Callovian-Oxfordian (Jurassic) bivalves from the Kamar-e-Mehdi Formation of east-central Iran

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Abstract: The Kamar-e-Mehdi Formation (Callovian – Oxfordian) is the fill of a shelf lagoon situated in the western and central parts of the so-called Tabas Block for a N-S distance of 200-300 km. From the predominantly fine-grained carbonates, which in the depocenter reach more than 1000 m in thickness, 69 taxa of bivalves are described, which differ greatly in their preservation depending on their original shell mineralogy. Aragonitic taxa are only preserved as internal or composite moulds, whereas calcitic taxa occur in shell preservation. New to science is the pectinid *Camptonectes* (*Grandinectes*) *teres* subgen. nov. et sp. nov. and the pholadomyid *Agrawalimya tubularis* sp. nov. Most of the taxa are common also in the Middle und Upper Jurassic of Europe. Exceptions are the genera *Agrawalimya*, which so far is known only from the Callovian of Kachchh, western India, and *Neoburmesia*, which is solely known from Japan.

▪ *Keywords: Bivalvia, taxonomy, Callovian, Oxfordian east-central Iran*

Zusammenfassung: Die mehr als 1000 m mächtige Kamar-e-Mehdi-Formation (Callovium – Oxfordium) ist die Füllung einer Schelflagune, die sich im westlichen und zentralen Teil des sog. Tabas-Block auf 200-300 km in N-S Richtung erstreckt. Die vorwiegend karbonatische Beckenfüllung enthält lagenweise eine reichhaltige Molluskenfauna, wobei Muscheln stark dominieren. Neunundsechzig Muscheltaxa werden beschrieben, von denen die Pectinide *Camptonectes* (*Grandinectes*) *teres* subgen. nov. et sp. nov. und die Pholadomyide *Agrawalimya tubularis* sp. nov. neu sind. Die Faunenerhaltung ist insgesamt mäßig, wobei ursprünglich aragonitische Taxa nur als Steinkerne bzw. Prägesteinkerne erhalten sind. Die meisten Taxa sind auch aus dem Mittel- und Oberjura von Europa bekannt. Ausnahmen sind die Gattungen *Agrawalimya* (bislang nur aus dem Becken von Kachchh, westliches Indien bekannt) und *Neoburmesia* (bislang nur aus Japan bekannt).

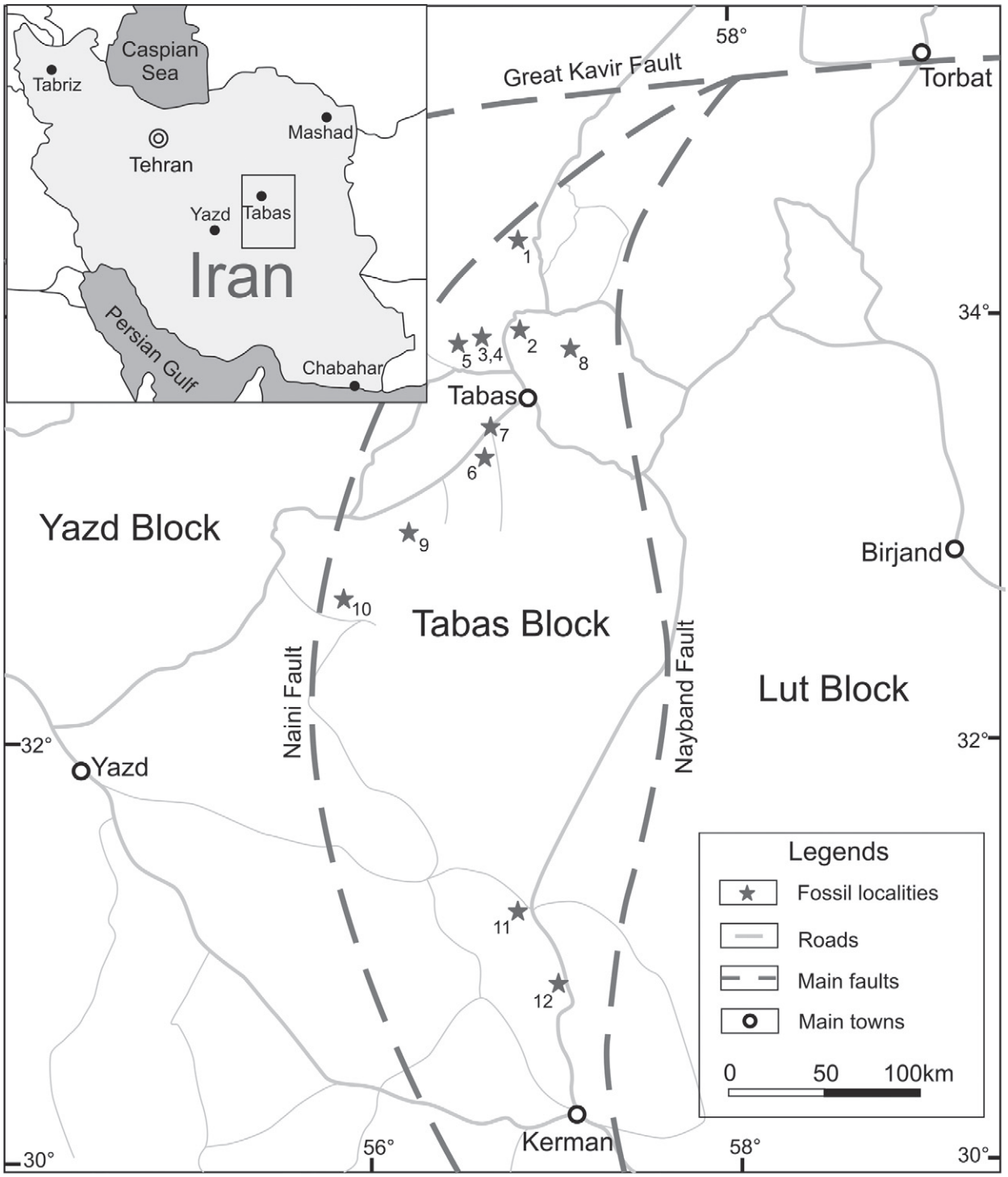
▪ *Schlüsselwörter: Bivalvia, Taxonomie, Callovium, Oxfordium, östlicher Zentraliran*

Introduction

Bivalves are a common element of Jurassic strata in Iran. Our knowledge about the distribution, diversity, and composition of this group is, however, very meagre. A taxonomic report on the bivalve fauna occurring in the Lower to lower Middle Jurassic part of the Shemshak Group was published by Sestini (1966) and some Jurassic bivalves from central Iran were figured by Cox (1936). Extensive field work in east-central and northern Iran during the last 20 years has produced a wealth of benthic macroinvertebrates, the most important group being the bivalves. The present paper is the first in a series intended to document the Jurassic bivalve fauna from various parts of Iran to provide a sound basis for palaeoecological and palaeobiogeographic studies.

Present-day Iran consists of a collage of various terranes, which had collided with the Turan Plate of Eurasia in the late to latest Triassic (Eo-Cimmerian Orogeny; e.g., Sengör, 1984; Wilmsen et al., 2009) resulting in the formation of the Cimmerian Mountain Chain in northern Iran. In northern Iran a foreland basin developed in the Early Jurassic which turned into the marginal area of a back-arc basin, the South Caspian Basin, from the late Early Jurassic onwards (Wilmsen et al., 2009). In east-central Iran in contrast, the central-east Iranian Microcontinent (CEIM; Takin, 1972) experienced a varied history documented by non-marine to shallow-marine rocks, which are the expression of extensional tectonics as well as of eustatic sea-level changes.

The present material comes from the Tabas Block, one of three north-south-oriented structural units that form the CEIM. The Tabas Block is sandwiched between the Lut Block in the east and the Yazd Block in the west (Fig. 1). Jurassic rocks are widely distributed and well exposed on the Tabas Block. The Lower and part of the Middle Jurassic sedimentary succession (Lower Jurassic – lower Bajocian) are characterized by siliclastic sequences subdivided into the Ab-e-Haji, Badamu, and Hojedk formations (Wilmsen et al., 2009). The upper Middle and Upper Jurassic succession (Upper Bajocian – Upper Jurassic) is dominated by carbonate sediments and is termed Magu Group and Bidou Group in the northern and southern Tabas Block, respectively (Aghanabati, 1977, 1998; Wilmsen et al., 2009). The Magu Group in the northern part of the block has been subdivided, in ascending order, into the Baghamshah, Kamar-e-Mehdi, and Magu Gypsum formations. The Bidou Group in the southern part of the block consists of the Bidou, Kamar-e-Mehdi, and Ravar formations (Schairer et al. 2000, 2003; Fürsich et al. 2003; Wilmsen et al. 2003, 2009) (Fig. 2).



Text-fig. 1. Study area with position of localities on the Tabas Block of east-central Iran. For localities 1-12 see Table 1.

The present paper deals with the bivalve fauna of the Kamar-e-Mehdi Formation, a large-scale shelf-lagoon protected in the east by a large carbonate platform system represented by the Esfandiar Limestone Formation and bordered in the west by the crest of the Yazd Block which was emergent at that time (Wilmsen et al. 2010). Bivalves are the dominant elements of the benthic macrofauna, whereas other benthic groups such as gastropods, brachiopods, corals, and sponges are far less common. The Kamar-e-Mehdi Formation is widely distributed in the central and northwestern part of the Tabas Block. It interfingers with siliciclastic rocks in the southern part of the block. The formation consists predominantly of carbonate facies types, in particular bioturbated mud- to bioclastic wackestones, bioclastic marl, and biorudstones, the latter in the form of shell concentrations. More rarely, small oyster/calcareous sponge or coral patch reefs are developed as are thin grain- and rudstones. Towards the top, intercalations of up to decametre-thick gypsum units and mudstone units, the latter commonly with gypsum needles occur (Wilmsen et al. 2010). Especially in the northern Tabas Block the so-called Echellon Limestone Member is developed at the base of the formation. It differs by exhibiting dm- to m-thick intercalations of

Tab. 1. Localities of bivalves from the Kamar-e-Mehdi Formation. For position on the map see Text-fig. 1.

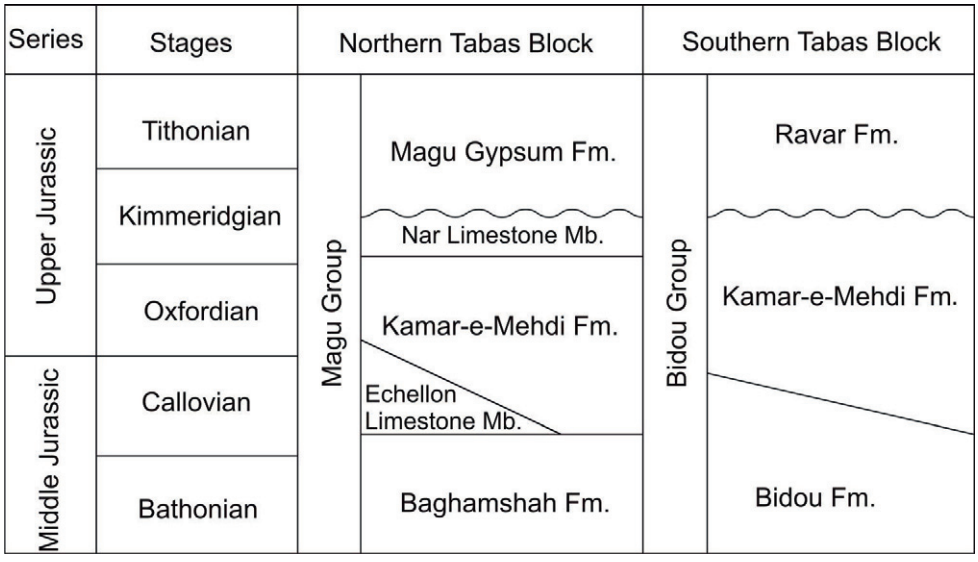
	Locality	co-ordinates
1	N of Kalshaneh	N 34° 07, E 56° 49´
2	S of Kuh-e-Bag-e Vang	N 33° 56´ 54´´, E 56° 47´ 05´´
3	Kuh-e-Nakhlak	N 33° 49´ 28´´, E 56° 36´ 34´´
4	E of Tigh-e Nakhlak	N 33° 51´, E 56° 37´
5	Kuh-e-Echellon area	N 33° 47´, E 56° 30´
6	slopes 45 km SW of Tabas	N 33° 19´, E 56° 32´
7	SW of Tabas	N 33° 21´, E 56° 36´
8	Kuh-e-Gelkan	
9	Kamar-e-Mehdi area	N 33° 02´, E 56° 26´
10	Kuh-e-Dowshakh	N 33° 08´ 32´´, E 56° 18´ 53´´
11	Chorand Valley, W of Ravar	N 31° 10´, E 56° 53´
12	vicinity of Bidou village	N30° 48´, E 57° 00´

microbialites and the widespread occurrence of oncoid float- to rudstones. At the top of the formation another member, the Nar Limestone Member, can be distinguished. It is dominated by pure mudstones, mudstones with gypsum pseudomorphs, and peloidal wackestones with rare intercalations of oo- or intragrainstones. The Nar Limestone Member is restricted to the western part of the Tabas Block.

Siliciclastic sediments are rare and consist of thin, well sorted siltstones and fine-grained sandstones, invariably with a sharp erosional base, signs of strong currents such as flute casts and tool marks, parallel lamination, ripple lamination and, less commonly, hummocky cross-stratification. These sediments commonly contain scattered bivalves, in particular pectinids, in current-stable convex-up position.

The rocks of the Kamar-e-Mehdi Formation are largely composed of small-scale (2-4 m thick) asymmetric cycles, starting with marl or marly mud-/wackestones and generally topped by thin shell concentrations. These cycles most likely reflect shallowing with minor changes in water energy. The general environment appears to have been comparatively quiet, affected only by major storms and storm-generated currents. Some stenohaline taxa such as calcareous sponges, corals, brachiopods and rare fragments of ammonites point to fully marine conditions, but increased intercalation of gypsum in the upper part of the formation suggests increasing hypersaline conditions restricting colonization by benthic organisms.

Although the bivalve fauna is dominated by a only few taxa such as *Pseudopecten*, *Camptonectes* (*Grandinectes*), *Pholadomya*, *Ceratomya*, and *Actinostreon*, the presence of altogether more than 60 taxa shows that living conditions across much of the shelf lagoon were reasonably good. Only bivalves with an originally calcitic shell (e.g., pectinids, oysters) are preserved with shell, those with an aragonitic shell being preserved as internal moulds. It is well possible that selective shell dissolution influenced



Text-fig. 2. Lithostratigraphy of the Middle and Upper Jurassic rocks of the western Tabas Block.

and distorted to some extent the original composition of the fauna.

Biostratigraphy

Detailed sections of the Kamar-e-Mehdi Formation are found in Wilmsen et al. (2010). At the type locality, the formation reaches 1350 m in thickness but thins towards both north and south. Biostratigraphically, the sedimentary succession cannot be subdivided as only a few fragments of perisphinctid ammonites were found. The base can be dated as Lower Callovian due to finds of the ammonite *Macrocephalites*, and the Nar Limestone Member at the top of the formation contains agglutinated foraminifera which yield a Late Oxfordian-Early Kimmeridgian age (Wilmsen et al. 2000).

Material and methods

The present study is based on numerous specimens collected from various localities of the Kamar-e-Mehdi Formation of the Tabas Block (Fig. 1; Table 1) mainly during the years 1995 – 2006. Preservation varies from internal moulds and composite moulds to calcitic shell preservation. The preservation quality of originally aragonitic shells is, as a rule, poor. Many of the bivalves suffered from weathering processes which produced microkarst features not only on shell surfaces but also on internal moulds.

The material is housed in the collections of the Bayerische Staatssammlung für Paläontologie und Geologie, Munich (prefix: BSPG2012XI). This is also the depository of some specimens formerly housed in the collections of the Institute für Paläontologie, Würzburg (PIW-2003IV).

Fig. 3 shows the measurements used in defining taxa. The measurements were taken with a Venier caliper; the umbonal angle was measured on photographed specimens. The following abbreviations were used:

L length
H height
L_A anterior length
L_P posterior length
UA umbonal angle

The classification of the bivalves follows that given in Amler et al. (2000).

Taxonomy

Class Bivalvia Linne, 1758
Subclass Palaeotaxodonta Korobkov, 1954
Order Nuculoida Dall, 1889
Family Nuculanidae Adams & Adams, 1858
Genus *Mesosaccella* Chavan, 1946

Type species. *Nucula foersteri* Müller, 1847.

Mesosaccella morrisii (Deshayes, 1853)
Pl. 1, Figs. 1-3

1853 *Leda morrisii* sp. nov. – Deshayes: 318.
1978 *Mesosaccella morrisi* (Deshayes, 1853) – Duff: 28, pl. 1, figs. 22, 24-33, text-fig. 7.

Material. Six right and 5 left internal moulds, 2 right and 1 left valve in shell preservation (BSPG2012XI 376-378, 425-428) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area.

Description and remarks. The small bivalve (length: 3.9–6.7 mm) is a rare but persistent element of shell pavements dominated by small bivalves in the Kamar-e-Mehdi Formation. Although no detailed hinge features can be observed apart from the presence of taxodont teeth, the general shape corresponds closely to that of *Mesosaccella morrisii* as figured, for example, by Duff (1978). The shell is distinctly longer than high, the ventral margin is gently curved, and both the anterior and posterior margins form a blunt angle with the anterodorsal and posterodorsal margin, respectively. The umbones are situated anterior of mid line of the shell, and both the anterodorsal and posterodorsal margins slope away from it. Shell surface smooth.

Subclass Pteriomorphia Beurlen, 1944
Superorder Isofilibranchia (Iredale, 1939) Pojeta, 1971
Order Mytiloida Férussac, 1822
Family Mytilidae Rafinesque, 1815
Genus *Modiolus* Lamarck, 1799
Subgenus *Modiolus* Lamarck, 1799

Type species. *Mytilus modiolus* Linné, 1758.

Modiolus (*Modiolus*) *imbricatus* J. Sowerby, 1818
Pl. 1, Fig. 4; Pl. 3, Fig. 4

1818 *Modiola imbricata* sp. nov. – J. Sowerby: 21, pl. 112, figs. 1, 3.
1940 *Modiolus imbricatus* J. Sowerby – Cox: 64, pl. 5, figs. 1-7.

Material. Composite moulds with remains of shell material of 5 right, 4 left, and 6 articulated valves (BSPG2012XI 338-350, 519) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area and at Kuh-e-Echellon.

Description. Shell oblique, strongly inflated; dorsal margin straight, forming distinct angle with the much longer posterodorsal margin, which is sloping obliquely. Umbones subterminal, forward directed; anterior ventral margin straight to weakly concave. Broad umbonal ridge running to the narrowly rounded posteroventral end. Anterior of the umbonal ridge there is a shallow sulcus. Ornamentation consists of distinct growth lines which may become imbricated.

Remarks. Due to the common preservation as internal or composite moulds, fossil specimens of *Modiolus* are often compactionally distorted. This is also the case in the present material whereby, depending on the orienta-

Tab. 2. List of bivalve taxa occurring in the Kamar-e-Mehdi Formation of the western Tabas Block.

Mesosaccella morrisii (Deshayes, 1853)

Modiolus (*Modiolus*) *imbricatus* J. Sowerby, 1818

Arcomytilus laitmairensis (de Loriol, 1883)

Inoperna perplicata (Etallon, 1862)

Grammatondon (*Grammatodon*) sp.

Pteria plana (Morris & Lycett, 1854)

Bakevellia (*Bakevellia*) *waltoni* (Lycett, 1863)

?*Bakevellia* sp.

Costigervillia crassicosta (Morris & Lycett, 1853)

Gervillella lanceolata (Münster, 1833)

Isogonomon (*Rostroperna*) *thurmanni* (Contejean, 1860)

Eligmus rollandi Douvillé, 1907

Pinna lanceolata J. Sowerby, 1821

Trichites cf. *saussuri* Voltz in Thurmann, 1832

Acesta (*Acesta*) *spectabilis* (Contejean, 1859)

Acesta (*Acesta*) *subantiquata* (Roemer, 1836)

Plagiostoma laeviusculum J. Sowerby, 1822

Plagiostoma hersilium d´Orbigny, 1850

Plagiostoma aff. *mutabile* Arkell, 1926

Plagiostoma aciculatum (Münster, 1835)

Limea (*Pseudolimea*) *duplicata* (J. de C. Sowerby, 1827)

Liostrea sandalina (Goldfuss, 1833)

Nanogyra nana (J. Sowerby, 1822)

Actinostreon gregareum (J. Sowerby, 1815)

Actinostreon erucum (Defrance, 1821)

Camptonectes (*Camptonectes*) *laminatus* (J. Sowerby, 1818)

Camptonectes (*Camptonectes*) *virdunensis* (Buvignier, 1852)

Camptonectes (*Camptonectes*) cf. *virdunensis* (Buvignier, 1852)

Camptonectes (*Camptonectes*) *subulatus* (Münster, 1836)

Camptonectes (*Grandinectes*) *teres* sp. nov.

Camptonectes (*Camptochlamys*) *clathratus* (Roemer, 1836)

Chlamys (*Chlamys*) *textoria* (Schlotheim, 1820)

Eopecten velatus (Goldfuss, 1833)

Pseudopecten (*Pseudopecten*) *tipperi* (Cox, 1936)

Radulopecten inequicostatus (Young & Bird, 1822)

Radulopecten fibrosus (J. Sowerby, 1816)

Radulopecten strictus (Münster, 1833)

Spondylopecten (*Plesiopecten*) *subspinosus* (Schlotheim, 1820)

Trigonia (*Trigonia*) cf. *reticulata* Agassiz, 1840

Myophorella (*Myophorella*) sp.

Myophorella (*Promyophorella*) sp.

Corbulomima cf. *obscura* (J. de C. Sowerby, 1827)

Pterocardia buvignieri (Deshayes, 1857)

Lucinid sp. indet.

Neocrassina (*Neocrassina*) *subdepressa* (Blake & Hudleston, 1877)

Nicaniella extensa (Phillips, 1829)

Opis (*Trigonopis*) sp.

Protocardia (*Protocardia*) *striatula* (J. de C. Sowerby, 1829)

Protocardia (*Protocardia*) *intexta* (Münster, 1837)

Integricardium (*Integricardium*) *bannesianum* (Contejean, 1860)

Quenstedtia laevigata (Phillips, 1829)

Quenstedtia bathonica (Morris & Lycett, 1854)

Anisocardia (*Anisocardia*) aff. *tenera* (J. Sowerby, 1821)

Isocyprina cyreniformis (Buvignier, 1852)

arcticid bivalve sp. A

Eocallista tancrediformis (Blake & Hudleston, 1870)

Agrawalimya tubularis sp. nov.

Goniomya (*Goniomya*) *literata* J. Sowerby, 1819

Homomya vezelayi (d'Archiac, 1843)

Homomya cf. *vezelayi* (d'Archiac, 1843)

Neoburmesia iwakiensis Yabe & Sato, 1942

Pachymya (*Arcomya*) sp.

Pholadomya (Pholadomya) cf. *socialis* Morris & Lycett, 1854

Pholadomya (Bucardiomya) lirata (J. Sowerby, 1818)

Pholadomya (Bucardiomya) sp. A

Ceratomyopsis striata (d´Orbigny, 1822)

Ceratomya concentrica (J. de C. Sowerby, 1825)

Myopholas acuticostata (J. de C. Sowerby, 1827)

Platymyoidea sp.

Cercomya (*Capillimya*) *striata* (Agassiz, 1843)

tion of the specimen within the rock, either the area in front of the umbonal ridge or the area behind it is greatly expanded. Diagnostic features of the species include the distinct angle between the dorsal and posterodorsal margins, and the comparatively long dorsal margin compared to *Modiolus* (*Modiolus*) *bipartitus* J. Sowerby, 1818 (e.g., Arkell, 1929: 55, pl. 2, figs. 1-4, text-fig. 8).

Genus *Arcomytilus* Agassiz in J. Sowerby, 1842

Type species. *Mytilus pectinatus* J. Sowerby, 1821.

Arcomytilus laitmairensis (de Loriol, 1883)
Pl. 1, Figs. 5-8

1883 *Mytilus laitmairensis* sp. nov. – de Loriol: 57, pl. 8, figs. 6-12.

Material. Five right, 8 left valves, and 3 articulated specimens, all of them fragmented to a varying degree (BSPG2012XI 351-364, 528, PIW2003IV 22), from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area, the Kuh-e-Dowshakh area, at Kuh-e-Nakhlak and Kuh-e-Echellon, and from the Bidou Formation of the Chorand Valley, west of Ravar.
Description. Shell cuneiform, umbones pointed and situated at the anterior end. Flat to concave anteroventral area separated from the remainder of the shell by a distinct umbonal ridge. Dorsal margin straight to faintly convex and grading into the rounded posterior margin; anteroventral margin concave. Valves ornamented with numerous radial riblets, which may branch towards the posterior margin, so that the density of ribs remains the same across the shell. Towards the anteroventral and posterodorsal margins branching is more pronounced, and riblets exhibit a slight divaricate pattern.
Remarks. *Arcomytilus laitmairensis* is a wide spread Middle to Upper Jurassic species of the genus, occurring on both the northern and southern shelves of the Tethyan Ocean. Despite the poor preservation, the characteristic ornamentation and outline place the material from east-central Iran firmly in the species.

Genus *Inoperna* Conrad in Kerr, 1875

Type species. *Modiolus* (*Inoperna*) *carolinensis* Conrad, 1875.

Inoperna perplicata (Etallon, 1862)
Pl. 1, Fig. 9

1862 *Mytilus perplicatus* sp. nov. – Etallon in Thurmann & Etallon: 223, pl. 29, fig. 8.

Material. Three poorly preserved fragments of articulated composite moulds (BSPG2012XI 365-366, 368) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area and from the Echellon Limestone Member 45 km SW Tabas.
Description and remarks. Two of the specimens are fragmented composite moulds, the other one is the fragment of a cast of a right valve. The later shows the typical ornamentation of the species. It differs from the similar *Inoperna sowerbiana* (d'Orbigny, 1850) in having comparatively strong secondary ribs, which usually number 2-3 for each primary rib (Fürsich & Werner, 1988: 127). Another complete articulated composite mould is too poorly preserved to allow identification at the species level and therefore has been identified as *Inoperna* sp. (BSPG2012XI 367).

Order Arcoida Stoliczka, 1871
Family Parallelodontinae Dall, 1898
Genus *Grammatodon* Meek & Hayden, 1861
Subgenus *Grammatodon* Meek & Hayden, 1861

Type species. *Arca* (*Cucullaea*) *inornata* Meek & Hayden, 1859.

Grammatodon (*Grammatodon*) sp.
Pl. 1, Figs. 10-14.

Material. Composite moulds of 5 right and 8 left valves (BSPG2012XI 379 a-c, 382, 384, 385, 386, 387) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area (Chah-e-Bidu).
Description and remarks. Small, short specimens with straight dorsal margin and broad, salient umbones. Length/height ratio approximately 1.30. Antero- and posterodorsal margins forming an angle of 90-100° with the dorsal margin; with distinct posterior umbonal ridge. Shell surface covered with numerous faint radial riblets, which are stronger near the anterior and posterior end.

In one specimen remains of a typical *Grammatodon* hinge are seen. The general preservation, however, is too poor to allow identification at the species level.

Superorder Eupteriomorphia Boss, 1982
Order Pterioida Newell, 1965
Family Pteriidae Gray, 1847
Genus *Pteria* Scopoli, 1777

Type species. *Mytilus hirundo* Linne, 1758.

Pteria plana (Morris & Lycett, 1854)
Pl. 1, Fig. 15.

1854 *Pteria plana* sp. nov. – Morris & Lycett: 128, pl. 14, fig. 4.

Material. One right valve with remains of shell material (BSPG2012XI 380) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area (Chah-e-Bidu).
Description. Shell moderately inflated, oblique, with long posterior wing, and short anterior ear. Umbo projecting beyond the dorsal margin. Anterior region of valve more strongly sloping than the posterior part. Surface smooth except for growth lines.

Remarks. Fürsich & Werner (1988: 106) regarded *Pteroperna* Morris & Lycett, 1853 as a junior synonym of *Pteria* Scopoli, 1777, a view followed here.

Family Bakevelliidae King, 1850
Genus *Bakevellia* King, 1848
Subgenus *Bakevellia* King, 1848

Type species. *Avicula antiqua* Münster in Goldfuss, 1836.

Bakevellia (*Bakevellia*) *waltoni* (Lycett, 1863)

Pl. 1, Fig. 16

1863 *Gevillia waltoni* sp. nov. – Lycett: 110, pl. 32, fig. 4.
1995 *Bakevellia* (*Bakevellia*) *waltoni* (Lycett, 1863) – Muster: 38, pl. 5, figs. 1-13.

Material. Three fragmentary specimens: 2 poorly preserved articulated valves and 1 left valve (BSPG2012XI 335-337) from the Kamar-e-Mehdi Formation at Kuh-e-Echellon.

Description and remarks. Shell oblique, strongly inflated, narrow, with small anterior auricle and inconspicuous posterior wing. With ill-defined triangular area posterior of beak, and remains of ligament area seen; with closely spaced ligament pits. Below the anterior auricle there is a wide, shallow byssal notch.

The specimens, even though poorly preserved, fall in the range of variation of *Bakevellia* (*Bakevellia*) *waltoni* as defined by Muster (1995).

?*Bakevellia* sp.

Pl. 1, Fig. 17

Material. Two articulated specimen (BSPG2012XI 329) from the Kamar-e-Mehdi Formation at Kuh-e-Echellon.

Description and remarks. Shell medium sized, inequivalved (right valve much less inflated than left valve). Right valve with pointed umbo, anterodorsal margin concave, remains of a small anterior auricle seen. Posterodorsal margin straight and turning into well-rounded ventral margin. Remains of ligament area exhibit closely spaced ligament pits. Surface ornamentation of comarginal, spaced, wavy riblets.

The remains of the ligament area place the specimen clearly into the family Bakevelliidae. The shell consists of a very thin layer of calcite prisms, any aragonitic layers having been dissolved during diagenesis. In shape the specimens resemble *Bakevellia*, except for the distinctly unequal valves. For this reason, its identification is doubtful.

Genus *Costigervillia* Cox & Arkell, 1948

Type species. *Gervillia crassicosta* Morris & Lycett, 1853.

Costigervillia crassicosta (Morris & Lycett, 1853)

Pl. 1, Figs. 18-19

1853 *Gervillia crassicosta* sp. nov. – Morris & Lycett: 23, pl. 2, fig. 9.
1995 *Costigervillia crassicosta* (Morris & Lycett, 1853) – Muster: 48, pl. 6, figs. 11-14; pl. 7, figs. 1-3, text-fig. 34 (cum synonymy).

Material. One right and one incomplete articulated specimen (BSPG2012XI 369, 512) from the Echellon Limestone Member, W of Kuh-e-Echellon, and from the Kamar-e-Mehdi Formation of the Kuh-e-Dowshakh area.

Description and remarks. Although the anterior and posterior parts of one of the specimen are missing, the remaining information clearly identifies it as *Costigervillia crassicosta*. Characteristic features are the strongly inequivalved oblique shell, with the left valve distinctly inflated and the right valve concave, and the presence of eight coarse radial ribs on the left valve carries whereas the right valve appears to be smooth. There is a small anterior auricle and a more conspicuous posterior wing.

Genus *Gervillella* Waagen, 1907

Type species. *Perna aviculoides* J. Sowerby, 1814.

Gervillella lanceolata (Münster, 1833)

Pl. 1, Fig. 20; Pl. 2, Figs. 1-2

1833 *Gervillia lanceolata* sp. nov. –Münster in Goldfuss: 123, pl. 115, fig. 9.
1995 *Gervillella lanceolata* (Münster, 1833) – Muster: 66, pl. 12, figs. 5-10; pl. 13, figs. 1-7; pl. 14, figs. 1-2, text-fig. 50 (cum synonymy).

Material. One articulated composite mould, 6 right and 9 left valves, partly preserved with shell but commonly not complete (BSPG2012XI 370-378) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area.

Description and remarks. *Gervillella lanceolata* is relatively common in the Kamar-e-Mehdi Formation, but well preserved specimens are very rare. In several cases, the specimens are conspicuous elements of shell pavements where they occur as convex-up orientated single valves. Most specimens are comparatively small, the largest one measuring approximately 80 mm in length.

Muster (1995: 62) provided a table with the characteristic features of the various species of *Gervillella*. According to her, an important diagnostic feature is the ratio between the diagonal length and the maximum width (without the wing). As in our material this ratio is close to 5, and the ratio between the diagonal length and the length of the posterior wing is approximately 2, it can be placed with confidence into *Gervillela lanceolata*. *Gervillella monotis* (Eudes-Deslongchamps, 1824) exhibits similar values, but is characterized by an acute posterior wing, which is not present in our material.

Family Isognomonidae Woodring, 1925
Genus *Isognomon* Solander in Linghtfoot, 1786
Subgenus *Rostroperna* Cox, 1964

Type species. *Isognomon* (*Rostroperna*) *schencki* Cox, 1964.

Isognomon (*Rostroperna*) *thurmanni* (Contejean, 1860)
Pl. 2, Fig. 5

1860 *Perna thurmanni* sp. nov. – Contejean: 303, pl. 21, fig. 12.
1989 *Isognomon* (*Rostroperna*) *thurmanni* (Contejean, 1860) – Fürsich & Werner: 126, pl. 10, figs. 2-5, pl. 11, fig. 1, pl. 20, fig. 1, pl. 21, fig. 1, pl. 22, figs. 1-2, text figs. 14-17.

Material. One articulated specimens (BSPG2012XI 514) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area.
Description. Shell small for the species, compressed, with distinctly protruding, rounded anterior margin; ventral margin also well rounded, posterior margin concave. Umbones small, situated in the anterior half of the shell. Distinct posterior umbonal ridge present, separating a posterior wing from the main body. Most of this wing is broken off. Surface covered with irregular growth rugae. Ligament area only partially preserved, high, with irregularly arranged, comparatively narrow, vertical ligament grooves. Some of these grooves do not extend for the full height of the ligament area.
Remarks. Shell outline and features of the ligament area are characteristic of the subgenus of *Rostroperna*, and correspond closely to the material figured by Fürsich & Werner (1989). The small size of the specimen suggests that it is a juvenile.

Family Malleidae Lamarck, 1819
Genus *Eligmus* J.A. Eudes-Deslongchamps, 1856

Type species. *Eligmus polytypus* J.A. Eudes-Deslongchamps, 1856 (subsequently designated by Tate, 1868)

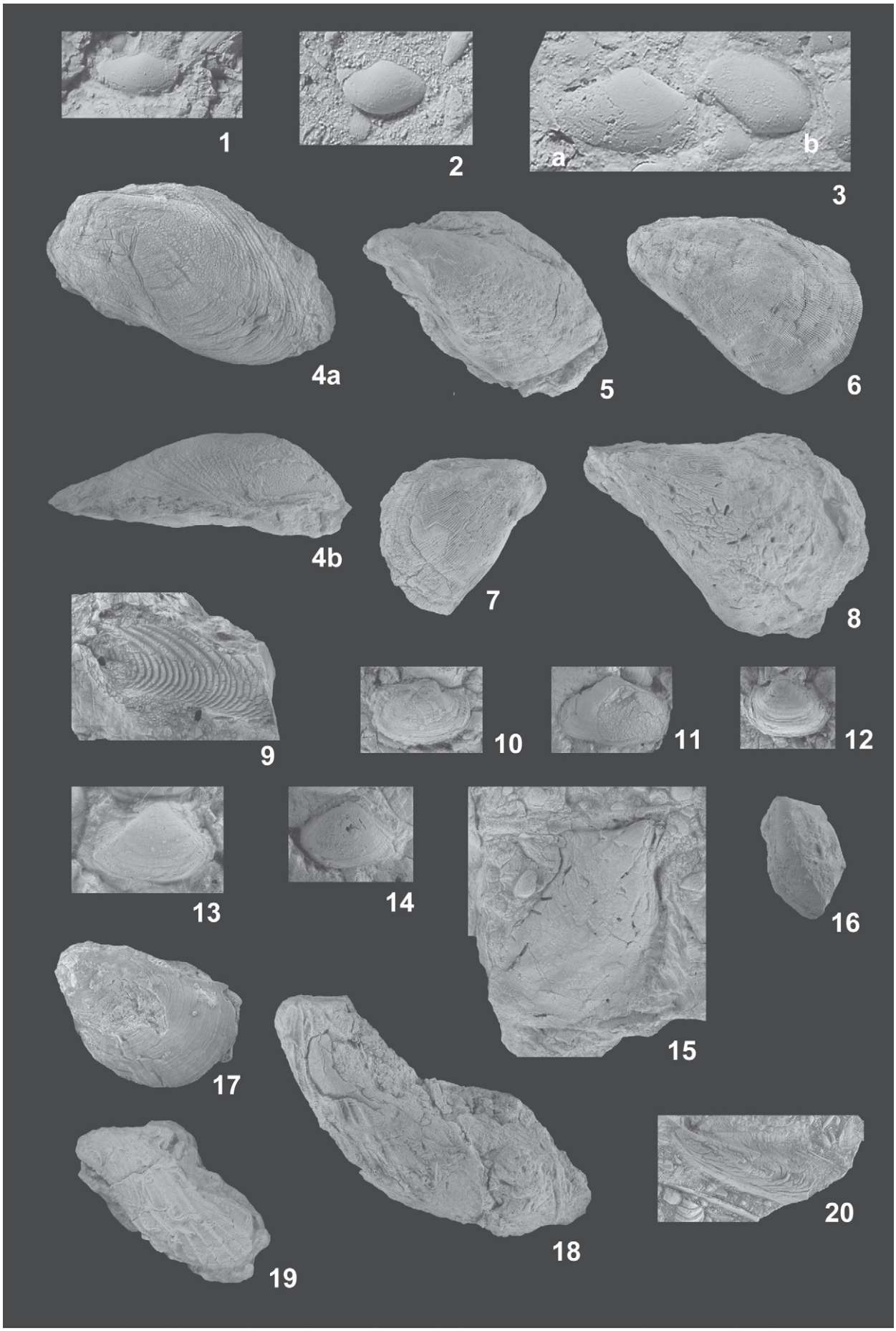
Eligmus rollandi Douvillé, 1907
Pl. 2, Figs. 3-4, 6

1907 *Heligmus rollandi* sp. nov. – Douvillé: 105, p. 15, figs. 1-3.

Material. 84 specimens (BSPG1012XI 290-300, PIW-2003IV 25) from the Echellon Limestone Member at Kuh-e-Echellon, Kuh-e-Nakhlak, and 45 km SW of Tabas, and from the Kamar-e-Mehdi Formation of the Kuh-e-Echellon area.
Measurements (in mm).

Specimen	L	H	n ribs
BSPG2012XI 295a	20.2	15.1	12
BSPG2012XI 295b	25.8	18.7	9
BSPG2012XI 295c	24.7	17.0	11
BSPG2012XI 296a	17.6	13.0	12
BSPG2012XI 296b	20.6	15.7	10
BSPG2012XI 291	38.3	27.1	>8
BSPG2012XI 293	22.0	18.5	8
BSPG2012XI 299a	25.0	20.1	13
BSPG2012XI 299b	17.1	14.9	10
BSPG2012XI 299c	19.3	14.6	>12
BSPG2012XI 299d	23.1	20.2	8
BSPG2012XI 299e	17.9	14.2	14
BSPG2012XI 299f	21.3	19.5	9
BSPG2012XI 299g	20.5	17.1	9
BSPG2012XI 299h	23.8	18.6	9
BSPG2012XI 299i	19.9	14.5	16
BSPG2012XI 299j	41.3	31.1	11

Plate 1: **Figs. 1-3**. *Mesosaccella morrisii* (Deshayes, 1853) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area. **1**. Right valve; BSPG2012XI 378b, x4. **2**. Left valve, BSPG2012XI 376, x4. **3**. Right valve (a) and left valve (b); BSPG2012XI 428a, b, x4.
Fig. 4. *Modiolus* (*Modiolus*) *imbricatus* J. Sowerby, 1818 from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area. Left valve; a: side view, b: dorsal view; BSPG2012XI 341, x1.
Figs. 5-8. *Arcomytilus laitmairensis* (de Loriol, 1883). **5**. Articulated specimen, left valve view, from the Kamar-e-Mehdi Formation of the Echellon area; BSPG2012XI 353, x1. **6**. Left valve from the Kamar-e-Mehdi Formation of Kuh-e-Nakhlak; PIW2003IV 22, x1. **7**. Right valve from the Kamar-e-Mehdi Formation of the Echellon area; BSPG2012XI 355, x1. **8**. Left valve from the Kamar-e-Mehdi Formation of Kuh-e-Nakhlak; BSPG2012XI 351, x1.
Fig. 9. *Inoperna perplicata* (Etallon, 1862) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area. Fragment of left valve; BSPG2012XI 365, x1.
Figs. 10-14. *Grammatodon* (*Grammatodon*) sp. from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area. 10. Right valve, BSPG2012XI 385, x1. 11. Left valve, BSPG2012XI 387a, x1. 12. Left valve, BSPG2012XI 384, x1. 13. Right valve, BSPG2012XI 386, x2. 14. Right valve, BSPG2012XI 387b, x2.
Fig. 15. *Pteria plana* (Morris & Lycett, 1854) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area. Right valve, BSPG2012XI 380, x1.
Fig. 16. *Bakevellia* (*Bakevellia*) *waltoni* (Lycett, 1863) from the Kamar-e-Mehdi Formation at Kuh-e-Echellon. Left valve; BSPG2012XI 335, x1.
Fig. 17. ?*Bakevellia* sp. from the Kamar-e-Mehdi Formation at Kuh-e-Echellon. Articulated specimen, left valve view; BSPG2012XI 329, x1.
Figs. 18-19. *Costigervillia crassicostata* (Morris & Lycett, 1853). **18**. Left valve, from the Kamar-e-Mehdi Formation of Kuh-e-Dowshakh; BSPG2012XI 369, x1. **19**. Left valve from the Kamar-e-Mehdi Formation at Kuh-e-Echellon; BSP2012XI 512, x1.
Fig. 20. *Gervillella lanceolata* (Münster, 1833) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area. Fragment of left valve; BSP2012XI 371, x1.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Description. Shell up to 41.3 mm in length, outline subcircular to elongate-ovate, poorly to moderately inflated, with the greatest inflation in the umbonal area. Dorsal margin straight, remaining margins well to broadly rounded. Umbones situated about one-fourth of the length of the dorsal margin from the anterior end. Interior of each valve with raised myphorous platform, which is dorsoventrally elongated and situated close to the umbones. Both valves with broad resilifer. Greatest thickness of shell in the umbonal area due to the pronounced resilifer and muscle scar platform. Surface ornamentation consisting of 8 to 16 somewhat irregular radial to slightly divaricate ribs. In cross-section, these ribs are either broadly rounded or else angular. Anterior-most part of shell and posterodorsal area devoid of ribs.
Remarks. According to Cox (1935), *Eligmus rollandi* differs from other species of the genus by the lack of crenulations along the posterodorsal margin and by a more elongated shape compared to *Eligmus weiri* Cox, 1935.

Eligmus rollandi occurs only at the base of the Kamar-e-Mehdi Formation (Echellon Limestone Member) in the northern part of the Tabas Block, where it forms thin shell concentrations, in which most individuals are enveloped by a microbial crust.

Family Pinnidae Leach, 1819
Genus *Pinna* Linné, 1758
Subgenus *Pinna* Linné, 1758

Type species. *Pinna rudis* Linné, 1758.

Pinna lanceolata J. Sowerby, 1821

Pl. 3, Figs. 1-2

1821 *Pinna lanceolata* sp. nov. – J. Sowerby: 145, pl. 281.
1933 *Pinna lanceolata* J. Sowerby – Arkell: 219, pl. 28, fig. 5
1934 *Pinna lanceolata* J. Sowerby – Arkell: pl. 29, figs. 1-3.

Material. Five articulated fragmented internal moulds with remains of shell (BSPG2012XI 330-334) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area and from the Echellon Limestone Member 45 km SW Tabas.
Description. Shell medium-sized for the genus, long, narrow, lanceolate. Dorsal margin long and straight, ventral margin faintly concave, posterior margin rounded-rectangular. Valves divided by a secondary ligament running from the umbo to the posterior end. Ventral half of shell ornamented with 8-12 slightly wavy radial ribs, dorsal half of shell with 3-5 radial ribs and distinct growth folds. Shell consisting of a thin prismatic layer.
Remarks. Although Arkell (1933) counted only 8-10 radial ribs on the ventral part of his specimens from the Oxfordian of England, we place the specimens from the Kamar-e-Mehdi Formation in his species, as all other features are identical.

Genus *Trichites* Voltz in Thurmann, 1832

Type species. *Trichites saussuri* Voltz in Thurmann, 1832.

Remarks. Fragments of *Trichites* are not uncommon in the Kamar-e-Mehdi Formation, but usually they are too small to be identified at the species level.

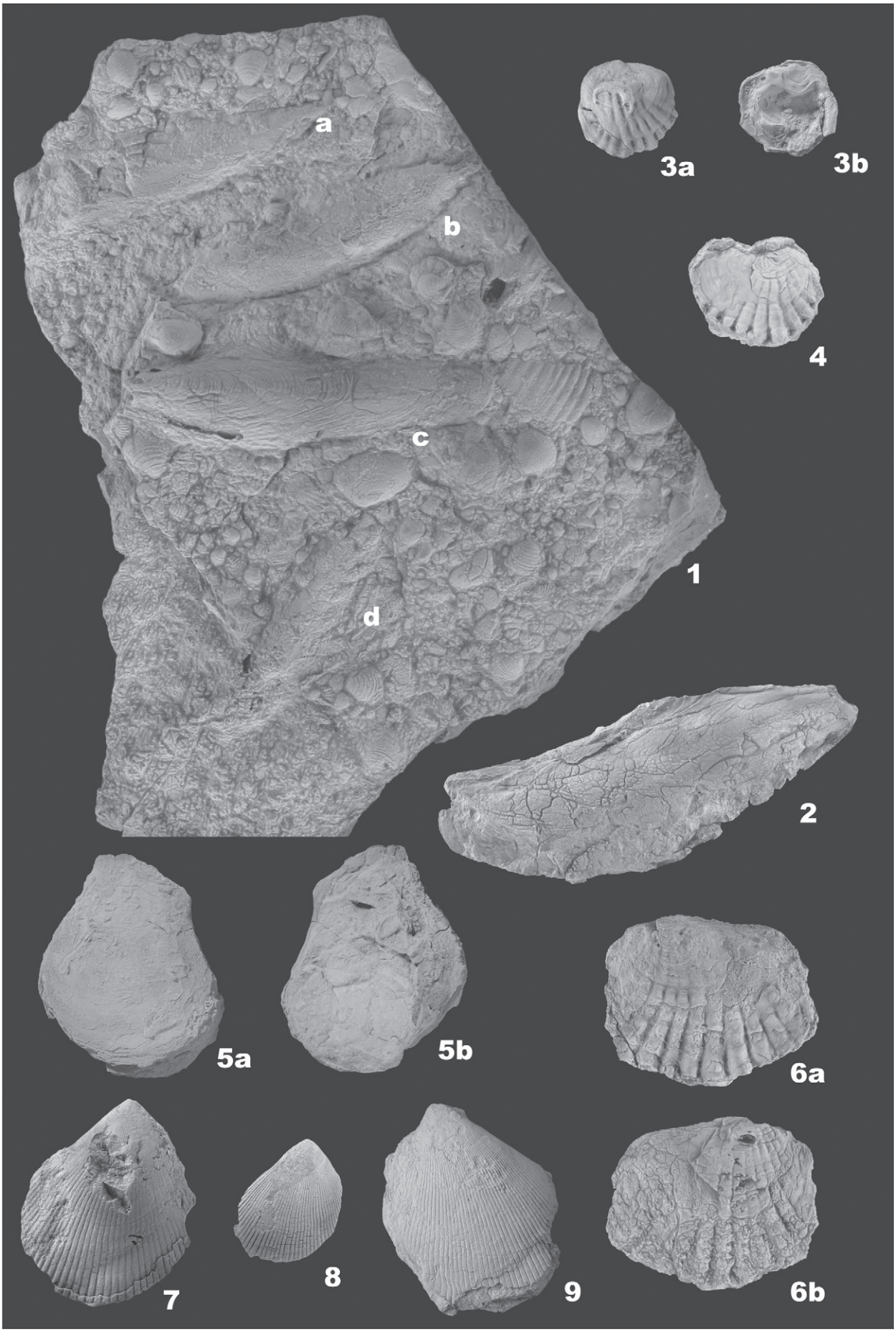
Trichites cf. *saussuri* Voltz in Thurmann, 1832

Pl. 6, Fig. 1

cf. 1832 *Trichites Saussuri* sp. nov. – Voltz in Thurmann: 13.
cf. 1881 *Trichites incrassatus* sp. nov. – Boehm: 171, pl. 34, figs. 1-4.

Material. One internal mould of an articulated specimen (BSPG2012XI 529) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area.
Description. Large internal mould (H: 132 mm), distinctly higher than long with remains of shell near the ventral margin exhibiting the typical prismatic structure of *Trichites*. Highly inequivalve: right valve strongly concave, left valve strongly convex. Dorsal margin straight, very short. Umbones inconspicuous, situated at the anterior end of the short dorsal margin. With at least six radial folds, some of them branching, which extend from the umbonal area to the margin.
Remarks. Several species of *Trichites* with pronounced radial folds have been described from Jurassic rocks. In *Trichites consolacionensis* Choffat, 1888 from the Kimmeridgian of the Lusitanian Basin the folds are restricted to the dorsal half of the flank (e.g., Fürsich & Werner 1988: 133, pl. 10, fig. 1, pl. 11, fig. 3, text-fig. 17). *Trichites mayeri* Choffat, 1888 from Callovian strata of the same basin is too incomplete to allow a proper judgement of its specific placement, *Trichites nodosus* Lycett (1850: 347, pl. 10) from the Bathonian of England differs in outline as does *T. perlongus* Boehm (1881: 172, pl. 36, fig. 2), and *T. rugatus* Boehm (1881: 173, pl. 36, fig. 1) from the Upper Jurassic of the Franconian Alb, southern Germany,

Plate 2: **Figs. 1-2**. *Gervillella lanceolata* (Münster, 1833) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area. **1**. Fragments of left valves (a, b, d) and fragment of right valve (c); BSPG2012XI 375a-d, x1. **2**. Articulated specimen, right valve view; BSPG2012XI 370, x1.
Figs. 3-4, 6. *Eligmus rollandi* Douvillé, 1907 from the Echellon Limestone Member, Kamar-e-Mehdi Formation, W of Kuh-e-Echellon. **3**. Left valve; a: lateral view, b: interior view; BSPG2012XI 294, x1. **4**. Right valve; BSPG2012XI 299a, x1. **6**. Articulated specimen; a: left valve view, b: right valve view; BSPG2012XI 299b, x1.
Fig. 5. *Isognomon* (*Rostroperna*) *thurmanni* (Contejean, 1860) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area. Articulated specimen; a: left valve view, b: right valve view; BSPG2012XI 514, x1.
Figs. 7-9. *Acesta* (*Acesta*) *spectabilis* (Contejean, 1859). **7**. Left valve from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; BSPG2012XI 250, x1. **8**. Left valve from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; BSPG2012XI 249, x1. **9**. Right valve from the Echellon Limestone Member S of Kuh-e-Bagh-e-Vang; BSPG2012XI246, x1.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and *T. suprajurensis* Krumbeck (1905: 96, pl. 10, fig. 1) from the Upper Jurassic of Lebanon. *Trichites seebachi* Boehm (1881: 170, pl. 32 fig. 1, pl. 33, fig. 2), again from the Upper Jurassic of the Franconian Alb, carries numerous and fairly regular radial folds.

The closest resemblance exist with *Trichites saussuri* Voltz in Thurmann, 1832 from the Upper Jurassic rocks of the Swiss Jhura Mountains and with its junior synonym *Trichites incrassatus* Boehm (1881: 171, pl. 34, figs. 1-4) from the Upper Jurassic of the Franconian Alb. Apart from a similar ornamentation, the specimen exhibits the same curvature of the valves as *T. saussuri*. As our specimen is, however, only an internal mould and as no further details about the ornamentation of the valves can be retrieved, we place it in the latter species with some reservation.

Order Limoida Waller, 1978
Family Limidae Rafinesque, 1815
Genus *Acesta* Adams & Adams, 1858
Subgenus *Acesta* Adams & Adams, 1858

Type species. *Ostrea excavata* Fabricius, 1779.

Acesta (*Acesta*) *spectabilis* (Contejean, 1859)
Pl. 2, Figs. 7-9

1859 *Lima spectabilis* sp. nov. – Contejean: 307, pl. 22, figs. 1-3.
1932 *Lima* (*Acesta*) cf. *spectabilis* Contejean – Arkell: 138, pl. 13, fig. 2.

Material. Eleven partly fragmented specimens, all of them single valves (BSPG2012XI 245-255) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area and S of Kuh-e-Bagh-e-Vang.
Description. Shell medium-sized, distinctly higher than long, weakly inflated. Umbo moderately pointed (umbonal angle 86-87°), anterodorsal margin straight to faintly concave, posterodorsal margin slightly convex, lower half of shell semi-circular. Anterior umbonal ridge well defined, delimiting a narrow, lanceolate lunule. Surface ornamented with numerous (37-52) flat-topped radial ribs separated by narrow punctate interspaces. In some specimens, the interstices are slightly wider and exhibit a pattern of narrowly spaced growth lines.
Remarks. Our specimens correspond to *Acesta* (*Acesta*) *spectabilis* of Contejean (1859), and Thurmann & Étallon (1862) in shape and ornamentation. Arkell (1932) placed his specimen from the Oxfordian of Yorkshire only with doubt in the species, because in Contejean's figure and description the ribs fade in the central part of the valves. We regard this feature, however, as part of the variability of the species. *Acesta* (*A.*) *spectabilis* differs from *Acesta* (*A.*) *subantiquata* discussed below by a lower number of radial ribs, which are distinctly wider. According to the Treatise (Cox & Hertlein, 1969: N386), *Acesta* exhibits an ill-defined anterior umbonal ridge, while in our specimens this umbonal ridge is very distinct. In this respect, our specimens resemble the genus *Plagiostoma*, the shape of which, however, differs distinctly from that of *Acesta*.

Acesta (*Acesta*) *subantiquata* (Roemer, 1836)
Pl. 3, Fig. 3

1836 *Lima subantiquata* sp. nov. – Roemer: 78, pl. 13, fig. 15.
1932 *Lima* (*Acesta*) *subantiquata* Roemer – Arkell: 136, pl. 13, figs. 8-10 (cum synonymy)
1936 *Lima* (*Acesta*) *subantiquata* Roemer – Arkell: pl. 51, fig. 15.

Material. One right valve (BSPG2012XI 244) from the Kamar-e-Mehdi Formation at Kuh-e-Nakhlak.
Description. Shell medium-sized, weakly inflated, with acute umbo. Anterodorsal ridge straight, posterodorsal margin convex, auricles not seen. Ornamentation consisting of numerous fine radial striae of variable strength, separated by narrow punctate interstices.
Remarks. The acute umbo, the straight anterodorsal ridge, and the numerous radial riblets place the specimen into *Acesta* (*A.*) *subantiquata* as described by Arkell (1932, 1936).

Genus *Plagiostoma* J. Sowerby, 1814

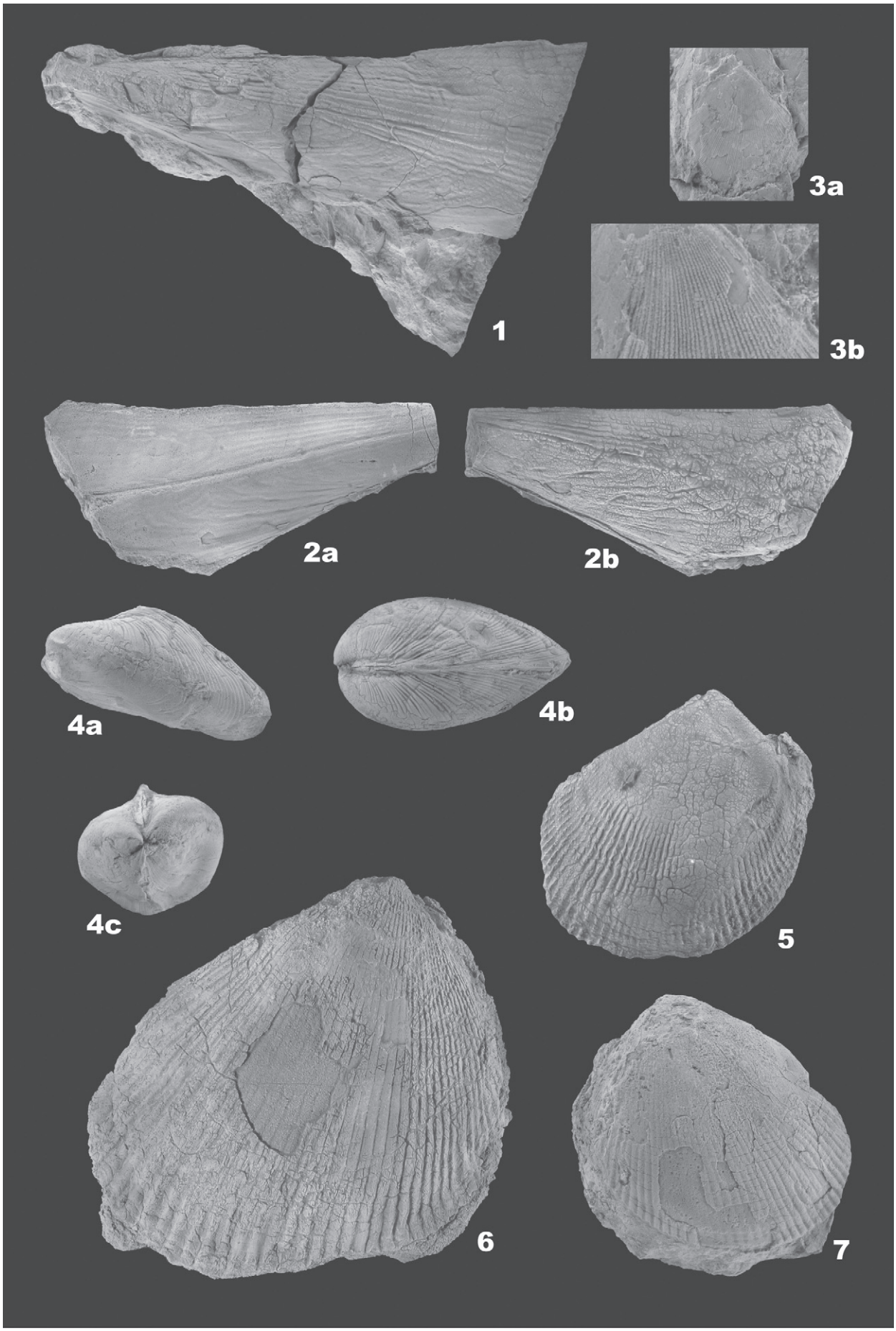
Type species. *Plagiostoma giganteum* J. Sowerby, 1814 by subsequent designation (Stoliczka 1871).

Plagiostoma laeviusculum J. Sowerby, 1822
Pl. 3, Figs. 5-7

1822 *Plagiostoma laeviusculum* sp. nov. – J. Sowerby: 112, pl. 382.
1931 *Lima* (*Plagiostoma*) *laeviuscula* (Sowerby) – Arkell: 129, pl. 12, figs. 2-3.
1932 *Lima* (*Plagiostoma*) *laeviuscula* (Sowerby) – Arkell: pl. 14, figs. 1-3.

Material. Two articulated specimens and 4 fragmented single valves (BSPG2012XI 256-265) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area, at Kuh-e-Echellon, S of Kuh-e-Bagh-e-Vang, N of Kalshaneh, and E of Tigh-e-Nakhlak, and from the Echellon Limestone Member N of Kalshaneh.

Plate 3: **Figs. 1-2**. *Pinna lanceolata* J. Sowerby, 1821 from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area. **1**. Articulated specimen, left valve view; BSPG2012XI 331, x1. **2**. Articulated specimen; a: right valve view, b: left valve view; BSPG2012XI 331, x1.
Fig. 3. *Acesta* (*Acesta*) *subantiquata* (Roemer, 1836) from the Kamar-e-Mehdi Formation at Kuh-e-Nakhlak. Right valve; BSGP2012XI 244; a: x1; b: x4.
Fig. 4. *Modiolus* (*Modiolus*) *imbricatus* J. Sowerby, 1818 from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area. Articulated specimen; a: left valve view, b: dorsal view, c: anterior view; BSPG2012XI 344, x1.
Figs. 5-7. *Plagiostoma laeviusculum* J. Sowerby, 1822. **5**. Left valve from the Kamar-e-Mehdi Formation 45 km SW of Tabas; BSPG2012XI 258, x1. **6**. Left valve from the Echellon Limestone Member, S of Kuh-e-Bagh-e-Vang; BSPG2012XI 265, x1. **7**. Right valve from the Kamar-e-Mehdi Formation E of Kuh-e-Nakhlak; BSPG2012XI 256, x1.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Description. Shell medium- to large-sized, longer than high, moderately inflated, but with depressed umbonal area. Anterior part of the shell much larger than posterior part, margins well-rounded except for the concave anterodorsal margin and the straight posterodorsal margin. Anterior umbonal ridge very distinct, faintly concave, deliminating a wide lunule. Anterior auricle small. Ornamentation consisting of numerous radial ribs (50-60), rounded in cross-section and separated in the central part of the shell by equally wide sulci, which narrow towards the umbonal area. Sulci crossed by numerous, narrowly spaced growth lines, which turn into punctae in the umbonal area.

Remarks. The specimens clearly falls in the range of variation of *Plagiostoma laeviusculum* as figured by Arkell (1931, 1932).

Plagiostoma hersilium d'Orbigny, 1850

Pl. 4, Fig. 1

1850 *Plagiostoma hersilia* sp. nov. – d'Orbigny: 283, n° 392.
1910 *Lima hersilia* d'Orb. – Thevenin: 94 (66), pl. 19, figs. 7-8.
cf. 1943 *Lima* (*Plagiostoma*) *hersilia* d'Orbigny – Cox: 176, pl. 26, fig. 73, pl. 27, fig. 74.

Material. One right valve (BSPG2012XI 266) from the Echellon Limestone Member S of Kuh-e-Bagh-e-Vang.

Description. Shell comparatively large, longer than high (H: 61.8 mm), ovate, moderately inflated, with long, more or less straight anterodorsal margin; posterodorsal margin much shorter and convex, remaining margins regularly curved. Auricles broken off. Ornamentation consisting of numerous rounded ribs (>110) with interstices that are narrow and punctate in the umbonal area (up to a height of about 4 cm). The interstices increase in width and exhibit narrowly spaced growth lines towards the venter.

Remarks. Our specimen closely resemble *Plagiostoma hersilium* as figured by Thevenin (1910). *Lima* (*Plagiostoma*) *hersilium* of Cox (1943) reaches much larger sizes (L up to 21.5cm) and the anterodorsal margin is sloping less steeply. Due to the large size of his specimen figured on pl. 26 fig. 73, the radial ornamentation appears coarser, with the interstices becoming distinctly wider than the ribs.

Plagiostoma aff. *mutabile* Arkell, 1926

Pl. 4, Figs. 2-5

aff. 1926 *Lima* (*Plagiostoma*) *mutabilis* sp. nov. – Arkell: 201, pl. 20, figs. 1-3.

Material. Twenty specimens, 2 of them articulated, the remaining ones commonly fragmented single valves (BSPG2012XI 267-286) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area, N of Kalshaneh, Kuh-e-Echellon, and Kuh-e-Nakhlak, and from the Echellon Limestone Member S of Kuh-e-Bagh-e-Vang, 45 km SW of Tabas, and N of Kalshaneh.

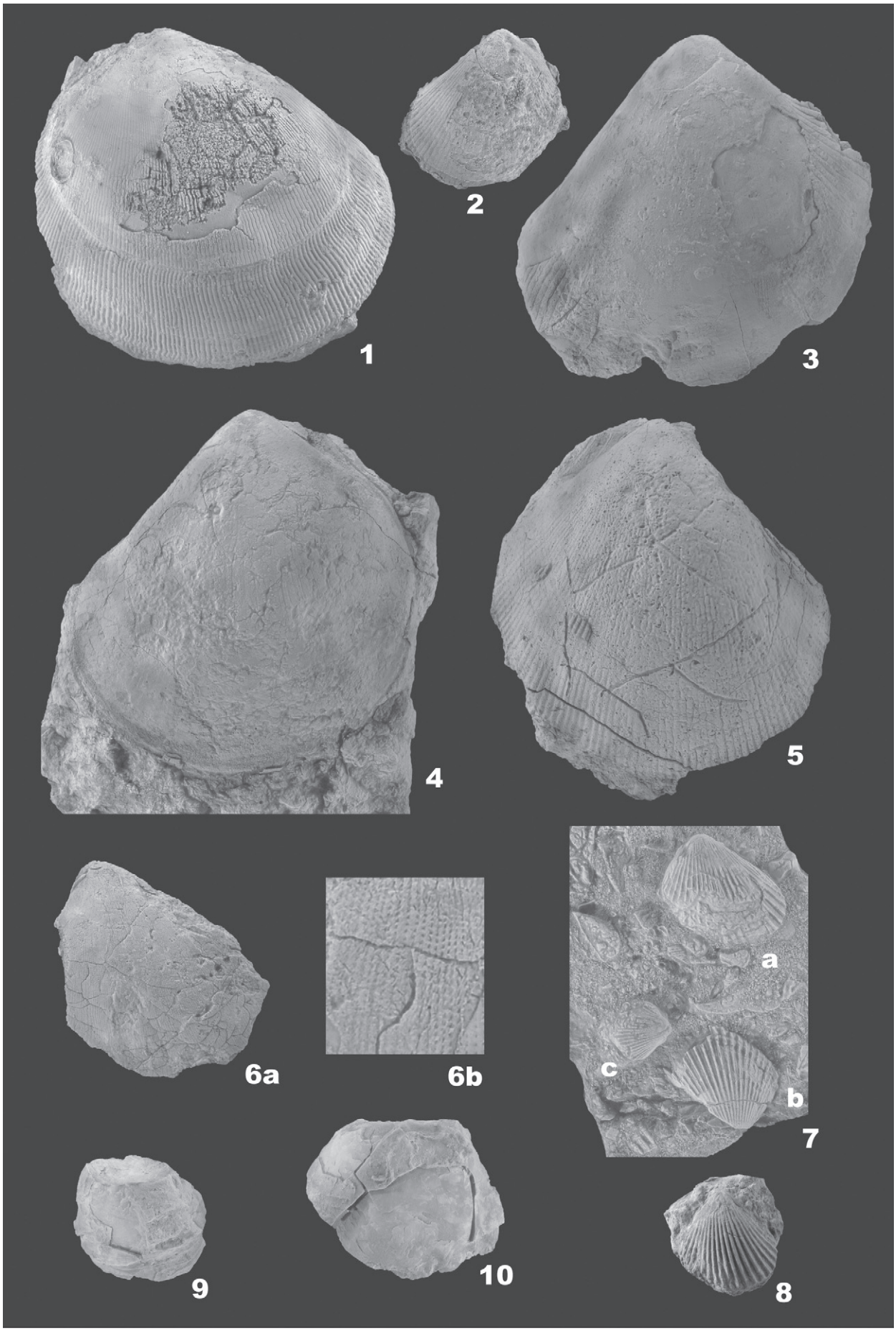
Measurements (in mm).

Specimen	L	H	L/H
BSPG2012XI 269	28.1	28.3	0.99
BSPG2012XI 270	58.8	60.3	0.97
Holotype (Arkell, 1926: pl. 20, figs. 1-3)	118	114	1.03

Description. Shell medium-sized, less oblique than many other species of *Plagiostoma*, anterodorsal margin straight and longer than the curved posterodorsal margin; remaining margins well rounded. Lunule well developed, wide. Inflation moderate to high. Ornamentation highly variable, in some specimens radial riblets and grooves are only seen on the anterior and posterior part of the shell, the remaining shell surface being smooth. In other specimens the whole surface is covered with numerous (60-80) flat-topped ribs, separated by narrow grooves. In yet other specimens, the width of ribs and furrows may be equal. In the umbonal area, only very narrow interstices exist, which exhibit distinct punctae.

Remarks. Our specimens resemble *Plagiostoma mutabile* Arkell, 1926 in the pattern of ornamentation, except that, according to Arkell, the material from the Oxfordian of England does not exhibit punctae. Other differences include the length/height ratio, our specimens being generally slightly higher than long, whereas the specimens from England are slightly longer than high. As numerous species of *Plagiostoma* have been described from Jurassic strata, which are often difficult to keep apart, it appears best to place the specimens from east-central Iran tentatively in *P. mutabile* rather than erecting a new species.

Plate 4: **Fig. 1**. *Plagiostoma hersilium* d'Orbigny, 1850 from the Echellon Limestone Member S of Kuh-e-Bagh-e-Vang. Right valve, BSPG2012XI 266, x1.
Figs. 2-5. *Plagiostoma* aff. *mutabile* Arkell, 1926. **2**. Left valve from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; BSPG2012XI 269, x1. **3**. Left valve from the Kamar-e-Mehdi Formation 45 km SW of Tabas; BSPG2012XI 279, x1. **4**. Left valve from the Echellon Limestone Member, 45 km SW of Tabas; BSPG2012XI 270, x1. **5**. Right valve from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; BSPG2012XI 273, x1.
Fig. 6. *Plagiostoma aciculatum* (Münster, 1835) from the Echellon Limestone Member S of Kuh-e-Bagh-e-Vang. Articulated specimen, right valve view; BSPG2012XI 287; a: x1; b: x4.
Figs. 7-8. *Limea* (*Pseudolimea*) *duplicata* (J. de C. Sowerby, 1827) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area. **7**. Left valves (a-c); BSPG2012XI 413, x1. **8**. Left valve; BSPG2012XI 288, x1.
Figs. 9-10. *Liostrea sandalina* (Goldfuss, 1833) from the Kamar-e-Mehdi Formation at Kuh-e-Echellon. **9**. Left valve; BSPG2012XI 328, x1. **10**. Left valve; BSPG2012XI 327, x1.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Plagiostoma aciculatum (Münster, 1835)

Pl. 4, Fig. 6

1835 *Lima aciculata* sp. nov. – Münster in Goldfuss: 82, pl. 101, fig. 5a-c.

Material. One fragmented articulated specimen (BSPG2012XI 287) from the Echellon Limestone Member S of Kuh-e-Bagh-e-Vang.

Description and remarks. Due to its fragmented nature, little can be said about the shape of the specimen, except that it is comparatively compressed, with a long, straight anterodorsal ridge, which delimits a moderately wide lunule. The ornamentation consists of numerous (>100) narrow, punctate grooves. The dense punctate ornamentation and the compressed shape are very similar to *Plagiostoma aciculatum*, and therefore we place our specimen in this species.

Genus *Limea* Bronn, 1831
Subgenus *Pseudolimea* Arkell in Douglas & Arkell, 1932

Type species. *Plagiostoma duplicata* J. de C. Sowerby, 1827

Limea (*Pseudolimea*) *duplicata* (J. de C. Sowerby, 1827)

Pl. 4, Figs. 7-8

1827 *Plagiostoma duplicata* sp. nov. – J. de C. Sowerby: 114, pl. 559, fig. 3.

Material. One right and 5 left valves (BSPG2012XI 288-289, 412-413) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area and the Kuh-e-Dowshakh area, and the Echellon Limestone Member W of Kuh-e-Echellon.

Description and remarks. The small specimens (H: 16.2 mm; L: 16.5 mm) are inequilateral and carry 20-22 angular radial ribs. At the bottom of the grooves, there runs a faint line.

The ornamentation is characteristic of the subgenus *Pseudolimea* and the general shape of the shell corresponds closely to *Limea* (*P.*) *duplicata* as figured by numerous authors (e.g. Skwarko, 1974; Wen, 1979; Pugaczewska, 1986; Jaitly et al., 1995; Aberhan, 1998). The species differs from the closely related *L.* (*P.*) *alternicosta* by a higher number of ribs, faint secondary ribs, and in lacking the serrated ribs crests of the latter (Arkell, 1932: 140).

Order Ostreoida Férussac, 1822
Family Gryphaeidae Vialov, 1936
Genus *Liostrea* Douvillé, 1904

Type species. *Ostrea sublamellosa* Dunker, 1846.

Liostrea sandalina (Goldfuss, 1833)

Pl. 4, Figs. 9-10.

1833 *Ostrea sandalina* sp. nov. – Goldfuss: 21, pl. 79, fig. 9a-b, f-i (non 9c-e).

Material. Nine fragmentary specimens (BSPG2012XI 327-328) from the Kamar-e-Mehdi Formation at Kuh-e-Echellon.

Description and remarks. Shell quite variable in shape. Specimens generally larger than *Nanogyra nana* with a moderately large attachment area, and an umbo which is not or only slightly enrolled. Beyond the attachment area, the left valve grew away from the substrate forming an angle of up to 90˚with the older part of the shell. Some specimens exhibit indistinct radial folds.

Genus *Nanogyra* Beurlen, 1928

Type species. *Gryphaea nana* J. Sowerby, 1822

Nanogyra nana (J. Sowerby, 1822)

Pl. 5, Fig. 1

1822 *Gryphaea nana* sp. nov. – J. Sowerby: 114, pl. 383, fig. 3.

Plate 5: **Fig. 1**. *Nanogyra nana* (J. Sowerby, 1822) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area. Cluster of left valves, BSPG2012XI 301, x1.

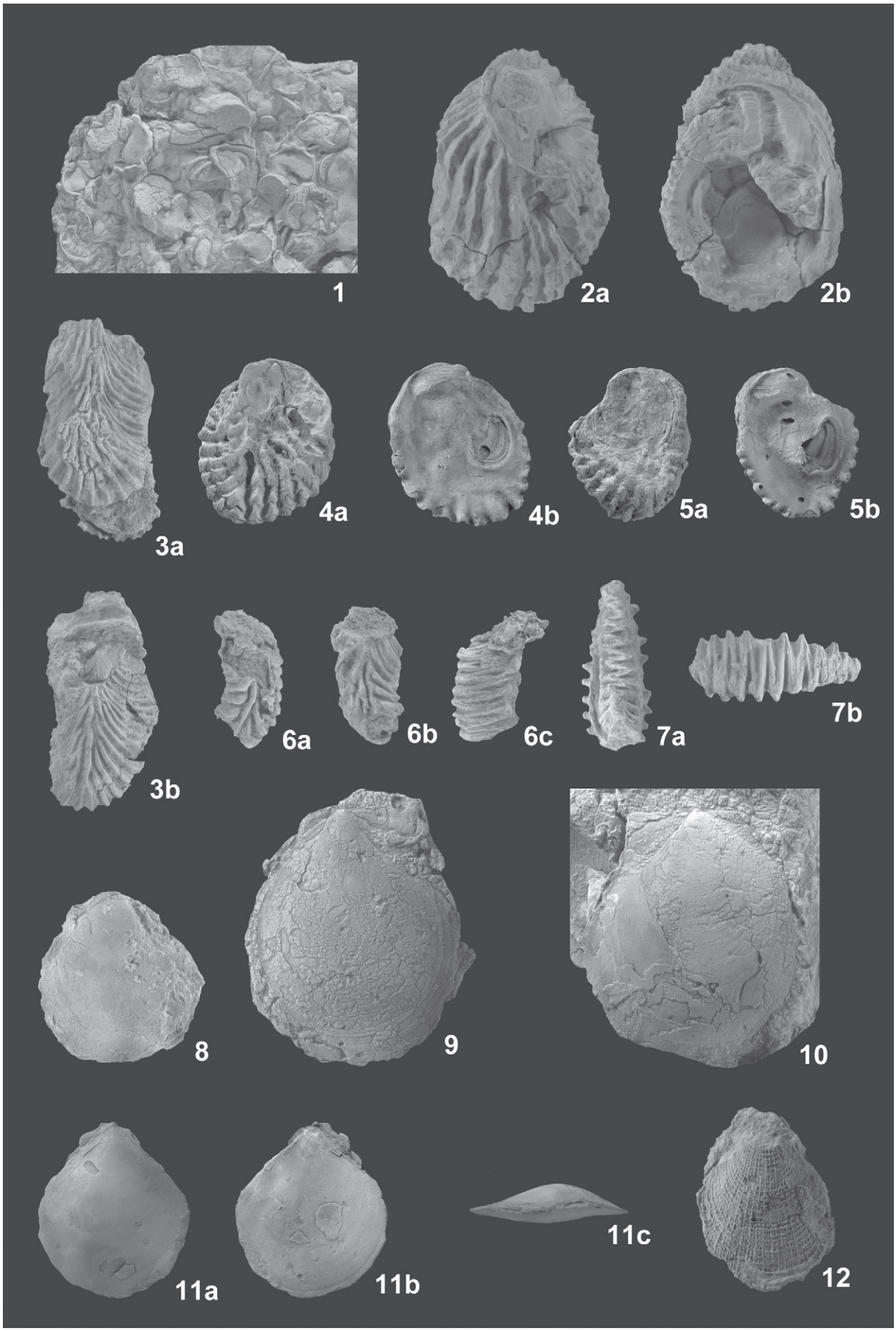
Figs. 2-5. *Actinostreon gregareum* (J. Sowerby, 1815). **2**. Left valve from the Echellon Limestone Member N of Kalshaneh; a: lateral view, b: interior view; BSPG2012XI 314a, x1. **3**. Articulated specimen from the Echellon Limestone Member, S of Kuh-e-Bagh-e-Vang; a: left valve view, b: right valve view; BSPG2012XI 315, x1. **4**. Right valve from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; a: lateral view, b: interior view; BSPG2012XI 310, x1. **5**. Right valve from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; a: lateral view, b: interior view; BSPG2012XI 311, x1.

Figs. 6-7. *Actinostreon erucum* (Defrance, 1821) from the Echellon Limestone Member. **6**. Articulated specimen, S of Kuh-e-Bagh-e-Vang; a: ?right valve view, b: ?left valve view, c: commissural view; BSPG2012XI 318, x1. **7**. Articulated specimen, W of Kuh-e-Echellon; a: ?left valve view, b: commissural view; BSPG2012XI 321, x1.5.

Figs. 8-9. *Camptonectes* (*Camptonectes*) *laminatus* (J. Sowerby, 1818). **8**. Right valve from the Kamar-e-Mehdi Formation N of Kalshaneh; BSPG2012XI 10, x1. **9**. Articulated specimen from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area, right valve view; BSPG2012XI 11, x1.5.

Figs. 10-11. *Camptonectes* (*Camptonectes*) *virdunensis* (Buvignier, 1852) . **10**. Left valve from the Echellon Limestone Member 45 km SW Tabas; BSPG2012XI 14, x1. **11**. Articulated specimen from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area, referred to the species with some doubt; a: right valve view, b: left valve view, c: dorsal view; BSPG2012XI 28, x1.

Fig. 12. *Camptonectes* (*Camptochlamys*) *clathratus* (Roemer, 1836). 5. Fragmented single valve from the Echellon Limestone Member, N of Kalshaneh; BSPG2012XI 5, x1.


1
2a
2b
3a
4a
4b
5a
5b
3b
6a
6b
6c
7a
7b
8
9
10
11a
11b
11c
12

Material. Two slabs with numerous, partly poorly preserved specimens, representing articulated, right, and left valves (BSPG2012XI 301-302) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area. In addition, scattered specimens occur encrusting other taxa.
Description and remarks. The uniformly small size, the strongly enrolled umbo, the distinctly convex left valve and flat to slightly concave right valve, clearly identify the bivalve as *Nanogyra nana*, one of the most widespread encrusting bivalves in the Jurassic. At several horizons within the Kamar-e-Mehdi Formation, *Nanogyra nana* is a major constituent of meter-sized patch reefs forming the reef framework together with calcareous sponges (Wilmsen et al., 2010).

Family Ostreidae Wilkes, 1810
Genus *Actinostreon* Bayle, 1878

Type species. *Ostrea solitaria* J. Sowerby, 1824.

Actinostreon gregareum (J. Sowerby, 1815)
Pl. 5, Figs. 2-5

1815 *Ostrea gregarea* sp. nov. – J. Sowerby: 19, pl. 111, figs. 1, 3.
1824 *Ostrea solitaria* sp. nov. – J. de C. Sowerby: 105, pl. 468, fig. 1.
1933 *Lopha gregarea* (J. Sowerby) – Arkell: 183, pl. 22, figs. 5-6, pl. 23, figs. 1-4.
1933 *Lopha solitaria* (J. Sowerby) – Arkell: 185, pl. 22, fig. 4, pl. 23, figs. 5-7.

Material. Fifty-two specimens (BSPG2012XI 303-317) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area and N of Kalshaneh, and from the Echellon Limestone Member S of Kuh-e-Bagh-e-Vang.
Description. Shells small to medium in size, very irregular in outline, depending on size of the attachment area. Outline varies from subcircular to irregular-ovate, some are narrow, much higher than long. The former morphotype is much more common. Ligament area highly variable, triangular to rectangular. Muscle scar reniform, clearly situated in the posterior half of the valve. At some point of growth, the left valves started to grow away from the substrate. It is from this point onwards that the ornamentation in form of angular radial ribs starts. Number of ribs 14-33. Ribs in the central ventral area occasionally more strongly developed and wider spaced than those of the anterior and posterior area. New ribs may be intercalated towards the ventral margin. The narrow morphotype usually carries a slightly higher number of ribs.
Remarks. Like many other bivalve workers, Arkell (1933) regarded *gregareum* and *solitarium* as two different species. As has been discussed by Jaitly et al. (2000), it is doubtful whether the two taxa merit separation at the species level. More likely, they represent ecophenotypic variants of one and the same species, the shape being strongly influenced by the substrate.

At some levels in the Kamar-e- Mehdi Formation, *Actinostreon* is quite common, forming loosely packed shell concentrations.

Actinostreon erucum (Defrance, 1821)
Pl. 5, Figs. 6-7

1821 *Ostrea eruca* sp. nov. – Defrance: 31.
1995 *Actinostreon eruca* (Defrance 1821) – Jaitly et al.: 186, pl. 14, figs. 9-11, pl. 15, figs. 1-2.

Material. Nine fragmented specimens (BSPG2012XI 318-326) from the Echellon Limestone Member at Kuh-e-Echellon and S of Kuh-e-Bagh-e-Vang.
Description. Very narrow, slightly curved, steep-sided *Actinostreon*. Cross-section of articulated valves rectangular, inflation commonly being greater than length. Ribs numerous, very sharp. Some specimens with a narrow smooth area in the middle of the shell extending from the umbo to the ventral margin, in others this part is covered with divaricating, partly branching ribs.
Remarks. Our material clearly falls within the range of variation of *Actinostreon erucum* as defined by Jaitly et al. (1995). The narrow smooth area on the flank of the shell of some specimens may result from attachment to a stick-like object.

Order Pectinoida Newell & Boyd, 1995
Family Pectinidae Wilkes, 1810
Genus *Camptonectes* Agassiz in Meek, 1864
Subgenus *Camptonects* Agassiz in Meek, 1864

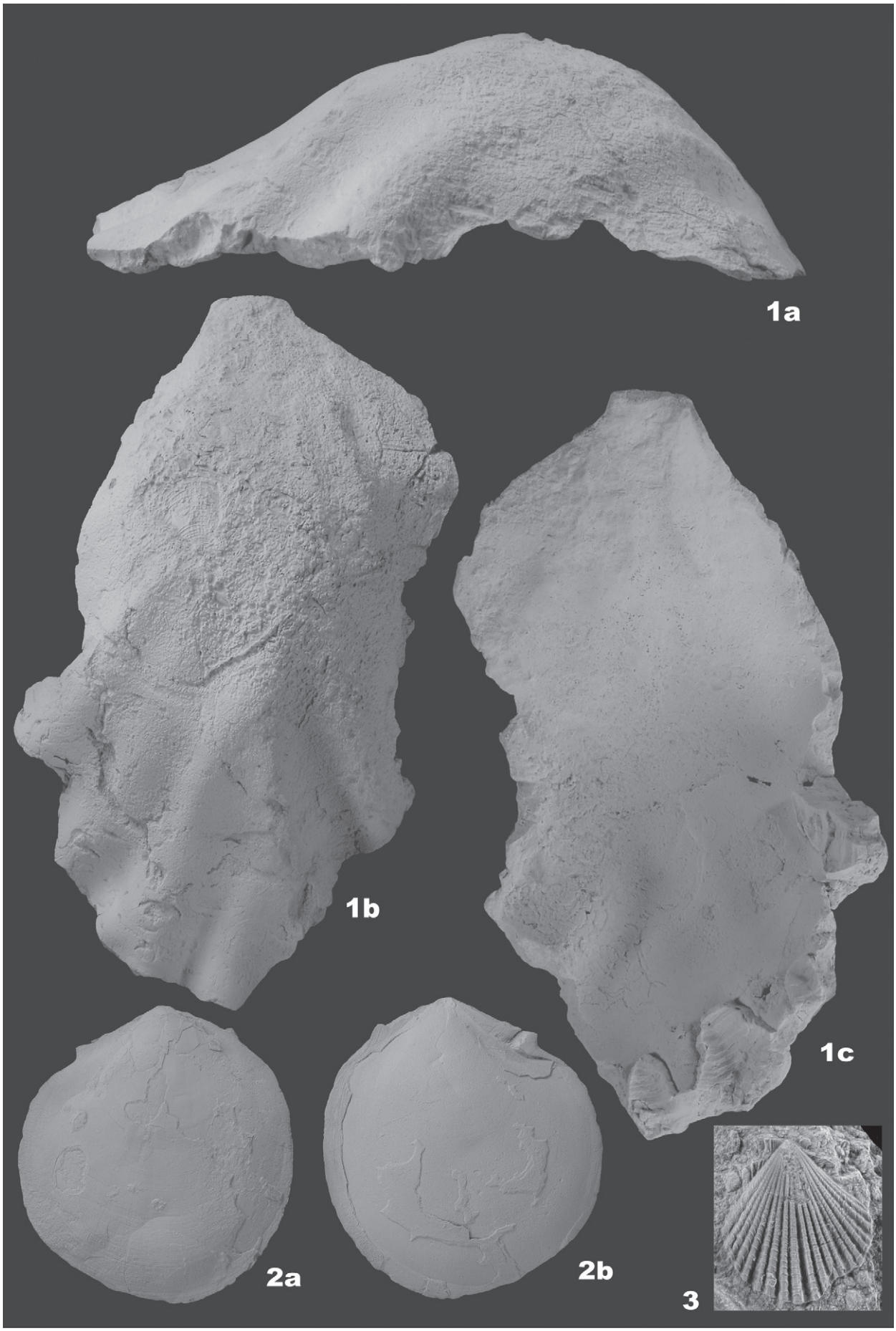
Type species. *Pecten lens* J. Sowerby, 1818.

Camptonectes (*Camptonectes*) *laminatus* (J. Sowerby, 1818)
Pl. 5, Figs. 8-9

1818 *Pecten laminatus* sp. nov – J. Sowerby: 4, pl. 205, fig. 4.
1984 *Camptonectes* (*Camptonectes*) *laminatus* (J. Sowerby, 1818) – Johnson: 124, pl. 4, figs. 10, 12-16, ?fig. 11; text-figs. 108-117. (cum syn.)

Material. Two articulated specimen, 1 right valve, and 1 left valve (BSPG2012XI 9-12) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area, at Kuh-e-Echellon, and N of Kalshaneh, and from the Echellon Limestone Member 45 km SW Tabas.
Measurements. (in mm).

Plate 6: **Fig. 1**. *Trichites* cf. *saussuri* Voltz in Thurmann, 1832. Internal mould of articulated specimen from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; a: posterior view (umbo at right), b: left valve view, c: right valve view; BSPG2012XI 529, x1.
Fig. 2. *Camptonectes* (*Camptonectes*) *subulatus* (Münster, 1836). Articulated specimen from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; a: left valve view, b: right valve view; BSPG2012XI 23.
Fig. 3. *Chlamys* (*Chlamys*) *textoria* (Schlotheim, 1820). Right valve from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; BSPG2012XI 223, x1.


1a
1b
1c
2a
2b
3

Specimen	L	H
BSPG2012XI 10	31.6	30.5
BSPG2012XI 11	37.0	31.2

Description. Specimens 31.6 to 61.0 mm in height, and 30.5 to >56.3 mm in length. Disc suboval, higher than long, slightly inequilateral. Greatest inflation of shell slightly posterior of the mid-line. Left valve slightly more inflated than right one. Anterior auricle of right valve with distinct byssal notch. Anterior dorsal margin of disc concave, remaining margin well rounded. Umbonal angle 95°. Ornamentation consisting of broad, flat, divaricate ribs separated by punctate interstices. Ornamentation less strongly developed in central area of disc.
Remarks. Johnson (1984) distinguished *Camptonectes* (*C.*) *laminatus* and *Camptonectes* (*C.*) *auritus* (Schlotheim, 1813) by the stronger ornamentations of the former. Based on this, our specimens can be placed in *laminatus*, even though their state of preservation is relatively poor.

Camptonectes (*Camptonectes*) *subulatus* (Münster, 1836)

Pl. 6, Fig. 2, Text-fig. 3

1836 *Pecten subulatus* sp. nov – Münster in Goldfuss: 73, pl. 98, fig. 12a-c.
1984 *Camptonectes* (*Camptonectes*) *subulatus* (Münster, 1836) – Johnson: 107, pl. 4, figs. 3-5, 7, 8; ?figs. 6, 9; text figs. 89-97. (cum syn.)

Material. Four articulated valves, 5 right and 3 left valves (BSPG2012XI 15-26) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area and S of Kuh-e-Bagh-e-Vang, and from the Echellon Limestone Member 45 km SW of Tabas and N of Kalshaneh.
Measurements (in mm).

Specimens	L	H	UA	H/UA
BSPG2012XI 15	54.8	57.9	129°	0.45
BSPG2012XI 17	56.4	56.2	125°	0.45
BSPG2012XI 19	47.6	52.3	-	-
BSPG2012XI 20	43.2	44.5	107°	0.42
BSPG2012XI 23	49.5	53.5	120°	0.45

Description. Disc orbicular, right and left valve faintly but similarly inflated, slightly inequivalve due to the concave anterodorsal margin of the right valve, while the anterodorsal margin of the left valve is straight to faintly concave. Discs slightly inequilateral, the line defining the greatest inflation not corresponding to the mid-line, but slightly posterior of it in the umbonal area. Auricles of right valve well demarcated, anterior auricle of the left valve not set off from the disc. Right anterior auricle with distinct byssal notch. Shell smooth, remains of divaricate grooves seen only at the anterior and posterior margins, as well as at the transition from the disc to the anterior auricle of the left valve.
Remarks. Johnson (1984) distinguished *Camptonectes* (*Camptonectes*) *subulatus* based on the restriction of the surficial ornament to the anterior and posterior shell margins. Compared to *C.* (*C.*) *virdunensis* the disc is more orbicular and generally of a larger size.

Camptonectes (*Camptonectes*) *virdunensis* (Buvignier, 1852)

Pl. 5, Figs. 10-11

1852 *Pecten virdunensis* sp. nov – Buvignier: 24, pl. 20, figs. 4-6.
1984 *Camptonectes* (*Camptonectes*) *virdunensis* (Buvignier, 1852) – Johnson: 130, pl. 4, figs. 1, 2; text figs. 118-120. (cum syn.)

Material. Three fragmented articulated specimens and 1 left valve (BSPG2012XI 13-14, 27-28) from the Echellon Limestone Member 45 km SW Tabas.
Measurements (in mm).

Specimen	L	H	UA	H/UA
BSPG2012XI 14	34.9	40.8	103°	0.40

Description. Disc suboval, higher than long, slightly inequivalve and inequilateral. Left valve slightly more inflated than right valve. Anterior ear of left valve distinctly larger than posterior ear, and set off from disc in contrast to the posterior auricle. On most part of disc ornamentations hardly visible, except near the ventral margin.
Remarks. The distinctly greater height compared to the length, and the faint ornamentation place our specimens with confidence into *Camptonectes* (*Camptonectes*) *virdunensis* as defined by Johnson (1984). The H/UA ratio is 0.40. The specimen BSPG2012XI 28 figured on Pl. 5, Fig. 11a-c can only with doubt be referred to *virdunensis*, as only small relicts of the shell are preserved. Still, the overall shape and the less inflated right as compared to the left valve suggest that it may belong to this species.

Subgenus *Camptochlamys* Arkell, 1930

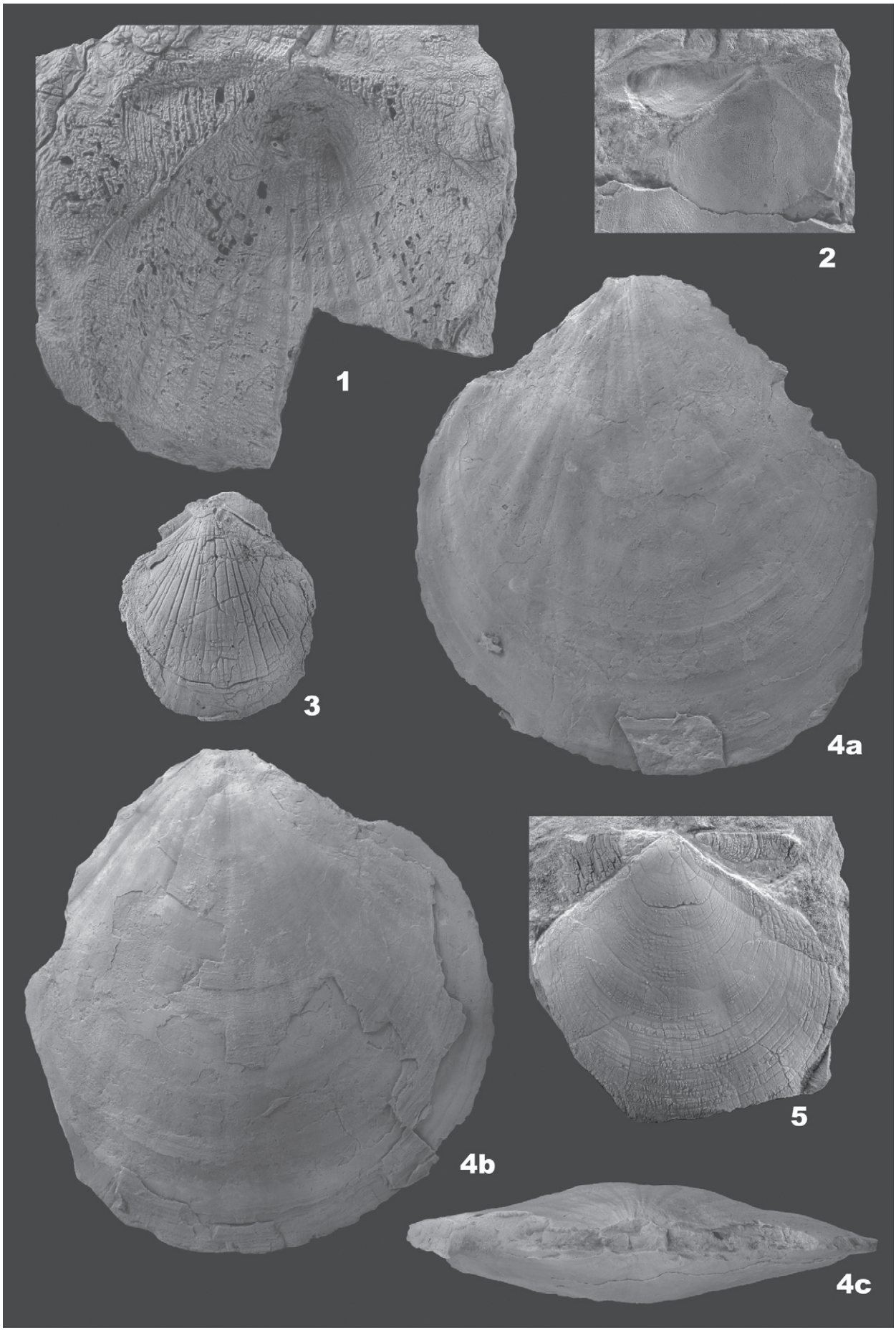
Type species. *Pecten intertextus* Roemer, 1839.

Camptonectes (*Camptochlamys*) *clathratus* (Roemer, 1836)

Pl. 5, Fig. 12; Pl. 7, Fig. 1

1836 *Pecten clathratus* sp. nov – Roemer: 212, pl. 13, fig. 9.
1984 *Camptonectes* (*Camptochlamys*) *clathratus* (Roemer, 1836) – Johnson: 143, pl. 4, figs. 23, 26, 27; pl. 5, figs. 1-3, 6; text figs. 131-136. (cum syn.)

Plate 7: Fig. 1. *Camptonectes* (*Camptochlamys*) *clathratus* (Roemer, 1836). Fragment of external mould of left valve from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; BSPG2012XI 1, x1.
Figs. 2-5. *Camptonectes* (*Grandinectes*) *teres* sp. nov. **2**. Fragment of right valve from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; BSPG2012XI 41, x1. **3**. Articulated specimen, left valve view, from the Bidou Formation of the Chorand Valley, W of Ravar; BSPG2012XI 35, x1. **4**. Articulated specimen from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; a: left valve view, b: right valve view, c: dorsal view; BSPG2012XI 36, x1. **5**. Fragment of right valve from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; BSPG2012XI 42, x1.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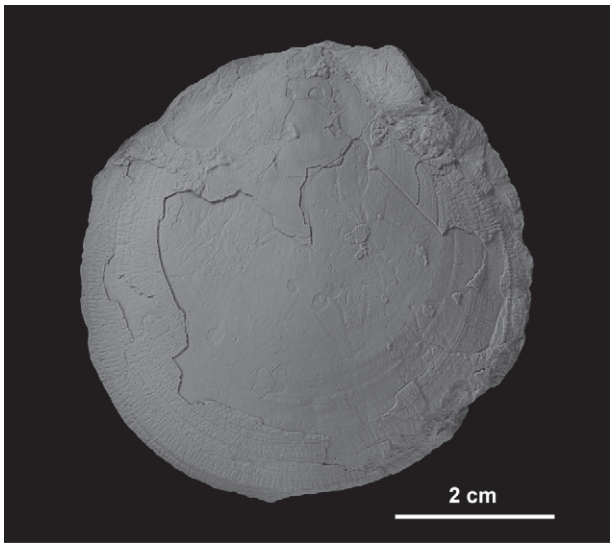


Text-fig. 3. *Camptonectes* (*Camptonectes*) *subulatus* (MÜNSTER, 1836). Right valve from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; BSPG2012XI 17, x1.

Material. Eight specimens (1 fragmented left valve, 7 fragmented single valves; BSPG2012XI 1-8) from the Kamar-e-Mehdi Formation at Kuh-e-Echellon and of the Kamar-e-Mehdi area, and from the Echellon Limestone Member N of Kalshaneh and 45 km SW Tabas.
Description. Specimens strongly varying in size (from 2 to >9 cm in height). Disc suboval, higher than long. Anterior ear of left valve not set off from disc, in contrast to posterior ear. Ornamentation consisting of sharp comarginal ribs crossed by numerous (more than 40) radial ribs, resulting in a reticulate pattern. Comarginal ribs stronger than radial ones. Distances between radial ribs smaller than between comarginal ribs. The specimen figured on Pl. 7, Fig. 1 is an external mould preserving the more elevated parts of the ornamentation. As a result, the distances between ribs appear larger. No divaricate striae observed. Auricles of left valve with distinct comarginal riblets; the presence of any radial ornamentation could not be ascertained.
Remarks. Although the specimens are poorly preserved and fragmented, they show the diagnostic features of *Camptonectes* (*Camptochlamys*) *clathratus* as defined by Johnson (1984), with the radial ornamentation extending to the ventral margin.

Subgenus *Grandinectes* subgen. nov.

Type species. *Camptonectes* (*Grandinectes*) *teres* sp. nov.

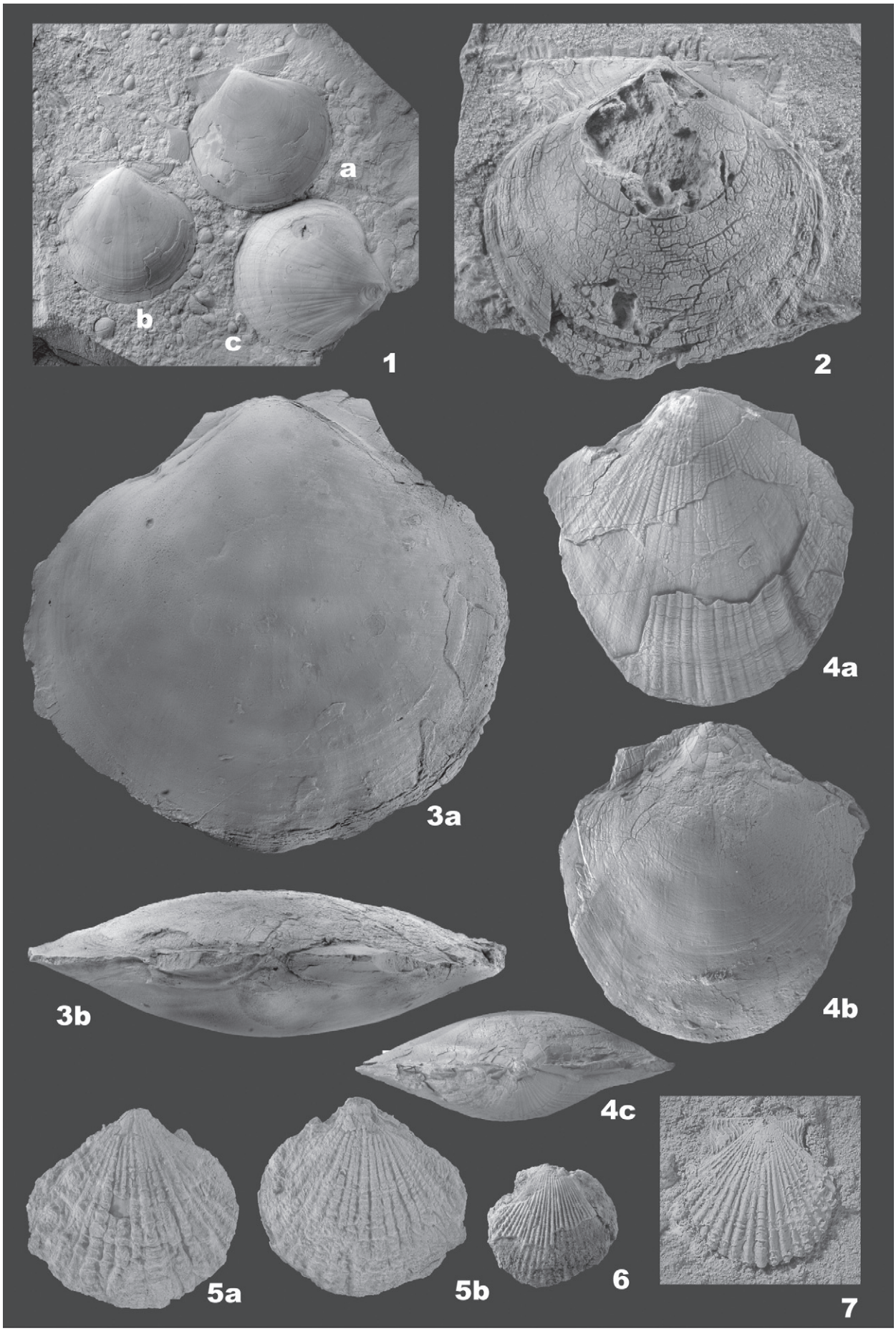
Derivation of name. Grandis (Latin) = large; for the large size of the individuals.
Diagnosis. Large, orbicular shells lacking any divaricate ornamentation. Right valve smooth, Left valve with radial ribs of varying strength.
Remarks. *Grandinectes* belongs to the group of large-sized *Camptonectes*, such as *Mclearnia* CRICKMAY, 1930, but differs from the latter by lacking the typical divaricate ornamentation, which is clearly seen in the holotype (*Pecten cinctus* J. SOWERBY, 1822, p. 96, pl. 371; see also KELLY, 1984: p. 70, pl. 11, figs. 10-14; pl. 12, figs. 2, 4). Moreover, *Mclearnia* is typical boreal in its distribution, Jurassic members of the species being, apart from rare occurrences in the Upper Volgian of East England, restricted to East Greenland, Northern Russia, and the ?Canadian Arctic.

Camptonectes (*Grandinectes*) *teres* sp. nov.
Pl. 7, Figs. 2-5; Pl. 8, Figs. 1-4

Derivation of name: Teres (Latin) = smooth; for the lack of the typical divaricate ornamentation and often smooth valves.
Diagnosis. As for genus.
Material. Seventeen articulated valves (both shells and internal moulds), 5 right and 6 left valves, 3 fragmented single valves (BSPG2012XI 29-55, PIW2003IV 19) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area and further W, the Nar Limestone Member N of Kuh-e-Echellon, and from the Bidou Formation of the Chorand valley, W of Ravar. Holotype: BSPG2012XI 55; paratypes: BSPG2012XI 46a-c, PIW2003IV 19.
Measurements (in mm).

Specimen	L	H	UA	H/UA
BSPG2012XI 29	117.2	114.1	-	-
BSPG2012XI 30	57.6	59.6	111°	0.54
BSPG2012XI 32	68.2	63.8	118°	0.54
BSPG2012XI 37	86.7	86.2	119°	0.72
BSPG2012XI 38	53.4	53.5	113°	0.47
BSPG2012XI 46a	46.3	48.1	112°	0.43
BSPG2012XI 46b	45.2	45.6	113°	0.40
BSPG2012XI 46c	48.9	50.2	110°	0.46
BSPG2012XI 47	70.2	71.5	108°	0.66
BSPG2012XI 51	67.8	67.2	108°	0.62
BSPG2012XI 52	79.2	80.1	111°	0.72
BSPG2012XI 53	52.3	53.9	109°	0.49
PIW2003IV 19	85.7	81.3	118°	0.69

Plate 8: Figs. 1-4. *Camptonectes* (*Grandinectes*) *teres* sp. nov. **1**. Right valve (a, b) and left valve (c) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; BSPG2012XI 46a-c, x0.5. **2**. Left valve from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; BSPG2012XI 43, x1. **3**. Paratype, articulated specimen from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; a: left valve view, b: dorsal view, PIW2003IV 19, x0.7. **4**. Holotype, articulated specimen from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; a: left valve view, b: right valve view, c: dorsal view; BSPG2012XI 55, x1.
Figs. 5-7. *Chlamys* (*Chlamys*) *textoria* (SCHLOTHEIM, 1820). **5**. Articulated specimen from the Kamar-e-Mehdi Formation S of Kuh-e-Bagh-e-Vang; a: right valve view, b: left valve view; BSPG2012XI 236, x1. **6**. Fragment of right valve from the Kamar-e-Mehdi Formation W of Kuh-e-Echellon; BSPG2012XI 242, x1. **7**. Left valve from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; BSPG2012XI 227, x1.


a
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2
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4a
3b
4b
4c
5a
5b
6
7

Description. Shell large, maximum length 117.2 mm, disc orbicular, nearly equilateral. Umbonal angle varying between 108° and 119°. Posterodorsal margin of the disc straight, anterodorsal margin faintly concave. Left valve weakly to moderately inflated, in most specimens more so than right valve. Right anterior auricle with distinct byssal notch, larger than posterior auricle, which forms an angle of 90° or slightly more with the disc. Ctenolium well developed at byssal notch. All auricles well demarcated from disc, and ornamented with growth lines.

Ornamentation of valves highly variable. That of right valve consisting of faint growth lines; more rarely, very flat, faint, and broad radial ribs are developed; interior of right valve commonly with numerous radial grooves, which vary in strength between specimens. Ornamentation of left valve with radial ribs of variable strength and width. Size of ribs varying within and between specimens, but generally wider than interstices. In some specimens (e.g., BSPG2012XI 56), the radial ribs are crossed by strong commarginal growth lines in the umbonal area, creating a reticulate pattern.

Remarks. As is true of the subgenus *Grandinectes*, the species *G. teres* can be easily differentiated, because of the differing ornamentation of the two valves, the lack of any divaricate ornamentation, and the presence of radial elements, not only on the outer surface of the left valve, but also on its interior. In contrast, the right valve is invariably smooth. The species is very widespread in the Kamar-e-Mehdi Formation of the eastern Tabas Block.

Genus *Chlamys* Röding, 1798
Subgenus *Chlamys* Röding, 1798

Type species. *Pecten islandicus* Müller, 1776.

Chlamys (*Chlamys*) *textoria* (Schlotheim, 1820)
Pl. 6, Fig. 3, Pl. 8, Figs. 6-8

1820 *Pectinites textorius* sp. nov – Schlotheim: 229.
1984 *Chlamys* (*Chlamys*) *textoria* (Schlotheim) – Johnson: 163, pl. 6, figs. 10-12, pl. 7, figs. 1-21, pl. 8, figs. 1-3, 5-20, ?fig. 4, text figs. 146-157. (cum syn.)

Material. Twenty-four specimens of variable preservational stages, 4 of them are articulated (BSPG2012XI 219-242) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area, at Kuh-e-Echellon, near Kuh-e-Dowshakh, and S of Kuh-e-Bagh-e-Vang, and from Echellon Limestone Member 45 km SW of Tabas and W of Kuh-e-Echellon.

Measurements (in mm).

Specimen	L	H	UA
BSPG2012XI 219	45.5	47.2	-
BSPG2012XI 223	26.6	29.5	87°
BSPG2012XI 227	26.2	26.7	99°
BSPG2012XI 228	22.5	23.2	96°
BSPG2012XI 229	25.2	26.1	105°
BSPG2012XI 230	20.8	22.9	-
BSPG2012XI 237	38.2	38.0	112°

Description. Disc generally higher than long, equilateral, slightly inequivalve, anterior and posterior dorsal margins straight and long, forming very obtuse angles with regularly curved, rounded ventral margin. Umbonal angle varying from 87° to 112°. Valves faintly convex, auricles well demarcated from disc, anterior auricle larger than posterior one, anterior auricle of right valve with deep byssal notch, that of left valve meeting the disc at an angle of more than 90°. Auricles covered with pronounced growth lamellae. Radial costae narrowly rounded, separated by interstices of the same width or wider. Number of costae varying between 19 and 28, most specimens displaying 20-21. Costae transversed by numerous closely spaced growth lamellae, which commonly increase in height on the crests of the costae.

Remarks. Except for few specimens, our material consists of small forms with a height of 22-29 mm. The inbricated commarginal lamellae are a diagnostic feature of the species and can be seen in all of our specimens.

Genus *Eopecten* Douvillé, 1897

Type species. *Spondylus tuberculosus* Goldfuss, 1836.

Eopecten velatus (Goldfuss, 1833)
Pl. 9, Fig. 1

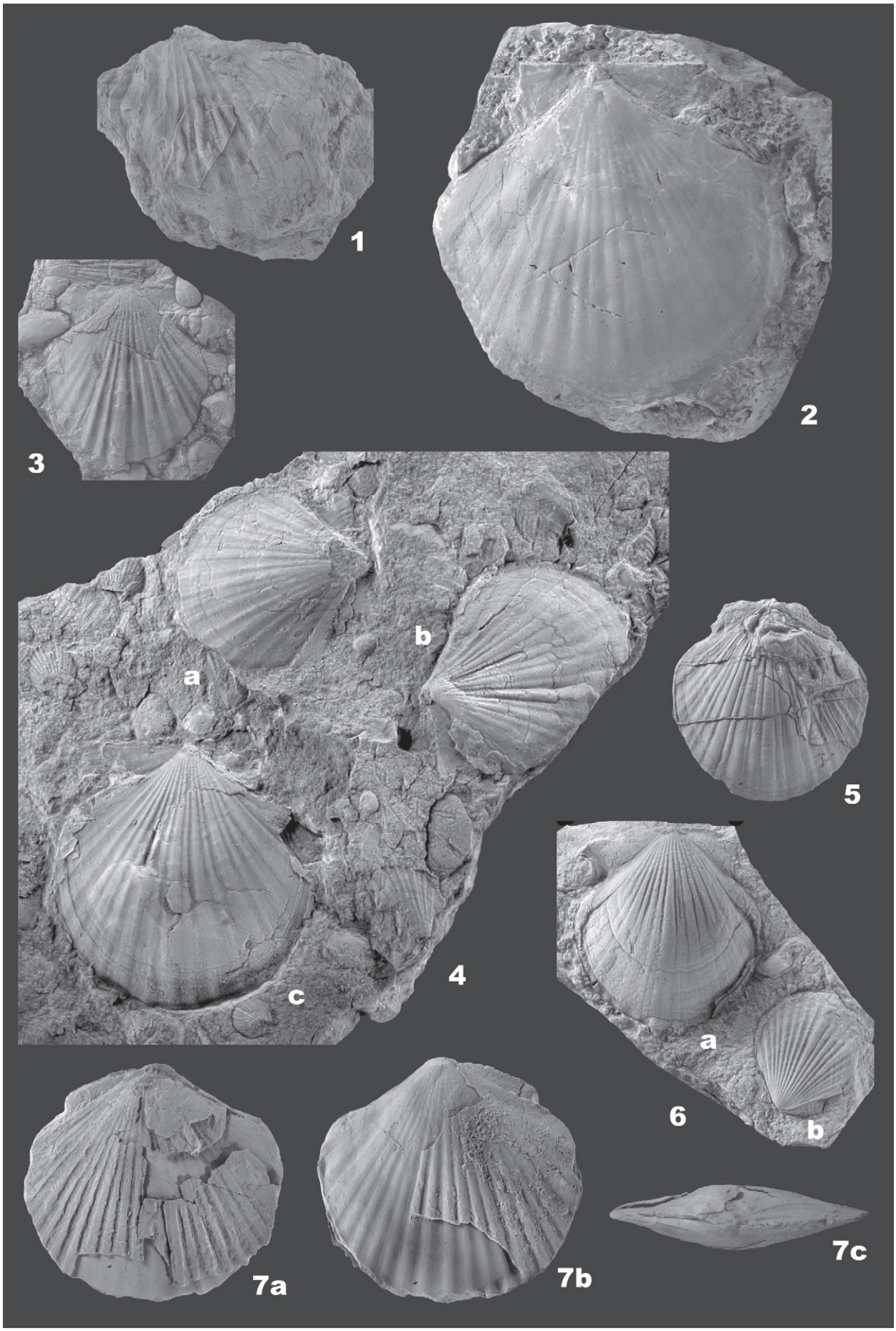
1833 *Pecten velatus* sp. nov. – Goldfuss: 45, pl. 90, fig. 2.
1984 *Eopecten velatus* (Goldfuss, 1833) – Johnson: 150, pl. 5, figs. 4, 5, 7, 8, text figs. 137-141. (cum syn.)

Material. Two fragmentary left valves (BSPG2012XI 211-212) from the Kamar-e-Mehdi Formation of the Kalshaneh area.

Description. Left valves moderately to well inflated, ornamentation consisting of around 11 distinct radial costae separated by much wider interstices, which contain several faint radial striae.

Remarks. Although the two specimens are poorly preserved, the ornamentation consisting of strong primary and weak secondary radial elements is characteristic of *Eopecten velatus* as defined by Johnson (1984).

Plate 9: **Fig. 1**. *Eopecten velatus* (Goldfuss, 1833) from the Kamar-e-Mehdi Formation of the Kalshaneh area. Fragment of left valve; BSPG2012XI 211, x1.
Figs. 2-7. *Pseudopecten* (*Pseudopecten*) *tipperi* (Cox, 1936). **2**. Right valve from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; PIW2003IV 20, x1. **3**. Left valve from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; PIW2003IV 18, x1. **4**. Internal moulds of right valve (b) and left valves (a, c) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; BSPG2012XI 164, x1. **5**. Articulated specimen, left valve view; Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; BSPG2012XI 77, x1. **6**. Internal moulds of left valves from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; BSPG2012XI 111a, b, x1. **7**. Articulated specimen from the Kamar -e-Mehdi Formation E of Tigh-e-Nakhlak; a: left valve view, b: right valve view, c: dorsal view; BSPG2012XI 101, x1.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Genus *Pseudopecten* Bayle, 1878
Subgenus *Pseudopecten* Bayle, 1878

Type species. *Pecten equivalvis* J. Sowerby, 1816.

Pseudopecten (*Pseudopecten*) *tipperi* (Cox, 1936)
Pl. 9, Figs. 2-7; Pl. 10, Figs. 1-2

1936 *Chlamys* (*Radulopecten*) *tipperi* sp. nov – Cox: 18, pl. 1, figs. 1-5.

Material. One hundred and sixty-three specimens of variable preservational states (BSPG2012XI 56-82, 85, 93-127, 133-146, 151-177, 243, 416, PIW2003IV 18, 20, 21) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area, at Kuh-e-Echellon, and SW of Tabas, from the Bidou Formation of Chorand valley, W of Ravar, and from the Echellon Limestone Member W of Kuh-e- Echellon.

Measurements (in mm).

Specimen	L	H	UA°	H/UA
BSPG2012XI 56a	52.6	55.9	95	0.59
BSPG2012XI 56b	31.0	34.6	96	0.36
BSPG2012XI 57	52.9	57.2	117	0.49
BSPG2012XI 58c	34.3	33.4	113	0.30
BSPG2012XI 61	45.4	46.3	104	0.45
BSPG2012XI 62	31.5	29.9	107	0.28
BSPG2012XI 64	48.7	47.0	119	0.39
BSPG2012XI 66	28.9	29.7	105	0.28
BSPG2012XI 69a	28.4	29.8	95	0.31
BSPG2012XI 70	41.0	41.6	106	0.39
BSPG2012XI 75	18.6	18.0	96	0.19
BSPG2012XI 76a	60.8	57.2	109	0.52
BSPG2012XI 77	35.0	35.9	114	0.31
BSPG2012XI 80	61.4	61.2	116	0.53
BSPG2012XI 82	52.9	49.8	116	0.43
BSPG2012XI 101	47.6	45.2	120	0.38
BSPG2012XI 104	85.6	85.0	113	0.75
BSPG2012XI 106	38.0	38.0	107	0.35
BSPG2012XI 107a	42.9	40.8	112	0.36
BSPG2012XI 108b	34.6	34.7	102	0.34
BSPG2012XI 111b	33.1	35.2	99	0.36
BSPG2012XI 115	14.6	15.8	100	0.16
BSPG2012XI 119	77.2	74.7	115	0.65
BSPG2012XI 122	50.3	50.1	108	0.46
BSPG2012XI 124	29.3	29.2	-	-
BSPG2012XI 127	65.8	66.6	114	0.58
BSPG2012XI 134	19.8	21.4	-	-
BSPG2012XI 135	19.2	21.1	96	0.22
BSPG2012XI 140	54.6	50.3	109	0.46
BSPG2012XI 144	83.1	74.5	118	0.63
BSPG2012XI 146a	64.8	66.5	107	0.62
BSPG2012XI 161	80.7	76.2	108	0.71
BSPG2012XI 164a	49.7	48.9	120	0.41
BSPG2012XI 169	30.7	31.6	113	0.28
PIW2003IV 20	55.2	55.0	111	0.50
PIW2003IV 21	114.5	103.9	122	0.85

Description. Small to large nearly equivalve, and equilateral shells, weakly inflated. Disc orbicular, umbonal angle varying between 95° and 122° (mean: 109°), increasing in larger specimens. Disc ornamented with 18 to 22 (average: 20) radial plicae of variable strength, fading towards the anterior and posterior ends. Plicae in the umbonal area usually more distinct than near the ventral margin. Except in rare cases no additional plicae are intercalated during growth; if so, the new plicae remain much thinner than the original ones. The plicae are also seen on the interior of the valves.

Plicae of the right valve commonly wider than interstices between them; plicae and interstices varying considerably in width, plicae commonly flattened. Plicae of the left valve similar to those of the right valve, except that they are more pronounced and the strength of neighbouring plicae may differ to a great extent. In some

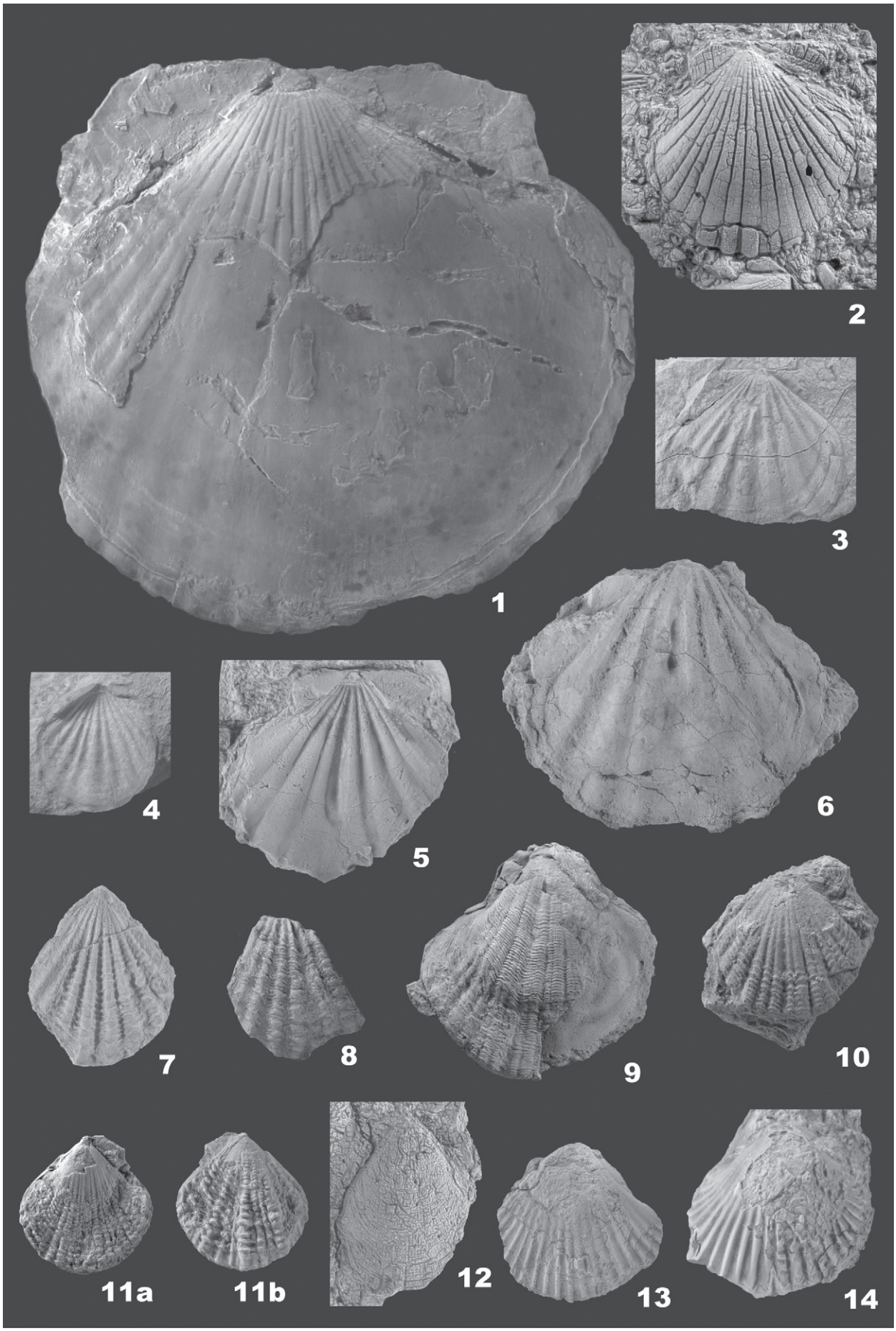
Plate 10: Figs. 1-2. *Pseudopecten* (*Pseudopecten*) *tipperi* (Cox, 1936). **1**. Right valve from the Bidou Formation of Chorand Valley, W of Ravar; PIW2003IV 21, x1. **2**. Right valve from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; BSPG2012XI 106, x1.

Figs. 3-6. *Radulopecten inequicostatus* (Young & Bird, 1822). **3**. Internal mould of right valve from the Echellon Limestone Member SW of Kuh-e-Gelkan; BSPG2012XI 86, x1. **4**. Right valve interior from the Echellon Limestone Member W of Kuh-e-Echellon; BSPG2012XI 131, x1. **5**. Interior view of left valve from the Echellon Limestone Member W of Kuh-e-Echellon; BSPG2012XI 181, x1. **6**. Internal mould of right valve from the Echellon Limestone Member W of Kuh-e-Echellon; BSPG2012XI 182, x1.

Figs. 7-11. *Radulopecten fibrosus* (J. Sowerby, 1816). **7**. Articulated specimen, ?left valve view from the Echellon Limestone Member W of Kuh-e-Echellon; BSPG2012XI 197, x1. **8**. Fragmented articulated specimen, ?right valve view from the Echellon Limestone Member N of Kalshaneh; BSPG2012XI 199; x1. **9**. Articulated specimen, right valve view, from the Echellon Limestone Member W of Kuh-e-Echellon; BSPG2012XI 198, x1. **10**. Right valve from the Echellon Limestone Member near Kuh-e-Nakhlak; BSPG2012XI 217, x2. **11**. Articulated specimen from the Echellon Limestone Member N of Kalshaneh; a: right valve view, b: left valve view; BSPG2012XI 200, x1.

Fig. 12. *Radulopecten strictus* (Münster, 1833) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area. Internal mould of left valve; BSPG2012XI 203, x1.

Figs. 13-14. *Spondylopecten* (*Plesiopecten*) *subspinosus* (Schlotheim, 1820). **13**. Articulated specimen, left valve view, from the Echellon Limestone Member, W Kuh-e-Echellon; BSPG2012XI 205, x1. **14**. Right valve from the Echellon Limestone Member, 45 km SW of Tabas; BSPG2012XI 204, x2.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specimens, a median plica, in others three or more plicae are distinctly stronger than the others. Occasionally, plicae appear to be paired.

Auricles clearly set off from disc, with distinct growth lines, right anterior one with byssal notch, left anterior auricle with a faint sinus.

Remarks. Cox (1936) created *Chlamys* (*Radulopecten*) *tipperi* based on material from the southern Tabas Block (Kerman-Ravar area). According to him, the material was obtained from Bajocian – Bathonian rocks. However, this information was erroneous, as own field observations showed that the species occurs abundantly in Callovian – Oxfordian rocks of the area ("Pecten Limestone" of earlier authors) and not in older strata. Due to his limited material, he did not document the full range of variation of the species; the specimens he figured represent only one end of the morphological spectrum.

Johnson (1984: 210) placed *Chlamys* (*Radulopecten*) *tipperi* of Cox in the synonymy of *Radulopecten scarburgensis* (Young & Bird, 1822). However, the species is much closer to *Pseudopecten* (*Pseudopecten*) *equivalvis* (J. Sowerby, 1816) than to *Radulopecten scarburgensis*, the main difference to the former being the more irregular ribbing. For this reason, we place *tipperi* in *Pseudopecten*, even though according to Johnson (1984) the genus does not extend beyond the Bajocian.

Radulopecten tipperi has also been recorded by Wen (1979: 299, pl. 87, figs. 1, 5, 7, 9, 10, 12), Wen (1982: 242, pl. 7, figs. 3-6), Yin & Fürsich (1991: 144, pl. 6, figs. 12-14), and Sha et al. (1998: 41, pl. 6, figs. 2-3) from the Bathonian – Callovian of Tibet. The species is very widely distributed in the Kamar-e-Mehdi and Bidou formations of the eastern Tabas Block (Wilmsen et al., 2010).

Genus *Radulopecten* Rollier, 1911

Type species. *Pecten hemicostatus* Morris & Lycett, 1853.

Radulopecten inequicostatus (Young & Bird, 1822)

Pl. 10, Figs. 3-6

1822 *Pecten inequicostatus* sp. nov. – Young & Bird: 235, pl. 9, fig. 7.
1984 *Radulopecten inequicostatus* (Young & Bird, 1822) – Johnson: 217, pl. 11, figs. 2, 4, 7-9. (cum syn.)

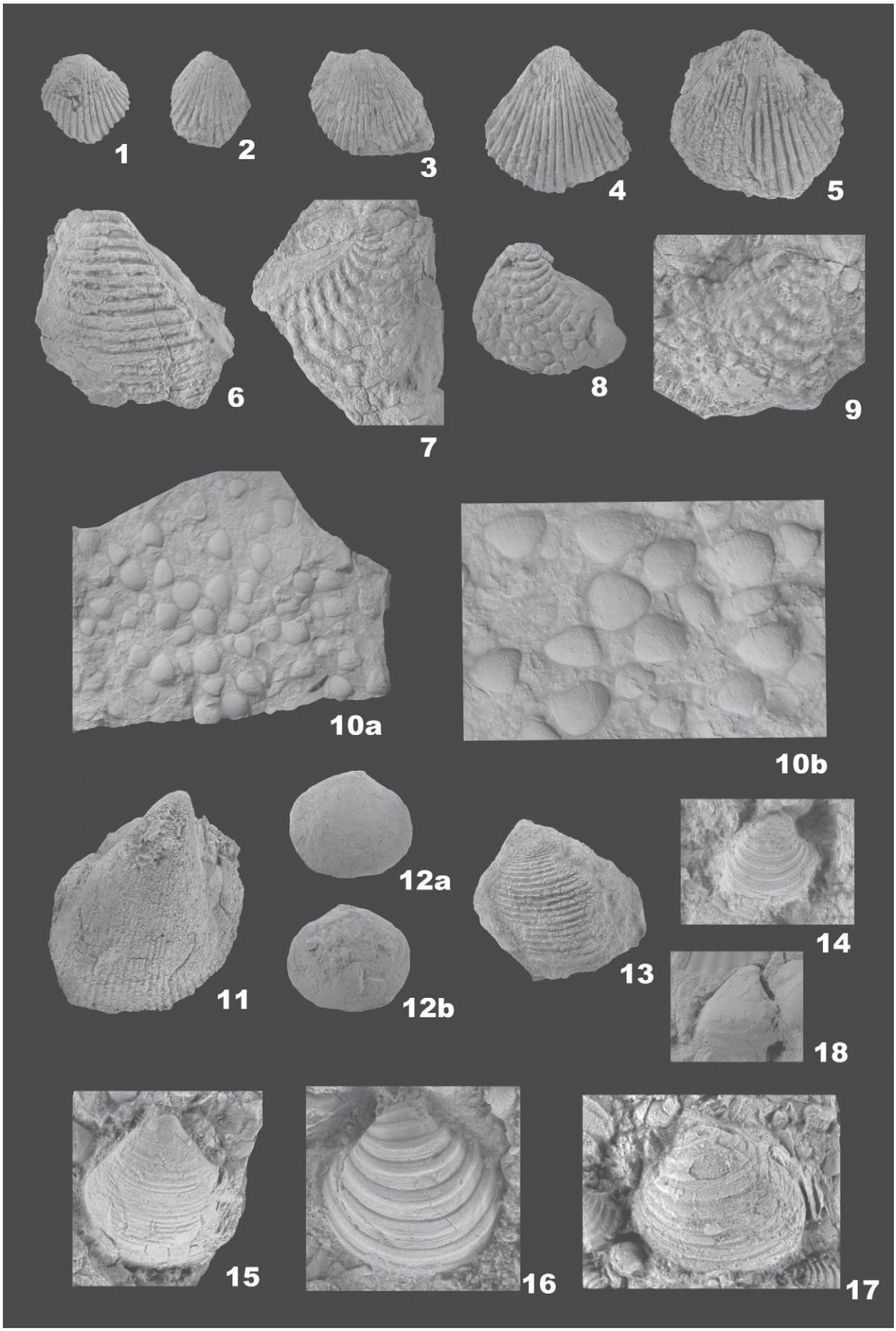
Material. Twenty-nine specimens in different preservational states (shell preservation, internal moulds, single valves, articulated specimens) (BSPG2012XI 83-84, 86-92, 128-132, 147-150, 178-188) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area, W of Kuh-e-Echellon, and S of Kuh-e-Bagh-e-Vang, and from the Echellon Limestone Member S of Kuh-e-Bagh-e-Vang, SW of Kuh-e-Gelkan, and SW of Tabas.

Measurements (in mm).

Specimen	L	H	UA	H/UA
BSPG2012XI 83	20.8	21.3	112°	0.19
BSPG2012XI 86	28.1	27.1	102°	0.27
BSPG2012XI 130	21.9	22.2	117°	0.19
BSPG2012XI 131	20.1	21.6	100°	0.22
BSPG2012XI 147	16.1	17.8	83°	0.21
BSPG2012XI 148	22.8	22.0	94°	0.23
BSPG2012XI 181	-	-	106°	-
BSPG2012XI 182	-	-	109°	-

Description. Small to medium-sized *Radulopecten* with 8-10 radial plicae of variable strength separated by wide interstices, the width and depth of which also vary. Number of plicae constant throughout ontogeny, not increas-

Plate 11: Figs. 1-5. *Spondylopecten* (*Plesiopecten*) *subspinosus* (Schlotheim, 1820). **1**. Fragmented single valve from the Echellon Limestone Member, W of Kuh-e-Echellon; BSPG2012XI 209, x1. **2**. Fragmented single valve from the Kamar-e-Mehdi Formation N of Kalshaneh; BSPG2012XI 208, x1. **3**. Fragmented single valve from the Echellon Limestone Member S of Kuh-e-Bagh-e-Vang; BSPG2012XI 206, x1. **4**. Fragment from the Echellon Limestone Member S of Kuh-e-Bagh-e-Vang; BSPG2012XI 207, x1. **5**. Articulated specimen, right valve view, from the Echellon Limestone Member W of Kuh-e-Echellon; BSPG2012XI 210, x1.
Fig. 6. *Trigonia* (*Trigonia*) cf. *reticulata* Agassiz, 1840 from the Kamar-e-Mehdi Formation at Kuh-e-Nakhlak. Fragment of left valve; BSPG2012XI 396, x1.
Figs. 7-8. *Myophorella* (*Myophorella*) sp. from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area. **7**. Fragment of right valve; BSPG2012XI 399, x1. **8**. Articulated specimen, left valve view; BSPG2012XI 397, x1.
Fig. 9. *Myophorella* (*Promyophorella*) sp. from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area. Fragment of right valve, BSPG2012XI 423, x2.
Fig. 10. *Corbulomima* cf. *obscura* (J. de C. Sowerby, 1827) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area. Pavement of single valves; PIW2003IV 27; a: x1, b: x2.
Fig. 11. *Pterocardia buvignieri* (Deshayes, 1857) from the Echellon Limestone Member N of Kalshaneh. Right valve; BSPG2012XI 381, x1.
Fig. 12. Lucinid sp. indet from the Kamar-e-Mehdi Formation at Kuh-e-Echellon. Articulated specimen; a: right valve view, b: left valve view; BSPG2012XI 393, x1.
Fig. 13. *Neocrassina* (*Neocrassina*) *subdepressa* (Blake & Hudleston, 1877) from the Kamar-e-Mehdi Formation SW of Tabas. Left valve, BSPG2012XI 395, x1.
Fig. 14-17. *Nicaniella* (*Nicaniella*) *extensa* (Phillips, 1829). **14**. Right valve from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; BSPG2012XI 407b, x4. **15**. Right valve from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; BSPG2012XI 401a, x4. **16**. Left valve from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; BSPG2012XI 405, x4. **17**. Left valve from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; BSPG2012XI 407a, x4.
Fig. 18. *Opis* (*Trigonopis*) sp. Internal mould of right valve from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; BSPG2012XI 379d, x1.5.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ing by intercalation of additional plicae. Disc suborbicular, umbonal angle varying between 83° and 117°. Interior of disc mirroring the radial plicae of the exterior. Right valve without, left valve with spaced plical lamellae. Auricles set off from disc, ornamented with strong commarginal growth lines, right anterior auricle with distinct byssal notch.

Remarks. Albeit commonly not well preserved, the present material can be placed with confidence in *Radulopecten inequicostatus* as defined by Johnson (1984). Radial striae, according to Johnson (1984) typical of the species, are only preserved as traces in some specimens.

Radulopecten fibrosus (J. Sowerby, 1816)

Pl. 10, Figs. 7-11

1816 *Pecten fibrosus* sp. nov. – J. Sowerby: 84, pl. 136, figs. 1, 2.
1984 *Radulopecten fibrosus* (J. Sowerby, 1816) – Johnson: 203, pl. 10, figs. 7-18, 20-22; text figs. 184-192. (cum syn.)

Material. Twenty variably preserved specimens, 8 of them articulated (BSPG2012XI 189-202, 213-218) from the Echellon Limestone Member S of Kuh-e-Bagh-e-Vang, W of Kuh-e- Echellon, near Kuh-e-Nakhlak and N of Kalshaneh, and from the Kamar-e-Mehdi Formation near Kuh-e-Dowshakh, S of Kuh-e-Bagh-e-Vang, and at Kuh-e-Echellon.

Measurements (in mm).

Specimen	L	H	UA
BSPG2012XI 197	-	-	93°
BSPG2012XI 199	24.0	25.2	94°
BSPG2012XI 201	-	-	91°
BSPG2012XI 216	-	-	82°
BSPG2012XI 217	13.2	13.5	86°

Description. Shell suborbicular, slightly higher than long, umbonal angle increasing with age, ranging from 82° to 94°. Auricles well demarcated from disc, but usually broken off. Inflation in juvenile specimens weak, that of gerontic individuals moderate. Ornamentation consisting of either regular or irregular radial plicae, crossed by commarginal lamellae. These are either regularly spaced or crowded. Number of plicae ranging from 9 to 20, the higher number of plicae being due to intercalatories. In specimen BSPG2012XI 200, the commarginal lamellae develop into irregular long scales.

Remarks. As the radial plicae extend right from the umbo, the specimens are best placed in *Radulopecten fibrosus*. The ornamentation, both with respect to number and strength of plicae, is quite variable. A characteristic feature is the presence of distinct commarginal lamellae. Whether their density varies between right and left valves can not be ascertained due to the generally poor preservation.

Radulopecten strictus (Münster, 1833)

Pl. 10, Fig. 12

1833 *Pecten strictus* sp. nov. – Münster in Goldfuss: 49, pl. 91, fig. 4a-c.

1984 *Radulopecten strictus* (Münster, 1833) – Johnson: 199, pl. 10, figs. 4-6. (cum syn.)

Material. One ?left internal mould (BSPG2012XI 203) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area.

Measurements (in mm).

Specimen	L	H	UA
BSPG2012XI 203	24.8	31.7	82°

Description. The internal mould, distinctly higher than long, exhibits traces of radial ornamentation consisting of numerous fine and dense riblets. Both ears are well demarcated from disc. Umbonal angle relatively narrow (82°).

Plate 12: Figs. 1-2. *Protocardia* (*Protocardia*) *striatula* (J. de C. Sowerby, 1829). **1**. Left valve from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; BSPG2012XI 419, x2. **2**. Left valve from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; BSPG2012XI 421, x2.

Fig. 3. *Protocardia* (*Protocardia*) *intexta* (Münster, 1837). Right valve from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; BSPG2012XI 455, x1.

Figs. 4, 6-7. *Quenstedtia laevigata* (Phillips, 1829). **4**. Right valve from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; BSPG2012XI 390, x1. **6**. Left valve from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; BSPG2012XI 389, x1. **7**. Articulated specimen from the Kamar-e-Mehdi Formation of the Kuh-e-Echellon area; a: right valve view, b: left valve view, c: dorsal view; BSPG2012XI 388, x1.

Fig. 5. *Integricardium* (*Integricardium*) *bannesianum* (Contejean, 1860). Articulated specimen from the Echellon Limestone Member N of Kalshaneh; a: right valve view, b: left valve view, c: dorsal view; BSPG2012XI 457, x1.

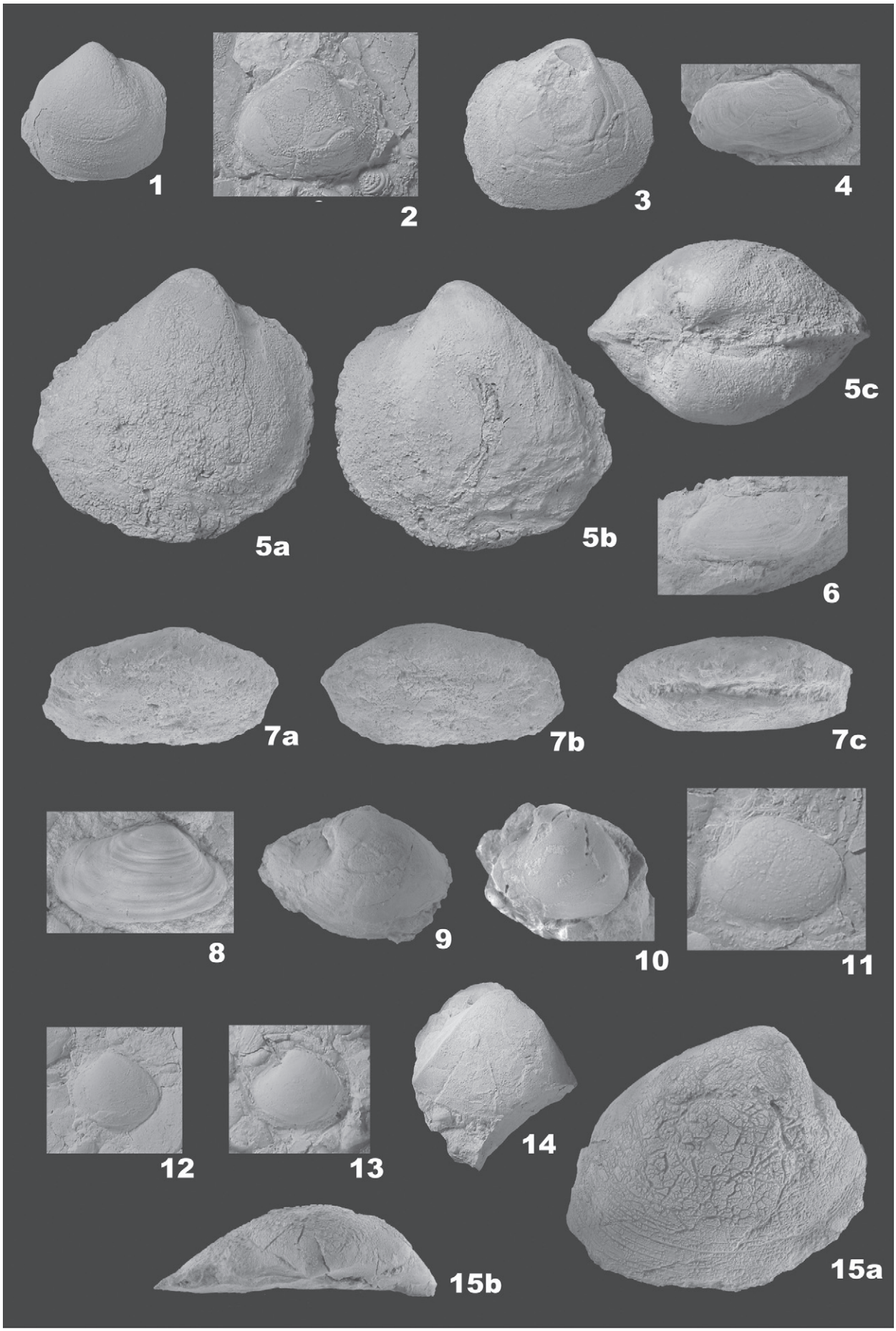
Fig. 8. *Quenstedtia bathonica* (Morris & Lycett, 1854) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area. Right valve; BSPG2012XI 411, x1.

Figs. 9-11. *Anisocardia* (*Anisocardia*) aff. *tenera* (J. Sowerby, 1821) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area. **9**. Left valve; BSPG2012XI 409a, x2. **10**. Left valve; BSPG2012XI 409b, x2. **11**. Left valve; BSPG2012XI 410, x2.

Figs. 12-13. *Isocyprina cyreniformis* (Buvignier, 1852) from the Kamar-e-Mehdi Formation of the Kuh-e-Dowshakh area. **12**. Left valve; BSPG2012XI 513b, x2. **13**. Left valve, BSPG2012XI 513a; x2.

Fig. 14. Arcticid bivalve sp. A from the Kamar-e-Mehdi Formation near Kuh-e-Dowshak. Fragment of right valve; BSPG2012XI 515, x1.

Fig. 15. *Eocallista tancrediformis* (Blake & Hudleston, 1877) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area. Right valve; a: lateral view, b: dorsal view; BSPG2012XI 465, x1.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Remarks. Despite its poor preservation, the specimen can be referred to *Radulopecten strictus* due to the characteristic ornamentation.

Genus *Spondylopecten* Roeder, 1882
Subgenus *Plesiopecten* Munier-Chalmas, 1887

Type species. *Pectinites subspinosus* Schlotheim, 1820.

Spondylopecten (*Plesiopecten*) *subspinosus* (Schlotheim, 1820)

Pl. 10, Figs. 13-14; Pl. 11, Figs. 1-5

1820 *Pectinites subspinosus* sp. nov. – Schlotheim: 223.
1984 *Spondylopecten* (*Plesiopecten*) *subspinosus* (Schlotheim, 1820) – Johnson: 84, pl. 3, figs. 1-7; text figs. 67-72. (cum syn.)

Material. Seven specimens, 2 of them articulated (BSPG2012XI 204 – 210) from the Kamar-e-Mehdi Formation W of Kuh-e-Echellon, N of Kalshaneh, and S of Kuh-e-Bagh-e-Vang, and from the Echellon Limestone Member 45 km SW of Tabas, S of Kuh-e-Bagh-e-Vang, and W of Kuh-e-Echellon.
Measurements (in mm).

Specimen	L	H
BSPG2012XI 205	28.9	27.6
BSPG2012XI 206	17.8	17.9
BSPG2012XI 204	16.0	15.2
BSPG2012XI 210	30.2	28.5

Description. Equivalve, equilateral, moderately inflated shell. Specimens preserved either as internal moulds or with abraded shell, which carries 20 to 25 radial ribs. In rare cases, these ribs exhibit an angular cross-section, and carry a faint line at their crest. Anterior auricles larger than posterior ones, well demarcated from disc. Right anterior auricle carrying several radial riblets crossed by numerous commarginal lamellae.
Remarks. The angular ribs place the specimens firmly into *Spondylopecten* (*Plesiopecten*) *subspinosus* as defined by Johnson (1984).

Subclass Heteroconchia Hertwig, 1895
Superorder Palaeoheterodonta Newell, 1965
Order Trigonioida Dall, 1889
Family Trigoniidae Lamarck, 1819
Genus *Trigonia* Bruguière, 1789
Subgenus *Trigonia* Bruguière, 1789

Type species. *Venus sulcata* Hermann, 1781.

Trigonia (*Trigonia*) cf. *reticulata* Agassiz, 1840

Pl. 11, Fig. 6

cf. 1840 *Trigonia recticulata* sp. nov. – Agassiz: 39, pl. 11, fig. 10.
cf. 1930 *Trigonia recticulata* Agassiz – Arkell: 81, pl. 6, figs. 1-4. (cum syn.)

Material. One poorly preserved composite mould of a left valve (BSPG2012XI 396) from the Kamar-e-Mehdi Formation at Kuh-e-Nakhlak.
Description and remarks. Although the umbo and posterior part of the mould is missing, the characteristic ornamentation of strong, spaced commarginal ribs on the flank agrees well with *Trigonia recticulata* as figured, for example, by Arkell (1930: pl. 6, figs. 1-4). Due to its poor preservation, we only tentatively place the specimen in this species.

Genus *Myophorella* Bayle, 1878
Subgenus *Myophorella* Bayle, 1878

Type species. *Myophorella nodulosa* Bayle, 1878 = *Trigonia nodulosa* Lamarck, 1801.

Myophorella (*Myophorella*) sp.

Pl. 11, Figs. 7-8

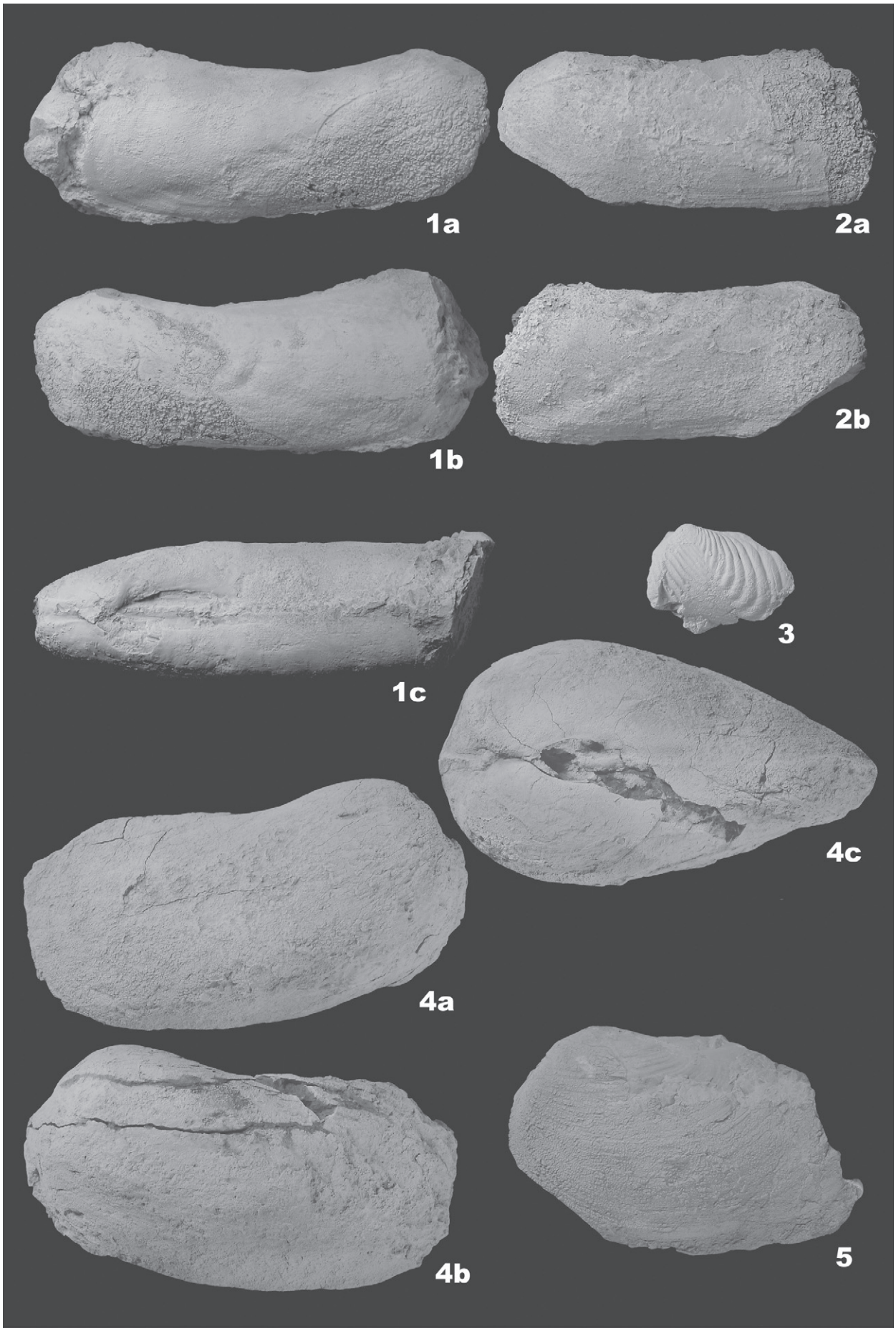
Material. One articulated and three right composite moulds (BSPG2012XI 397-400) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area..
Descriptions. Specimens small for the genus (largest specimen 32 mm in height), displaying the characteristic ornamentation of slightly divaricate rows of closely spaced tubercles on the flank. Area smooth except for faint growth lines and a thin median groove. Marginal carina thin, inconspicuous.
Remarks. Due to the poor preservation, the specimens can be only identified at the generic level.

Subgenus *Promyophorella* Kobayashi & Tamura, 1955

Type species. *Myophorella* (*Promyophorella*) *sigmoidalis* Kobayashi & Tamura, 1955.

Remarks. Cox (1969: N485) and Poulton (1979: 27) regarded *Promyophorella* as a junior synonym of *Myophorella*, but Leanza (1993: 31) argued that the presence of subconcentric costae with very small tubercles justify to keep *Promyophorella* as a separated subgenus.

Plate 13: Figs. 1-2. *Agrawalimya tubularis* sp. nov. from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area. **1**. Holotype, articulated specimen; a: right valve view, b: left valve view, c: dorsal view; BSPG2012XI 510, x1. **2**. Paratype, articulated specimen; a: left valve view, b: right valve view; BSPG2012XI 478, x1.
Fig. 3. *Goniomya* (*Goniomya*) *literata* (J. Sowerby, 1819) from the Echellon Limestone Member 45 km SW of Tabas. Fragmented articulated specimen, left valve view; BSPG2012XI 475, x1.
Figs. 4-5. *Homomya vezelayi* (d'Archiac, 1843). **4**. Articulated specimen from the Kamar-e-Mehdi Formation of the Kuh-e-Echellon area; a: right valve view, b: left valve view, c: dorsal view; BSPG2012XI 479, x1. **5**. Fragment of articulated specimen from the Echellon Limestone Member 45 km SW of Tabas; left valve view; BSPG2012XI 485, x1.


1a
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4c
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4b
5

Myophorella (*Promyophorella*) sp.
Pl. 11, Fig. 9

Material. One fragmentary composite mould of right valve (BSPG2012XI 423) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area.
Descriptions and remarks. As the preservation of the specimen is poor, only limited information can be given. The ornamentation on the flank consists of small, closely spaced tubercles which form commarginal ribs. Each tubercle has a ventral extension which nearly reaches the next row of tubercles. Only a small part of the area is seen. It appears to be covered with transverse ribs. These features justify the placement of the specimen in the subgenus *Promyophorella*.

Superorder Heterodonta Neumayr, 1883
Order Myoida Stoliczka, 1870
Family Corbulidae Lamarck, 1819
Genus *Corbulomima* Vokes, 1945

Type species. *Corbulomina nuciformis* Vokes, 1945.

Corbulomima cf. *obscura* (J. de C. Sowerby, 1827)
Pl. 11, Fig. 10

cf. 1827 *Corbula* sp. nov. – J. de C. Sowerby in Murchison: 320.
cf. 1827 *Corbula obscura* sp. nov. – J. de C. Sowerby: 140, pl. 572, fig. 5.
cf. 1978 *Corbulomima obscura* (J. de C. Sowerby) – Duff: 113, pl. 13, figs. 1-4, text-fig. 39.

Material. Sixteen right and 9 left internal moulds (BSPG2012XI 424,PIW2003IV 27) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area.
Descriptions and remarks. The small *Corbulomima* occasionally forms monospecific shell pavements, but more commonly occurs scattered among other small bivalves that form pavements in the Kamar-e-Mehdi Formation. Their preservation is usually poor, and generally only part of the outline is seen. This makes a precise identification difficult. The observable features, such as a shell longer than high, a gently curved ventral margin, a blunt posterior umbonal ridge, an anterior margin that meets the ventral margin forming an angle of 90˚-100˚, and a smooth surface apart from faint growth lines, are very close to *Corbulomima obscura*. For this reason, the specimens have been placed with reservation in this species.

Family Megalodontidae Morris & Lycett, 1853
Genus *Pterocardia* Bayan, 1874

Type species. *Cardium buvignieri* Deshayes, 1857.

Pterocardia buvignieri (Deshayes, 1857)
Pl. 11, Fig. 11

1857 *Cardium buvignieri* sp. nov. – Deshayes: 55.

Material. One right composite mould (BSPG2012XI 381) from the Echellon Limestone Member N of Kalshaneh.
Description and remarks. The medium-sized specimen shows the typical features of *Pterocardia*, such as pointed, slightly forward directed umbones, distinctly impressed muscle scars, a posterior lobe (only partly preserved), and an ornamentation of well developed radial ribs. Except for the small posterior lobe, which is a preservational artifact, the specimen closely corresponds to *Cardium* (*Pterocardia*) *corallinum* Leymerie, 1847 of Loriol (1891: 185, pl. 20, figs. 1-3) from the Oxfordian of the Swiss Jura Mountains.

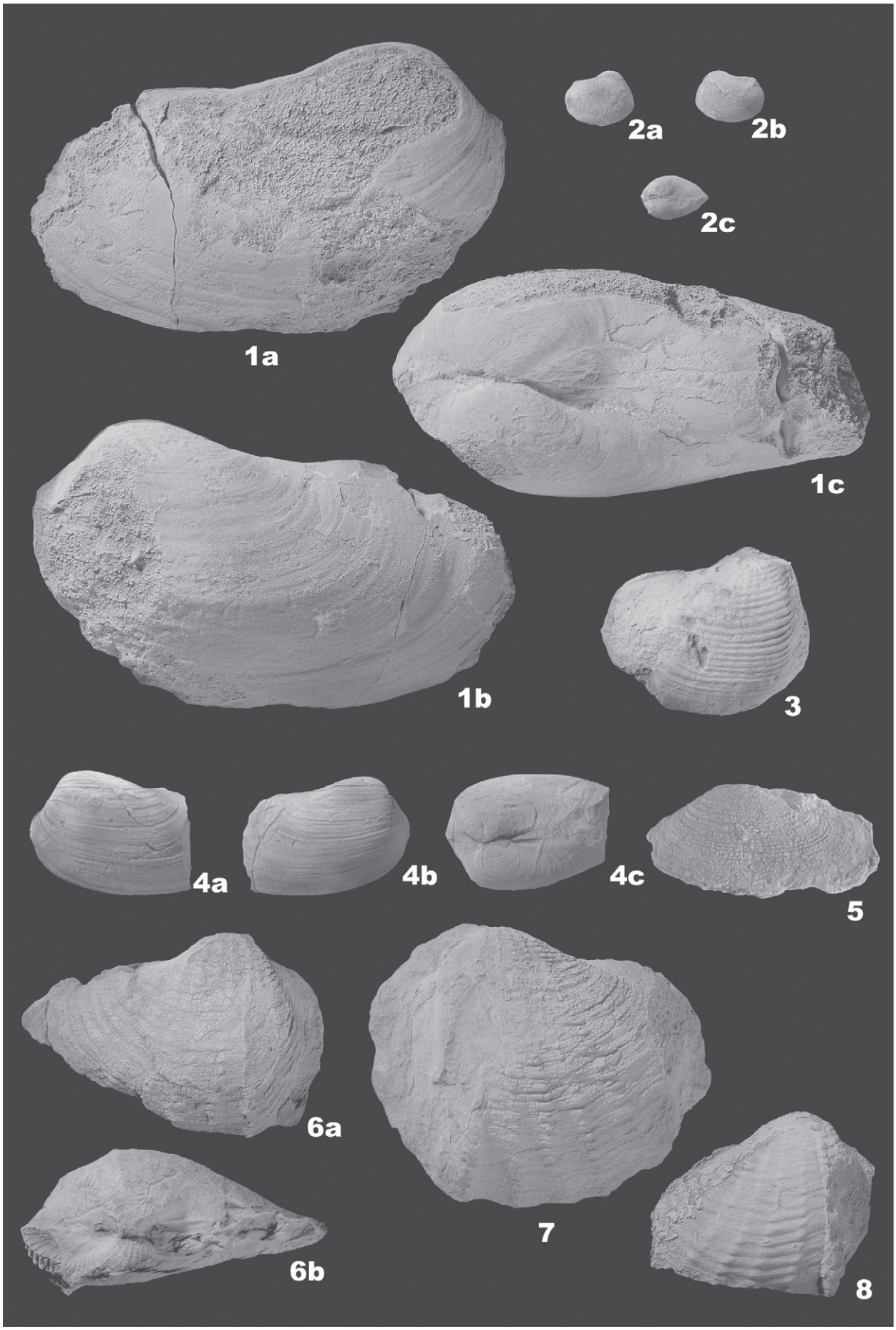
As the name *corallinum* is preoccupied by *Cardium corallinum* Linné, 1758 and therefore is not available for the species, and as *Cardium striatum* Buvignier, 1852, a synonym of *corallinum*, is also preoccupied, Deshayes (1857) proposed the name *buvignieri* for the taxon.

Order Veneroida Adams & Adams, 1856
Family Lucinidae Fleming, 1828

Lucinid sp. indet
Pl. 11, Fig. 12.

Material. One articulated internal mould (BSPG2012XI 393) from the Kamar-e-Mehdi Formation at Kuh-e-Echellon.
Description and remarks. The small, compressed orbicular mould with concave anterodorsal margin clearly belongs to the family Lucinidae. As the knowledge of the

Plate 14: Fig. 1. *Homomya vezelayi* (d'Archiac, 1843). 1. Articulated specimen from the Echellon Limestone Member 45 km SW of Tabas; a: right valve view, b: left valve view, c: dorsal view; BSPG2012XI 480, x1.
Figs. 2, 4. *Homomya* cf. *vezelayi* (d'Archiac, 1843) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area. **2**. Articulated specimen; a: right valve view, b: left valve view, c: dorsal view; BSPG2012XI 494a, x1. **4**. Articulated specimen; a: left valve view, b: right valve view, c: dorsal view; BSPG2012XI 494b, x1.
Fig. 3. *Pholadomya* (*Pholadomya*) cf. *socialis* Morris & Lycett, 1854 from the upper Kamar-e-Mehdi Formation SW of Tabas. Articulated specimen, right valve view; BSPG2012XI 508, x1.
Fig. 5. *Pachymya* (*Arcomya*) sp. from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area. Left valve; BSPG2012XI383, x2.
Figs. 6-8. *Pholadomya* (*Bucardiomya*) *lirata* (J. Sowerby, 1818). **6**. Articulated specimen from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; a: right valve view, b: dorsal view; BSPG2012XI 498, x1. **7**. Articulated specimen from the Echellon Limestone Member 45 km SW of Tabas; left valve view; BSPG2012XI 497, x1. **8**. Right valve from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; BSPG2012XI 502, x1.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hinge structure is essential for identifying the various genera in the family, a more precise identification is not possible.

Family Astartidae d'Orbigny, 1844
Genus *Neocrassina* Fischer, 1886
Subgenus *Neocrassina* Fischer, 1886

Type species. *Astarte obliqua* Deshayes, 1830 (= *Cypricardia obliqua* Lamarck, 1819).

Neocrasssina (*Neocrassina*) *subdepressa*
(Blake & Hudleston, 1877)
Pl. 11, Fig. 13

1877 *Astarte subdepressa* sp. nov. – Blake & Hudleston: 393, pl. 14, fig. 10.
1934 *Astarte subdepressa* Blake & Hudleston – Arkell: 235, pl. 33, figs. 1-9. (cum syn.)
2000 *Neocrasssina* (*Neocrassina*) *subdepressa* (Blake & Hudleston 1877) – Fürsich et al.: 74, pl. 2, figs. 8-14, text-figs. 7-9. (cum syn.)

Material. One left composite mould (BSPG2012XI 395) from the Kamar-e-Mehdi Formation SW of Tabas.
Description and remarks. The poorly preserved specimen exhibits a forward directed umbo, and a concave anterodorsal margin, the remaining margins, as far as they can be seen, are well rounded. The surface ornamentation consists of very dense, fine, commarginal ribs. These features are sufficient to place the specimen into *Neocrasssina* (*Neocrassina*) *subdepressa*.

Genus *Nicaniella* Chavan, 1945
Subgenus *Nicaniella* Chavan, 1945

Type species. *Astarte communis* Zittel & Goubert, 1861.

Nicaniella (*Nicaniella*) *extensa* (Phillips, 1829)
Pl. 11, Figs. 14-17

1829 *Crassina extensa* sp. nov. – Phillips: pl. 3, fig. 21.
1934 *Astarte extensa* (Phillips) – Arkell: 237, pl. 34, figs. 21-30. (cum syn.)

Material. One articulated, 29 right and 25 left valves, partly in shell preservation, partly composite moulds (BSPG2012XI 375a-c, 377, 401-407) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area and from the Echellon Limestone Member 45 km SW of Tabas.

Description. Shells small, with forward directed umbones, excavated anterodorsal margin and straight posterodorsal margin, the latter forming an obtuse angle with the posteroventral margin; ventral margin well rounded. Moderately inflated. Ornamentation highly variable, consisting of 7-18 commarginal ribs. In some specimens, the ornamentation consists of a low number of primary ribs, on which and between which much finer secondary ribs are developed. Hinge not seen. Ventral margin internally crenulated.
Remarks. Although no hinge features are seen, the shape and ornamentation is very characteristic of *Nicaniella* (*Nicaniella*) *extensa* as described for example by Arkell (1934: 237). The species is a common element of shell pavements and thin shell beds, where it occurs together with *Protocardia*, *Gervillella*, and small gastropods. In the Echellon Limestone Member, 45 km southwest of Tabas, *Nicaniella* (*Nicaniella*) forms a near monospecific concentration 2-3 cm in thickness.

Genus *Opis* Defrance, 1825
Subgenus *Trigonopis* Fischer (ex Munier-Chalmas, MS), 1887

Type species. *Opis similis* d'Orbigny, 1844.

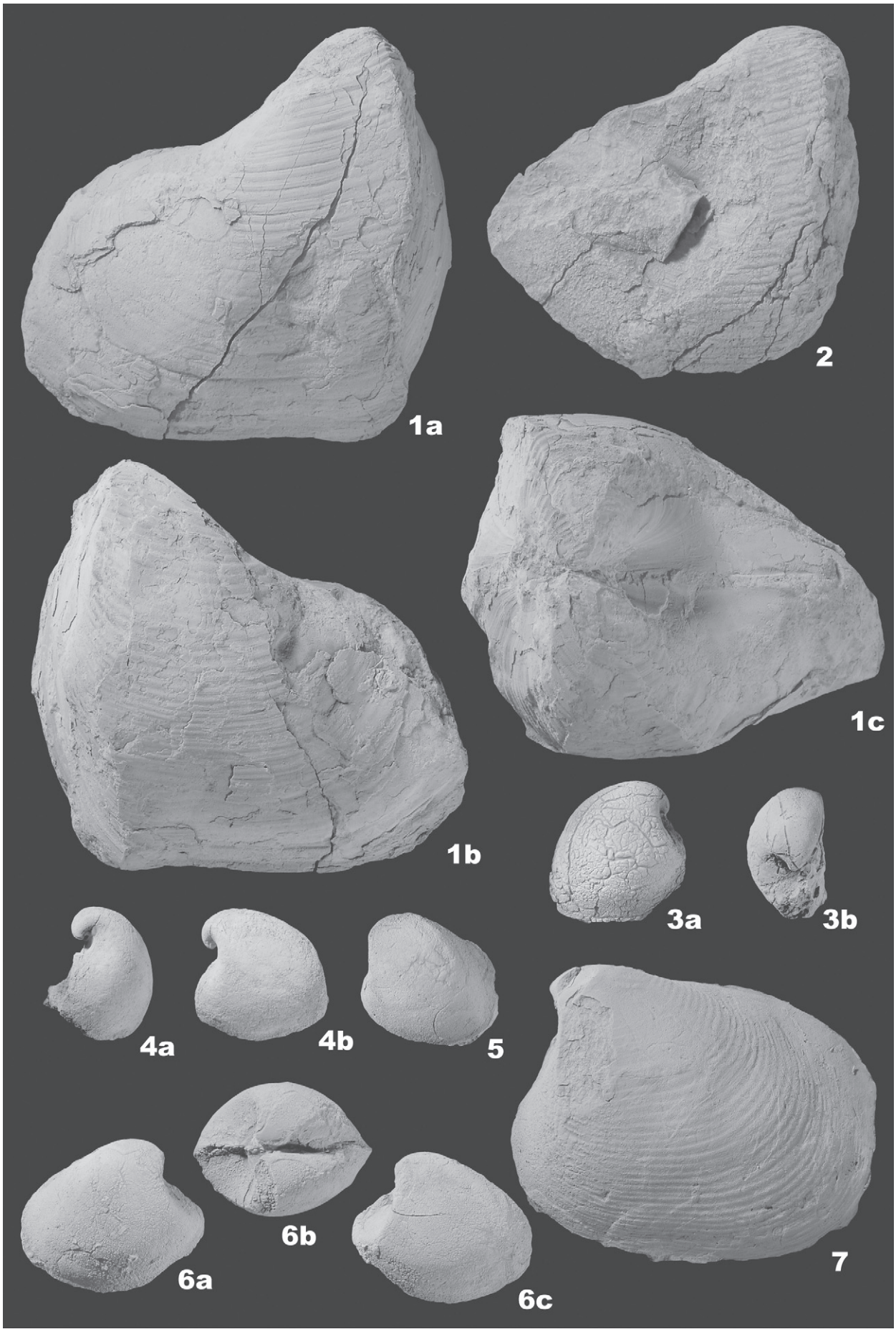
Opis (*Trigonopis*) sp.
Pl. 11, Fig. 18

Material. One right internal mould (BSPG2012XI 379d) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area.
Descrption and remarks. The triangular shape, the distinct posterior umbonal ridge, and the projecting, forward directed umbo are characteristic features of *Trigonopis*. The surface shows remains of closely spaced commarginal ribs. As no other features are visible, we refrain from placing the specimen into one of the numerous Jurassic species of the subgenus. Arkell's (1934: 259, pl. 34, figs. 7-9) *Opis* (*Trigonopis*) *corallina* Damon, 1860 from the Upper Oxfordian of southern England is similar, but our specimen lacks the shallow sulcus that precedes the posterior umbonal ridge. Moreover, this ridge is less acute than in typical *Opis* (*Trigonopis*) *corallina*.

Family Cardiidae Lamarck, 1809
Genus *Protocardia* von Beyrich, 1845
Subgenus *Protocardia* von Beyrich, 1845

Type species. *Cardium hillanum* J. Sowerby, 1813.

Plate 15: Figs. 1-2. *Pholadomya* (*Bucardiomya*) sp. A. **1**. Articulated specimen from the Kamar-e-Mehdi Formation of the Kuh-e-Dowshakh area; a: right valve view, b: left valve view, c: dorsal view; BSPG2012XI 511, x1. **2**. Articulated specimen from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; right valve view; BSPG2012XI 501, x1.
Figs. 3-5. *Ceratomyopsis striata* (d'Orbigny, 1822) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area. **3**. Right valve; a: lateral view, b: dorsal view; BSPG2012XI 454, x1. **4**. Left valve; a: anterior view, b: lateral view, BSPG2012XI 451a, x1. **5**. Left valve; BSPG2012XI 453, x1.
Figs. 6-7. *Ceratomya concentria* (J. de C. Sowerby, 1825) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area. **6**. Articulated specimen; a: right valve view, b: dorsal view, c: left valve view; BSPG2012XI 431, x1. **7**. Left valve; BSPG2012XI 446, x1.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Protocardia (*Protocardia*) *striatula*
(J. de C. Sowerby, 1829)
Pl. 12, Figs. 1-2

1829 *Cardium striatulum* sp. nov. – J. de C. Sowerby: 101, pl. 553, fig. 1.
1978 *Protocardia* (*Protocardia*) *striatula* (J. de C. Sowerby, 1829) – Duff: 102, pl. 12, figs. 7-11, 13.

Material. Seventeen right and 18 left composite moulds (BSPG2012XI 378, 414-415, 417-422) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area and at Kuh-e-Echellon.
Description. Small-sized *Protocardia* (height: 11.6 mm, length: 12.8, BSPG2012XI 419), equivalved, moderately inflated, subquadrate in outline. Umbones prominent, orthogyrate, rounded, in mesial position. Ornamentation of faint growth lines and 14-18 radial riblets, the latter occupying the area posterior of the poorly developed posterior umbonal ridge.
Remarks. *Protocardia* (*Protocardia*) *striatula* is a common element of shell pavements dominated by small bivalve taxa in the Kamar-e-Mehdi Formation.

Protocardia (*Protocardia*) *intexta* (Münster, 1837)
Pl. 12, Fig. 3

1837 *Cardium intextum* sp. nov. – Münster: 220, pl. 144, fig. 3.
1936 *Protocardia intexta* (Münster) – Arkell: 372, pl. 51, fig. 2. (cum syn.)

Material. One right and one articulated internal mould (BSPG2012XI 455, 464) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area and from the Echellon Limestone Member N of Kalshaneh.
Description and remarks. The two specimens are of medium size for the genus (height: 28.3 mm, length: 32.0 mm), and moderately inflated. The umbo is slightly directed forward, probably as a result of compaction. The outline is rounded-subquadrate, with the posterior and ventral margins less rounded than the anterior margin. A faint posterior umbonal ridge is present, posterior of it faint relicts of the radial ornamentation are seen.

Protocardia (*Protocardia*) *intexta* is a common name for medium-sized members of the genus,; our specimens fit illustrations of the species by Loriol et al. (1872: 246, pl. 14, figs. 13-15) from the Kimmeridgian of northern France, and by Holzapfel (1998: 113, pl. 8, figs. 7-8) from the Callovian of southern Tunisia.

Genus *Integricardium* Rollier, 1912
Subgenus *Integricardium* Rollier, 1912

Type species. *Cardium dupinianum* d'Orbigny, 1844.

Integricardium (*Integricardium*) *bannesianum*
(Contejean, 1860)
Pl. 12, Fig. 5

1860 *Cardium bannesianum* sp. nov. – Contejean: 276, pl. 15, figs. 1-5.
2000 *Integricardium* (*Integricardium*) *bannesianum* (Contejean, 1860) – Fürsich et al.: 115, pl. 12, figs. 14-18, text-figs. 27-28.

Material. Four articulated, six left and one right internal moulds (BSPG2012XI 456-463) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area and at Kuh-e-Nakhlak, and from the Echellon Limestone Member N of Kalshaneh and at 48 km SW of Tabas.
Measurements (in mm).

Specimen	L	H
BSPG2012XI 457	49.4	47.2
BSPG2012XI 458	~59.8	58.9
BSPG2012XI 461a	46.6	42.9

Description. Specimens large, well inflated, with salient umbones, which are ortho- to slightly prosogyrate, position of umbones mesial, length slightly greater than height. Shape rounded, subquadrate. Surface smooth, without posterior radial ribs.
Remarks. The lack of posterior radial ribs and the large size of the specimens clearly identify them as *Integricardium*. Variable in shape due to compactional distortion, they nevertheless correspond to *Integricardium* (*Intergricardium*) *bannesianum* (e.g. Fürsich et al., 2000).

Family Quenstedtiidae Cox, 1929
Genus *Quenstedtia* Morris & Lycett, 1855

Type species. *Pullastra oblita* Phillips, 1829.

Quenstedtia laevigata (Phillips, 1829)
Pl. 12, Figs. 4, 6-7

1829 *Psammobia laevigata* sp. nov. – Phillips: pl. 4, fig. 5.
1934 *Quenstedtia laevigata* (Phillips, 1829) – Arkell: 296, pl. 40, figs. 4-5. (cum syn.)

Material. Two articulated, and one left and one right internal moulds (BSPG2012XI 388-391) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area and of the Kuh-e-Echellon area.
Measurements (in mm).

Specimen	L	H	LA
BSPG2012XI 389	26.9	13.0	9.8
BSPG2012XI 390	29.0	15.4	10.4
BSPG2012XI 391	~34.0	16.5	12.3

Description. Shells small for the species, compressed, umbones small, acute, situated at two-fifth of shell length from the anterior end. Anterior and posterior margins well rounded, ventral margin more or less straight. With a faint posterior umbonal ridge. Moulds ornamented with growth lines of variable strength.
Remarks. The specimens fit *Quenstedtia laevigata* as figured by Arkell (1934: 296, pl. 40, figs. 4-5) from the Oxfordian of Yorkshire quite well. It is doubtful whether *Quenstedtia elongata* Hudleston of Arkell (1934: 298,

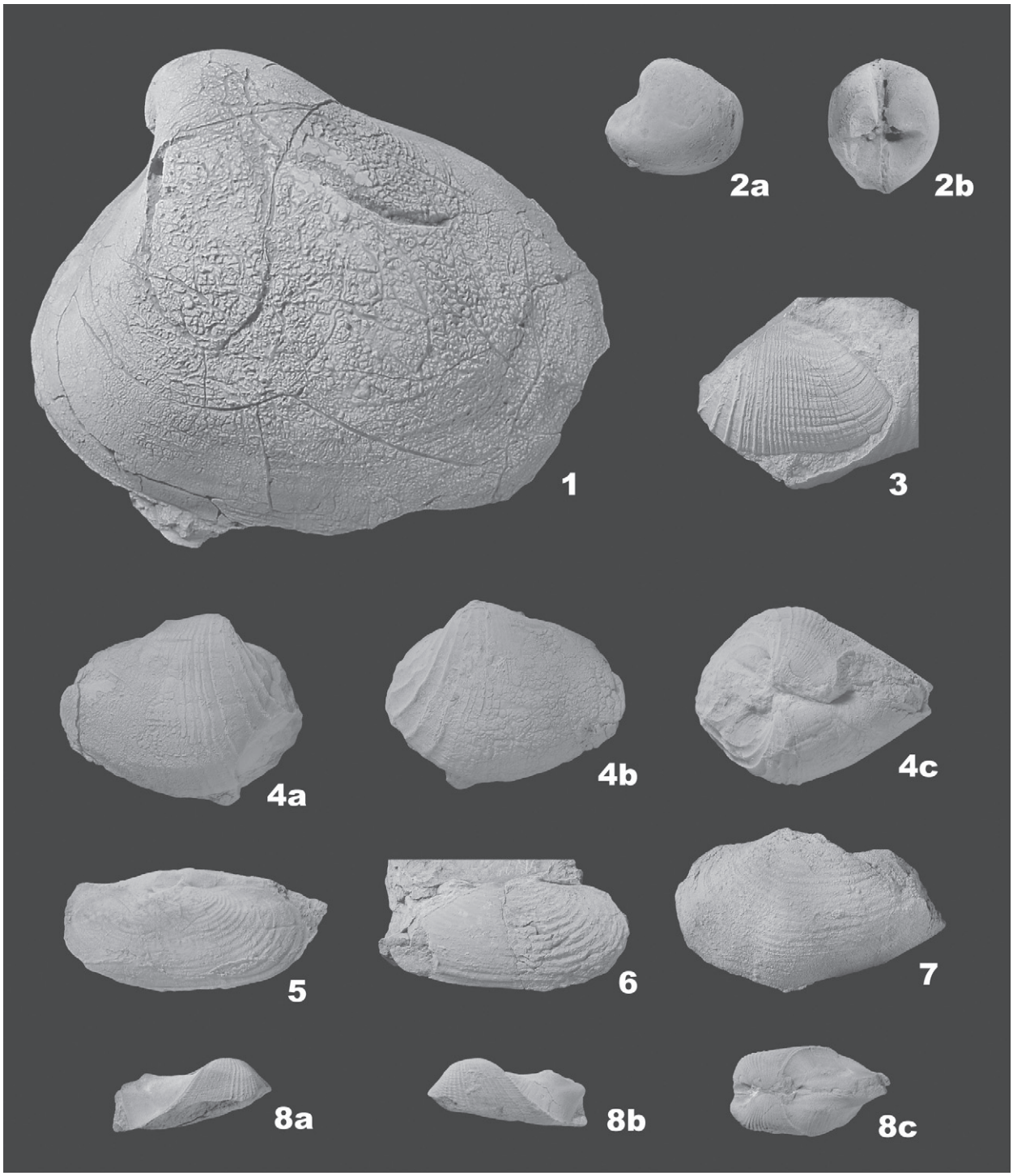

Plate 16: Figs. 1-2. *Ceratomya concentrica* (J. de C. Sowerby, 1825). **1**. Left valve from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; PIW2003IV 17, x1. **2**. Articulated specimen from the Kamar-e-Mehdi Formation 45 km SW of Tabas; a: left valve view, b: dorsal view; PIW2003IV 23, x1.
Figs. 3-4. *Myopholas acuticostata* (J. de C. Sowerby, 1827) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area. **3**. Fragment of left valve, BSPG2012XI 473, x1. **4**. Articulated specimen; a: right valve view, b: left valve view, c: dorsal view; BSPG2012XI 474a, x1.
Figs. 5-6. *Platymyoidea* sp. from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area. **5**. Articulated specimen; right valve view; BSPG2012XI 468, x1. **6**. Articulated specimen; right valve view; BSPG2012XI 467, x1.
Fig. 7. *Cercomya* (*Capillimya*) *striata* (Agassiz, 1843) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area. Articulated specimen; left valve view; BSPG2012XI 469, x1.
Fig. 8. *Neoburmesia iwakiensis* Yabe & Sato, 1942. Composite mould of articulated specimen from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area; a: right valve view, b: left valve view, c: dorsal view; BSPG2012XI 477, x1.

pl. 40, figs. 6-7) represents a separate species, as the differences to *laevigata* mentioned by Arkell are rather minor.

Quenstedtia bathonica (Morris & Lycett, 1854)
Pl. 12, Fig. 8

1854 *Corbis* (*Corbicella*) *bathonica* sp. nov. – Morris & Lycett: 95, pl. 13, fig. 14.

Material. Three right internal moulds (BSPG2012XI 387b, 392, 411) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area.
Description and remarks. As in the case of the preceding species, the specimens are very small and slightly compressed. Umbones near mesial, depressed, posterior umbonal ridge rounded, ventral margin nearly straight, anterior and posterior margins well rounded. The specimens closely correspond to the holotype as figured by Morris & Lycett (1854: pl. 13, fig. 14) from the Bathonian of southern England.

Family Arcticidae Newton, 1891
Genus *Anisocardia* Munier-Chalmas, 1863
Subgenus *Anisocardia* Munier-Chalmas, 1863

Type species. *Anisocardia elegans* Munier-Chalmas, 1863.

Anisocardia (*Anisocardia*) aff. *tenera* (J. Sowerby, 1821)
Pl. 12, Figs. 9-11

aff. 1821 *Isocardia tener* sp. nov. – J. Sowerby: 171, pl. 295, fig. 2.
aff. 1978 *Anisocardia* (*Anisocardia*) *tenera* (J. Sowerby, 1821) – Duff: 108, pl. 12, fig. 20 only.

Material. Four left and 4 right internal moulds (BSPG2012XI 408-410) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area.
Description. Specimens longer than high (height: 9.3 mm; length: 11.2 mm, BSPG2012XI 409a), moderately inflated; umbones prosogyrate, but only moderately so. Anteroventral margin obtusely rounded, anterodorsal margin concave, posterior margin sloping and passing smoothly into the faintly arcuate ventral margin. With very faint posterior umbonal ridge.
Remarks. The general shape clearly identifies the specimens as *Anisocardia*, even though no hinge information is available. A survey of the literature revealed only few comparable forms, such as one of the specimens figured as *Isocardia tener* by J. Sowerby (1821) from the Callovian of England. However, this species generally exhibits a far more strongly convex ventral margin (e.g., Duff, 1978). For this reason, the specimens from the Kamar-e-Mehdi Formation are kept in open nomenclature.

Genus *Isocyprina* Roeder, 1882

Type species. *Cardium cyreniforme* Buvignier, 1852.

Isocyprina cyreniformis (Buvignier, 1852)
Pl. 12, Figs. 12-13

1852 *Cardium cyreniforme* sp. nov. – Buvignier: 15, pl. 13, figs. 23-27.
1934 *Isocyprina cyreniformise* (Buvignier) – Arkell: 265, pl. 35, figs. 2-8, text-figs. 58, 59.

Material. Five left and two right composite moulds (BSPG2012XI 513) from the Kamar-e-Mehdi Formation of the Kuh-e-Dowshakh area.
Measurements (in mm).

Specimen	L	H
BSPG2012XI 513a	7.9	7.1
BSPG2012XI 513b	7.4	6.7
BSPG2012XI 513c	7.0	5.9

Description. Shells small, suborbicular, longer than high, moderately inflated, with small, slightly prosogyrate, submesial umbones. Margins regularly curved, anterodorsal area of the shell slightly excavated. With a well rounded, inconspicuous posterior umbonal ridge. Shell smooth, except for very faint growth lines. Hinge not seen.
Remarks. The specimens closely resemble in shape *Isocyprina cyreniformis* as figured, for example, by Arkell (1934), except that they are slightly longer than high. According to Arkell (1934), his specimens are roughly as long as high. However, this is partly due to the way he arranged his specimens. The specimens from the Kamar-e-Mehdi Formation are distinctly smaller than those described by Arkell (1934).

arcticid bivalve sp. A
Pl. 12, Fig. 14

Material. One right composite mould (BSPG2012XI 515) from the Kamar-e-Mehdi Formation near Kuh-e-Dowshak.
Description and remarks. Due to its fragmented nature and the lack of any information about the hinge structure, the composite mould cannot be identified even at the generic level. It is characterized by a protruding, depressed, prosogyrate umbo, and a very sharp posterior umbonal ridge, which separates a concave posterior area from the flank. This posterior area is characterized by several very faint radial striae. The remaining surface of the shell is smooth, except for growth lines.

Most likely, the specimen belongs to the family Arcticidae, which contains several genera of comparable shape, such as *Plesiocyprina* Fischer, 1887 and *Pronoella* (*Pronoella*) Fischer, 1887. The posterior radial striae are reminiscent of the genus *Protocardia*, but this genus has orthogyrate umbones.

Family Corbiculidae Gray, 1847
Genus *Eocallista* Douvillé, 1921

Type species. *Venus brongniarti* Roemer, 1836.

Eocallista tancrediformis (Blake & Hudleston, 1877)

Pl. 12, Fig. 15

1877 *Cyprina tancrediformis* sp. nov. – Blake & Hudleston: 300, 397, pl. 15, figs. 1, 1a.
1933 *Eocallista tancrediformis* (Blake & Hudleston) – Arkell: 302, pl. 41, figs. 4-6, 8, 9, text-fig. 71. (cum syn.)

Material. One articulated internal mould and 1 right composite mould (BSPG2012XI 394, 465) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area.
Description and remarks. Specimen BSPG2012XI 465 is 46.1 mm in height and 53.9 mm in length, compressed, with prosogyrate umbones, and a regularly curved posterior margin, which passes smoothly into the curved ventral margin; anterior margin well rounded, excavated dorsally. Surface covered with growth lines, hinge not seen.

The outline corresponds closely to that of the specimens figured by Arkell (1933: pl. 41, figs. 4-6, 8, 9). Even though the hinge structure can not be seen, there is little doubt that our specimen belongs to *Eocallista tancrediformis*.

Superorder Anomalodesmata Dall, 1889
Order Pholadomyoida Newell, 1965
Family Pholadomyidae Gray, 1847
Genus *Agrawalimya* Singh, Jaitly & Pandey, 1982

Type species. *Agrawalimya pseudosulcata* Singh, Jaitly & Pandey, 1982.

Agrawalimya tubularis sp. nov.

Pl. 13, Figs. 1-2

? 1996 *Agrawalimya* sp. A – Pandey et al.: 56, pl. 3, fig. 11, pl.4, figs. 1-2.

Derivation of name. Tubularis (Latin) = tubular; after the characteristic tubular shape.
Material. Holotype: Articulated composite mould (BSPG2012XI 510); paratype: fragmented articulated composite mould (BSPG2012XI 478), both from the basal Kamar-e-Mehdi Formation in the Kamar-e-Mehdi area.
Measurements (in mm).

Specimen	L	H	LP	I
BSPG2012XI 510	>78.2	32.5	61.9	29.1

Diagnosis. Specimens strongly elongated, inflation close to height, resulting in a near-tubular cross-section. Umbones small, compressed, situated approximately one-fifth of shell length from the anterior end. With shallow sulcus running from umbo to ventral margin; a second shallow sulcus extends towards the posteroventral corner. Posterior gape very wide.
Description. Strongly elongated shell, with more or less straight, parallel dorsal and ventral margins, posterodorsal margin oblique and grading into the well rounded posteroventral margin. Umbones orthogyrate, small, depressed, situated about one-fifth of shell length from the anterior end. Escutcheon narrow, lanceolate, of moderate length. A small, narrow lunule appears to be present. Shell well inflated, approaching a tubular shape but narrowing towards the anterior end. As a consequence, the posterior gape corresponds in area to the cross-section of the shell. A faint, shallow, slightly posteriorly directed sulcus runs from the umbones towards the ventral margin. A second, narrower sulcus starts some distance away from the umbones and extends to the posteroventral corner. In the holotype, this second sulcus is crossed by broad, inconspicuous growth folds. Apart from growth lines, shell ornamented with delicate pustules, which are arranged in radial rows but are seen in parts of the shell only.
Remarks. Although only two specimens are available and one of them is even poorly preserved, the observed features clearly differ from any known bivalve, thus justifying the creation of a new species. Features of the shell, such as strong elongation, wide posterior gape, and presence of the sulci, agree with the genus *Agrawalimya*. So far, this genus has only been recorded from Kachchh, western India (Singh et al., 1982; Pandey et al., 1996), i.e from the southern margin of Tethys. The type species *A. pseudosulcata* Singh, Jaitly & Pandey (1982: 274, figs. 1-3; Pandey et al., 1996: 56, pl. 3, figs. 5-10) differs in being much shorter, and lacking the posterior umbonal ridge. *Agrawalimya* sp. A (Pandey et al., 1996) from the early Middle Jurassic of Kachchh may be conspecific with *tubularis* but these specimens are too poorly preserved to warrant any definite statement. Similarly elongated bivalves were described by Holzapfel (1998: 122, pl. 11, figs. 1-4) from the Callovian of southern Tunisia as *Pachymya* (*Arcomya*) *tunisiensis*. However, they differ from the present material by the compressed shape and the presence of a distinct posterior umbonal ridge, typical of *Arcomya*.

Genus *Goniomya* Agassiz, 1841
Subgenus *Goniomya* Agassiz, 1841

Type species. *Mya angulifera* J. Sowerby, 1819 (= *Mya intersectans* Smith, 1817).

Goniomya (*Goniomya*) *literata* (J. Sowerby, 1819)

Pl. 13, Fig. 3

1819 *Mya*? *literata* sp. nov. – J. Sowerby: 45, pl. 224, figs. 1-7.
1935 *Goniomya literata* (J. Sowerby) – Arkell: 344, pl. 48, figs. 1-7.

Material. Two fragmentary articulated composite moulds (BSPG2012XI 475-476) from the Echellon Limestone Member 45 km SW of Tabas.
Description and remarks. The two specimens are very poorly preserved, but exhibit the characteristic V-shaped ornamentation of rounded ribs, which are distinctly broader on the posterior flank. They closely correspond to *Goniomya* (*G.*) *literata* as figured, for example, by Arkell (1935).

Genus *Homomya* Agassiz, 1843

Type species. *Mactra* (*Lutraria*) *gibbosa* J. Sowerby, 1813.

Homomya vezelayi (d'Archiac, 1843)
Pl. 13, Figs. 4-5; Pl. 14, Fig. 1

1843 *Mya Vezelayi* sp. nov. – d'Archiac: 370, pl. 25, figs. 4, 4a, 4b.
1935 *Homomya vezelayi* (d'Archiac) – Arkell: 338, pl. 44, fig. 1.

Material. Eighteen articulated composite moulds and internal moulds (BSPG2012XI 479-491) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area, at Kuh-e-Echellon, Kuh-e-Nakhlak, and at Kuh-e-Dowshak, and from the Echellon Limestone Member at Kuh-e-Echellon and at 45 km SW of Tabas.
Description. Strongly elongated, well inflated *Homomya* with moderately developed umbones situated around one-fifth of shell length from the anterior end. Ventral margin broadly curved, grading smoothly into the well rounded posterior margin, dorsal margin straight, anterior margin rounded. Ventral and dorsal margins subparellel. Valves gaping posteriorly. Narrow, smooth, elongated escutcheon bordered by faint ridge. Surface covered with weak commarginal folds.
Remarks. The shape of *Homomya vezelayi* can be highly variable, depending on the degree of compactional distortion, which affected many of the specimens. Well preserved specimens, however, correspond closely to d'Archiac's (1843) figure of the species. Arkell (1935: 338) discussed in detail the relationship between *Homomya vezelayi* and *Homomya gibbosa* (J. Sowerby, 1813). To us, it is not clear whether *H. vezelayi* and *H. gibbosa* are different species, something which could be clarified only after investigating large populations of the two taxa. If they turned out to be synonyms, *H. gibbosa* would have priority.

Homomya cf. *vezelayi* (d'Archiac, 1843)
Pl. 14, Figs. 2, 4

Material. Five articulated composite moulds (BSPG2012XI 492-495) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area and at Kuh-e-Nakhlak.
Description and remarks. The present specimens differ from *H. vezelayi* as described above mainly by their small size (height ranging from 8.5 to 21.8 mm). At present it is not clear, whether they represent juveniles of *H. vezelayi* or a separate, small species of *Homomya*. The lack of specimens with intermediate size would suggest the latter.

Genus *Neoburmesia* Yabe & Sato, 1942

Type species. *Neoburmesia iwakiensis*, Yabe & Sato, 1942.

Neoburmesia iwakiensis Yabe & Sato, 1942
Pl. 16, Fig. 8

1942 *Neoburmesia iwakiensis* sp. nov. – Yabe & Sato: 251, figs. 1-3.

Material. One fragmentary articulated composite mould (BSPG2012XI 477) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area.
Description and remarks. Only a single species of *Neoburmesia*, *N. iwakiensis,* is known. So far it has been reported only from the Upper Jurassic of Japan (Yabe & Sato, 1942; Tamura, 1960, 1984; Hayami, 1975). The specimen from the Kamar-e-Mehdi Formation is much smaller than those from Japan, but resembles the species in all other features. The elongated shell is characterized by a sharp posterior umbonal ridge. Anterior of the ridge, the shell is ornamented with numerous radial ribs, which are intersected by growth lines, and become fainter towards the anterior end. This results in a somewhat reticulate pattern. Posterior of the umbonal ridge, the shell is smooth, but carries two radial ridges, the upper one defining a narrow, elongated escutcheon. The lower one is situated slightly more ventral of the upper one, and the area between the two is concave, as is the area between the lower ridge and the posterior umbonal ridge. Umbonal area flat, turning into a wide shallow sulcus ventrally.

Genus *Pachymya* J. de C. Sowerby, 1826
Subgenus *Arcomya* Roemer (ex Agassiz, MS), 1839

Type species. *Solen helveticus* Roemer (ex Thurmann, MS), 1839.

Pachymya (*Arcomya*) sp.
Pl. 14, Fig. 5

Material. One left composite mould (BSPG2012XI 383) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area.
Description and remarks. The small shell (length: ~21mm, height: 9.7mm) is compressed, the inconspicuous umbo is situated at about one-third of shell length from the anterior end. Both anterior and posterior ends are tapering, the anterior one more so than the posterior one. The ventral margin is only faintly curved. Surface smooth apart from growth lines. Identification at the species level is not possible.

Genus *Pholadomya* G.B. Sowerby, 1823
Subgenus *Pholadomya* G.B. Sowerby, 1823

Type species. *Pholadomya candida* G.B. Sowerby, 1823.

Pholadomya (*Pholadomya*) cf. *socialis*
Morris & Lycett, 1854

Pl. 14, Fig. 3

cf. 1854 *Pholadomya socialis* sp nov. – Morris & Lycett: 122, pl. 11, figs. 7, 7a.

Material. Eight articulated composite moulds (BSPG2012XI 502-509) from the upper Kamar-e-Mehdi Formation SW of Tabas.

Description and remarks. Small, generally poorly preserved *Pholadomya*. Most of the specimens have been preserved in life position and suffered compaction along the anterior-posterior axis, which makes it difficult to evaluate the outline. Characteristic features are the regular commarginal ribs and often only faint traces of radial ribs. In this respect, they resemble several other species which have been accommodated in *Pholadomya*, such as *Pholadomya asiatica* Redlich (1894: 74, pl. 12, fig. 9) from the Middle Jurassic of the Caucasus, *P.* (*P.*) *corrugata* Koch & Dunker (1837: 20, pl. 1, fig. 6) from the Lower Jurassic of northern Germany, *P. inornata* J. de C. Sowerby (Grant, 1840: pl. 21, fig. 8) from the Middle Jurassic of Kachchh, western India, and *P.* (*P.*) *kachchhensis* Pandey, Fürsich & Heinze (1996: 53, pl. 1, figs. 1-4, 6-10) from the Middle Jurassic of Kachchh. In addition, there are species, such as *P. hemicardia* Roemer (1836: 131, pl. 9, fig. 18) from the Upper Jurassic of northern Germany, where most individuals of a population exhibit radial ribs, but some hardly do so. Our specimens may be best compared to *P. socialis* Morris & Lycett (1854: 122, pl. 11, figs. 7, 7a) from the Bathonian of England, which is of comparably small size and also displays only faint radial ribs, whereas the rounded commarginal growth rugae are much more pronounced.

Subgenus *Bucardiomya* Rollier in Cossmann, 1912

Type species. *Pholadomya bucardium* Agassiz, 1842.

Pholadomya (*Bucardiomya*) *lirata* (J. Sowerby, 1818)

Pl. 14, Figs. 6-8

1818 *Cardita*? *lirata* sp. nov. – J. Sowerby: 222, pl. 197, fig. 3.
1996 *Pholadomya* (*Bucardiomya*) *lirata* (J. Sowerby, 1818) – Pandey et al.: 55, pl. 2, figs. 8-11, pl. 3, figs. 1-4.

Material. Six articulated and one right composite moulds (BSPG2012XI 496-500) Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area and from E of Tigh-e-Nakhlak, and from the Echellon Limestone Member 45 km SW of Tabas.

Description. Shell large, moderately inflated, rounded triangular in outline, with strongly protruding umbones, situated about one-fifth of shell length from the anterior end. Dorsal margin nearly straight, posterior margin well rounded, ventral margin regularly curved, and anterior margin truncated. Shell ornamented with numerous, distinct, rounded, commarginal ribs crossed by 5-7 radial ribs, of which the second one from the anterior end is usually the strongest. Towards the posterior end the radial ribs decrease in strength. At the intersecting points between radial and commarginal ribs, small nodes are present, the strength of which may vary between specimens. The very narrow, smooth, elongated escutcheon is boarded by a thin sharp ridge.

Remarks. According to Cox (1969: N828), the subgenus *Bucardiomya* does not possess an escutcheon. Consequently, *Bucardiomya lirata* would have to be transferred to *Pholadomya* s.s. As all other features fit *Bucardiomya* much better than *Pholadomya* s.s., we do not regard the presence/absence of an escutcheon as a sufficiently diagnostic feature. Similarly, in *Pholadomya* s.s., an escutcheon may also be present or absent.

P. (*B.*) *lirata* is a very common member of *Pholadomya* (*Bucardiomya*) in the southern Tethyan shelf seas, but has also been recorded from southern Europe (e.g., Radulovic et al., 1997; Dragastan et al., 1998; Sciau, 1993; Fischer, 1969) and even as far north as England (e.g., Lycett, 1863; Phillips, 1871).

Pholadomya (*Bucardiomya*) *protei* (Brongniart, 1821: 570, pl. 7, fig. 7) is very similar in shape and ornamentation. The main difference is the lack of nodes at the intersection between radial and commarginal ribs (e.g., the specimens figured by Arkell, 1935: 333, pl. 46, figs. 8-9, pl. 47, figs. 1-4; Colleté, 1996: 14, fig. 4). In the past, however, specimens clearly belonging to *lirata* have been placed in *protei* (e.g., Moesch, 1875: 79, pl. 30, figs. 1-2; Stefanini, 1939: 263, pl. 27, figs. 6-8; Ficcarelli, 1968: 42, pl. 3, figs. 8, 8a.).

Pholadomya (*Bucardiomya*) sp. A

Pl. 15, Figs. 1-2

Material. Two articulated composite moulds (BSPG2012XI 501, 511) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area and the Kuh-e-Dowshakh area.

Description and remarks. The generally shape of the two specimens, e.g. the strongly protruding umbones and the triangular outline, corresponds to that of *Bucardiomya*. The regular rounded commarginal ribs, which cover the surface is identical to that of *P.* (*B.*) *lirata*. However, the conspicuous radial ribs of the latter are not present. One of the specimens (BSPG2012XI 501) exhibits several faint radial ribs in the umbonal area, which fade away around 2 cm from the beaks. In the second specimen (BSPG2012XI 511), the umbonal area is too poorly preserved for detailed observations. The specimens have been placed in *Pholadomya* (*Bucardiomya*) rather than *Homomya*, because of the presence of these faint radial ribs. More material would be needed for a more precise taxonomic placement of the specimens.

Family Ceratomyopsidae Cox, 1964
Genus *Ceratomyopsis* Cossmann, 1915

Type species. *Ceromyopsis helveticus* de Loriol, 1897.

Ceratomyopsis striata (d'Orbigny, 1822)
Pl. 15, Figs. 3-5

1822 *Isocardia striata* sp. nov. – d'Orbigny: 104, pl. 7, figs. 7-9.
1934 *Ceromyopsis striata* (d'Orbigny) – Arkell: 317, pl. 43, figs. 8-9.
1996 *Ceratomyopsis striata* (d'Orbigny) – Pandey et al: 61, pl. 7, figs. 1-4, text-fig. 2.

Material. Two right, four left, two articulated internal moulds, and one right composite moulds (BSPG2012XI 447-454) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area and Kuh-e-Echellon area, and from the Bidou Formation of the Chorand valley west of Ravar.
Description. Specimens oblique-oval in shape, strongly inflated, umbones strongly enrolled and forward directed, higher than long, with distinctly excavated anterodorsal area. A faint posterior umbonal ridge separates a less inflated posterior area, which is, however, missing in most of the specimens. Shell ornament consisting of numerous closely spaced rounded commarginal ribs.
Remarks. Although the specimens are poorly preserved and the posterior lobe is generally missing, the shape is distinct enough to identify them as *Ceratomyopsis striata*. The high variability of the species has been documented by Pandey et al., (1996).

Family Ceratomyidae Arkell, 1934
Genus *Ceratomya* Sandberger, 1864

Type species. *Isocardia excentrica* Roemer, 1836.

Ceratomya concentrica (J. de C. Sowerby, 1825)
Pl. 15, Figs. 6-7; Pl. 16, Figs. 1-2

1825 *Isocardia concentrica* sp. nov. – J. de C. Sowerby: 147, pl. 491, fig. 1.
1934 *Ceratomya concentrica* (J. de Sowerby) – Arkell: 315, pl. 43, fig. 10.

Material. Twenty-four right, 22 left, and 18 articulated internal and composite moulds (BSPG2012XI 429-446, PIW2003IV 17, 23) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area, the Kuh-e-Echellon area, SW of Tabas, and E of Tigh-e-Nakhlak.
Measurements (in mm).

Specimens	L	H	I
BSPG2012XI 431	32.3	26.0	22.9
BSPG2012XI 435	43.9	39.5	32.7
BSPG2012XI 442	77.2	58.4	48.4
BSPG2012XI 438a	27.7	25.5	-
BSPG2012XI 438b	23.4	19.1	-
BSPG2012XI 438c	29.5	22.4	-
BSPG2012XI 446	62.2	52.8	-
BSPG2012XI 446	26.7	19.7	-
BSPG2012XI 445a	23.9	18.8	-
BSPG2012XI 445b	21.5	17.5	-
PIW2003IV 23	21.4	18.4	16.9

Description. Specimens small to very large, longer than high, strongly inflated; umbones salient, beaks strongly prosogyrate. Umbones situated between 10-30% of shell length from the anterior end. Anterodorsal area of shell excavated, anterior and posterior margins well-rounded, posterodorsal margin gently convex to nearly straight, and ventral margin gently curved. Surface ornamentation consisting of numerous regularly spaced commarginal ribs of moderate strength.
Remarks. The specimens closely resemble *Ceratomya concentrica* as figured, for example, by J. de C. Sowerby (1825). The species is very common in the Kamar-e-Mehdi Formation, often occurring articulated, but the valves are commonly distorted to a varying degree. The presence of numerous small specimens and very large specimens would indicate that we are dealing with two different species. However, specimens of intermediated size are present, and thus the small individuals more likely suffered a premature death rather than representing a separate species.

Family Myopholadidae Cox, 1964
Genus *Myopholas* Douvillé, 1907

Type species. *Pholadomya multicostata* Agassiz, 1842.

Myopholas acuticostata (J. de C. Sowerby, 1827)
Pl. 16, Figs. 3-4

1827 *Pholadomya acuticostata* sp. nov. – J. de C. Sowerby: 88, pl. 546, figs. 1, 2.

Material. Four articulated and one left composite moulds, partly fragmented (BSPG2012XI 471-474) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area.
Description and remarks. Strongly inflated, elongated shells; greatest inflation below the umbones, tapering towards the posterior end. Umbones situated one-fourth of shell length from the anterior end. Anterior margin well rounded, ventral margin broadly convex. Valves gaping posteriorly, surface ornamented with radial ribs, which in the anterior fourth of the shell are slightly arcuate, curving anteriorly near the ventral margin. Ribs sharp, and differing greatly in strength: those of the anterior quarter of the shell spaced and strongest (5-6 in number), and those from the middle of the flank becoming increasingly more crowded and delicate towards the posterior end. The better preserved specimens (BSPG2012XI 472, 473) exhibit a wide, very shallow sulcus extending from posterior of the umbo towards the ventral margin.

Our material is very close to *M. acuticostata* of J. de C. Sowerby (1827), especially to his pl. 546, fig. 2.

Family Laternulidae Hedley, 1918
Genus *Platymyoidea* Cox, 1964

Type species. *Platymya dilatata* Agassiz, 1943.

Platymyoidea sp.
Pl. 16, Figs. 5-6

Material. Two articulated composite moulds, one fragmentary cast (BSPG2012XI 466-468) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area and SW of Tabas.
Description and remarks. Specimens very elongated, dorsal and ventral margins more or less straight and parallel to each other. Umbones inconspicuous, mesial. Surface ornamentation of rounded commarginal ribs which are more strongly developed on the anterior part of the shell.

No comparable species is known from the Jurassic, but our specimens resemble ?*Platymyoidea* sp. A of Pandey et al. (1996: 64, pl. 9, fig. 6) from the Middle Jurassic of Kachchh, western India. The posteriorly directed internal umbonal plate is seen in one specimen (BSPG2012XI 468) and confirms the identification as *Platymyoidea*.

Genus *Cercomya* Agassiz, 1843
Subgenus *Capillimya* Crickmay, 1936

Type species. *Capillimya capillifera* Crickmay, 1936.

Cercomya (*Capillimya*) *striata* (Agassiz, 1843)
Pl. 16 , Fig. 7

1843 *Cercomya striata* sp. nov. – Agassiz: 149, pl. 11, figs. 13-15, pl. 11a, figs. 5-7.

Material. One articulated and one right fragmentary composite mould (BSPG2012XI 469-470) from the Kamar-e-Mehdi Formation of the Kamar-e-Mehdi area.
Descriptions. Specimens strongly elongated, with a straight dorsal margin and widely arched ventral margin; anterior margin well rounded, moderately inflated; umbones situated in the anterior half, with rounded posterior umbonal ridge. Surface ornamented with rounded commarginal folds, which fade towards the ventral margin and towards the posterior area. Delicate punctate radial striae start some distance anterior of the umbonal ridge and possibly extent posterior of it (not seen in our specimens). They increase in strength towards the ventral margin. In addition, specimen BSPG2012XI 469 exhibits a very shallow, barely noticeable sulcus extending from the umbones towards the ventral margin, and being slightly forward directed.
Remarks. Although the genus *Cercomya* can be easily recognized, this is not true of the two subgenera, *Cercomya* s.s. and *Capillimya*. The two subgenera are supposed to differ by the presence of punctate radial striae on the posteroventral area of the shell in the case of *Capillimya*, whereas in *Cercomya* the posterodordal area is smooth (Myra Keen & Cox, 1969). Several authors have expressed doubts whether the lack of radial striae in species of *Cercomya* is a primary feature or due to poor preservation (e.g., Arkell, 1936: 353). For example, *Cercomya undulata* (J. de C. Sowerby, 1827: 91, pl. 548, figs. 1-2) is identical to *C. striata* except for the lack of the radial striae. If this lack is indeed a preservational artifact, then *undulata* would have priority over *striata*. Doubts in this respect were already expressed by Arkell (1936), who listed *Cercomya striata* Agassiz as a possible synonym of *C. undulata*. In this context, it is doubtful whether differentiation of *Cercomya* into subgenera makes sense.

Conclusions

Despite the commonly poor preservation of the fauna and its occurrence in a partially restricted shelf lagoon 86 taxa of bivalves have been documented. They belong to a variety of guilds ranging from deep infaunal to cemented epifaunal forms which lived in a generally low-energy setting that was episodically disturbed by high energy events such as storms. Deposit-feeders are represented by a single taxon (*Mesosaccella*), whereas byssate pectinids are very common, in particular some comparatively large forms (*Camptonectes (Grandinectes) teres* and *Pseudopecten (P.) tipperi*). Although all bivalves lived within the vast shelf lagoon, many are reworked and suffered transport for short distances. As a result they can be regarded as parautochthonous. The close association of bivalves with carbonates exhibiting gypsum needles and with thick packages of gypsum suggests that salinity of the lagoonal waters was commonly slightly elevated. This is corroborated by the extreme scarcity of a number of stenohaline groups such as ammonites and echinoderms.

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