institute, Tehran, 37, 86–94. [in Persian].

Afshar-Harb, A., 1970, Geology of Sarakhs area and Khangiran gas field. Geological Division. Tehran: Exploration and Product Group, National Iranian Oil Company, 1–17.

Afshar-Harb, A., 1994, Geology of Kopet Dagh, *in* Hushmandzadeh, A., (ed.), Treatise on the Geology of Iran: Geological Survey of Iran, Tehran, 275 pp. [in Persian].

Aghanabati, A., 2004, Geology of Iran: Geological survey of Iran, 606 pp. [in Persian].

Astibia, H., Merle D., Pacaud, J.-M., Elorza, J., Payros, A., 2018, Gastropods and bivalves from the Eocene marly formations of the Pamplona Basin and surrounding areas (Navarre, western Pyrenees): Geodiversitas, 40(11), 211–257.

Berberian, M., King, G., 1981, Towards a Paleogeography and Tectonic Evolution of Iran: Canadian Journal of Earth Sciences, 18(2), 210–265.

Bronn, H.G., 1831, Übersicht der Fossilen Überreste in den tertiären subappeninischen Gebirgen: Italiens Tertiär-Gebilde und deren organische Einschlüsse, 176 pp.

Davoudzadeh, M., Lamerer, B., Weber-Diefenbach, K., 1997, Paleogeography, Stratigraphy, and Tectonics of the Tertiary of Iran: Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen, 205(1), 33–67.

Davoudzadeh, M., Schmidt, K., 1981, Contribution to the paleogeography and stratigraphy of the Upper Triassic to Middle Jurassic of Iran: Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen, 162, 137–163.

Davoudzadeh, M., Schmidt, K., 1982, Zur Trias des Iran: Geologische Rundschau, 71, 1021–1039.

Davoudzadeh, M., Schmidt, K., 1983, Contribution to the paleogeography and stratigraphy of the Middle and Upper Jurassic of Iran: Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen, 166, 327–346.

Davoudzadeh, M., Schmidt, K., 1984, A review of the Mesozoic Paleogeography and Paleotectonic Evolution of Iran: Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen, 168, 182–207.

Davoudzadeh, M., Schmidt, K., 1985, Contribution to the Paleogeography, Stratigraphy and Tectonics of the Cretaceous and Paleocene of Iran: Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen, 169, 284–306.

Davoudzadeh, M., Weber-Diefenbach, K., 1986, Contribution to the paleogeography, stratigraphy and tectonics of the Infracambrian and Lower Paleozoic of Iran: Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen, 175, 121–145.

Davoudzadeh, M., Weber-Diefenbach, K., 1987, Contribution to the paleogeography, stratigraphy and tectonics of the Upper Paleozoic of Iran: Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen, 172, 245–269.

Deshayes, G.P., 1832, Description des Coquilles Fossiles des Environs de Paris: Chez l'auteur and others, Paris, 1, 147–290.

Férussac, A.E. de, 1822, Tableaux systématiques des animaux mollusques classés en familles naturelles, dans lesquels on a établi la concordance de tous les systèmes; suivis d'un Prodrome général pour tous les mollusques ou fluviatiles, vivantes ou fossiles: Paris, 111 pp.

Fischer de Waldheim, G., 1835, Lettre à M. le Baron de Férussac sur quelques genres de coquilles du Muséum-Demidoff et en particulier sur quelques coquilles fossiles de la Crimée: Bulletin de la Société Impériale des Naturalistes de Moscou, 8, 99–123.

Golonka, J., 2004, Plate tectonic evolution of the southern margin of Eurasia in the Mesozoic and Cenozoic: Tectonophysics, 381, 235–273.

Mekawy, M.S., 2012, Climatic changes in Egypt through Cretaceous-Recent times based on stable isotopes in oyster shells: Egyptian Journal of Geology, 56, 333–345.

Oppenheim, P., 1903, Zur Kenntnis alttertiaren Faunen in Agypten, 30(3), 1–164.

Rafinesque, C.S., 1815, Analyse de la nature ou tableau de l'Univers et des corps organisés, etc.: Palermo, 224 pp.

Raisossadat, S.N., Shokri, M.H., 2011, Biostratigraphic studies of the lower Cretaceous (Upper Barremian-lower Aptian) Sarcheshmeh and Sanganeh formations in the Kopet Dagh basin, NE Iran: an integration of calcareous nannofossil and ammonite stratigraphies: Stratigraphy and Geological Correlation, 19(2), 188–204.

Raulin, V., Delbos, J., 1855, Extrait d'une monographie des *Ostrea* des terrains tertiaires de l'Aquitaine: Bulletin de la Societé Géologique de France, serie 2, 12, 1144–1164.

Rivandi, B., Vahidinia, M., Nadjafi, M., Mahboubi, A., Sadeghi, A., 2013, Biostratigraphy and Sequence Stratigraphy of Paleogene Deposits in Central Kopet-Dagh Basin (NE of Iran): Journal of Geological Research, 2013, 12 p. Article ID 892198.

Romanovsky, G.D., 1878-1890, Materialy dlya geologiy Turkestanskago kraya [Materials for the geology of the Turkestanian region]: Academie Impériale des Sciences, St. Petersbourg, 1, 167 pp., 30 pls. (1878); 2, 161 pp., 27 pls. (1884); 3, 165 pp., 23 pls. (1890), Saint Petersburg [in Russian].

Scarlato, O.A., Starobogatov, Y.L., 1979, Osnovny cherty evoliutsii i sistema klassa Bivalvia, *in* Starobogatov, Y.L. (ed.), Morfologiia, sistematika i filogeniia molliuskov: Akademiya NAUK SSSR, Trudy zoologicheskogo Instituta, Leningrad, 80, 5–38 [in Russian].

Stenzel, H.B., 1959, Cretaceous oysters of southwestern North America, *in* International Geological Congress, XX Sesión, Mexico City, 1956, El Sistema Cretácico 1, 15–37.

Stöcklin, J., Setudehnia, A., 1991, Stratigraphic lexicon of Iran, Geological Survey of Iran, Tehran, Report No. 18, 376 pp.

Strougo, A., 1976, Le groupe de *Ostrea* (*Turkostrea*) *multicostata* Deshayes, 1832: Géologie Méditerranéenne, 3, 27–44.

Taherpour-Khalil-Abad, M., Conrad, M.A., Aryaei, A.A., Ashouri, A.R., 2010, Barremian-Aptian dasycladalean algae, new and revisited, from the Tirgan Formation in the Kopet Dagh, NE Iran: Carnets de Géologie, Art 2010/05(CG2010_A05), 1–13.

Taherpour-Khaili-Abad, M., Schlagintweit, F., Vaziri, S.H., Aryaei, A.A., Ashouri, A.R., 2013, *Balkhania balkhanica* Mamontova, 1966 (benthic foraminifera) and *Kopetdagaria sphaerica* Maslov, 1960 (dasycladalean alga) from the Lower Cretaceous Tirgan Formation of the Kopet Dagh mountain range (NE Iran) and their paleobiogeographic significance: Facies, 59(1), 267–285.

Vyalov, O.S., 1936, Sur la classification des huîtres: Comptes rendus (Doklady) of the Academy of Sciences of the USSR, new series 4(13), 1(105), 17–20.

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