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1 **A preliminary account on Devonian trilobites from Arabian Plate, SE Turkey**

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13 **Abstract.** Recently several Devonian localities and the related biota occurring from the
14 southeastern Turkey have been reinvestigated. Although, the Hakkari-Çukurca and the
15 Diyarbakır-Hazro areas of the Arabian Plate are considered as an important source of the
16 Devonian macrofossils from the north Arabian sector of Gondwana, the existing record of
17 Devonian trilobites in these regions were unknown hitherto. We here report and illustrate for
18 the first time Lower and Middle Devonian trilobites represented by two proetid pygidia and
19 one calymenid pygidium. The morphological features of these pygidia suggest that they can
20 be assigned to undetermined species of *Gravicalymene* (Calymenidae) and *Podoliproetus*
21 (Proetidae), two genera known in the Lochkovian; and *Basidechenella* (Proetidae), a genus
22 known in the Givetian.

23 **Keywords:** Southeastern Turkey, trilobites, Devonian (Lochkovian, Givetian), Arabian Plate

24 **I. Introduction**

25 Paleozoic sequences characterized by siliciclastic rocks with interbedded carbonates are
26 exposed in southern Turkey and constitute a W-E trending outcrop belt (Ghienne et al., 2010;
27 Hoşgör, 2021). The Paleozoic period of the southern Turkey contain a remarkable fossil
28 assemblage that has been studied intensively since the 50's of the 20th century. As a result,
29 several new discoveries and careful reinvestigations of Paleozoic fossils from the Taurus
30 Chain and the Arabian Plate in southern Turkey have been achieved. Progress regarding the
31 systematic description and stratigraphic position of trilobites, brachiopods, echinoderms,
32 arthropods, bivalves, rugose corals and microfloras, has accelerated significantly in the past
33 few years (e.g., Higgs et al., 2002; Dean 2006; Gourvenec and Hoşgör, 2012, 2015; Hoşgör
34 et al., 2012; Lamsdell et al., 2013; Denayer and Hoşgör, 2014; Hoşgör, 2014; Zamora et al.,
35 2015; Mergl et al., 2018; Hoşgör, 2021).

36 The Devonian Period is represented in Turkey by almost complete and thick sedimentary
37 successions, which exhibit different lithofacies and especially shallow marine facies of
38 different paleogeographic origin (Yalçın and Yılmaz, 2010). In the fossil record, trilobites
39 may be encountered in sedimentary sequences that accumulated in near-shore environments,
40 although they remain scarce due to the relatively low number of studies dealing with shallow-
41 water sequences. They remain rare with only 26 genera currently reported from the Istanbul
42 area and nothing else from other areas in the Devonian of Turkey. However, trilobites were
43 relatively abundant and diverse in marine habitats along the Peri-Gondwanan margin during
44 the Devonian, at a time of climate upheavals (Becker et al., 2016) which triggered significant
45 changes in biodiversity and major biotic crises (Sepkoski, 1996; Bond and Grasby, 2017).

46 The present paper contributes to the systematic study of few Devonian trilobites, represented
47 by two proetid pygidia and one calymenid pygidium, found in a shallow shelf to tidal flat

48 facies from the Border Folds regarded as the northern part of the Arabian Plate of Gondwana,
49 SE Anatolia, SE Turkey (Fig. 1A).

50 **2. Geological and stratigraphical setting**

51 Most of Paleozoic units in southeastern Turkey are represented by Cambrian to Permian
52 successions of para-autochthonous and autochthonous units in the Amanos Mts., Tut, Korudağ,
53 Hazro, Derik and Çukurca outcrops, in the northern edge of the Arabian Plate (Fig.1A).

54 Specifically, the Devonian of the Arabian Plate is represented by relatively thick sedimentary
55 sequences observed from west to east in the Amanos Mountains, Hazro High and Hakkari
56 area (Fig. 1A). These thick sequences are either eroded at their top, so that the Upper
57 Devonian is often missing or it overlaps older units, so that the Lower Devonian is missing
58 (Yalçın and Yılmaz, 2010). The examined Devonian sections are located in northern

59 Diyarbakır and southern Hakkari areas in the southeast Anatolian autochthon (Fig.1A). The
60 Devonian of the northerly-located Hazro area is represented by Lower Devonian, while the
61 Devonian of the Hakkari- Çukurca area consists of Middle to Upper Devonian (Fig. 2;
62 Bozdoğan et al., 1987; Yılmaz and Duran, 1997; Gourvenec and Hoşgör, 2012; Ausich and
63 Göncüoğlu, 2020). Devonian sequences at both localities on the Arabian Plate consist of
64 lithological associations representing a shallow shelf to tidal flat facies (Yalçın and Yılmaz,
65 2010).

66 Based on the consistency of their lithology and their common sedimentary features,
67 considering from surface geology to subsurface data (Perinçek et al., 1991), the Devonian
68 marine successions of the Diyarbakır (Hazro) and Hakkari (Çukurca) areas are divided into
69 two stratigraphical groups, i.e., Diyarbakır and Zap groups and consist of four formations:
70 Dadaş (oldest), Hazro, Kayayolu, and Yığınlı formations (Fig.1B). The studied trilobites
71 located in the Hakkari-Çukurca (Çukurca anticline) and the Hazro areas came from the upper

72 part of the Dadaş Fm. in the Hazro area, and the lower part of the Yığınlı Fm. in the Çucurka
73 area (Fig.1B).

74 **2.1. Studied areas, materials and methods**

75 A first field work was devoted to the Silurian-Devonian Diyarbakır Group, which represents
76 the oldest sedimentary sequence of the northern Diyarbakır area. The Diyarbakır group is
77 exposed in two geographically separated areas where it forms the core of faulted anticlines,
78 the Korudağ anticlines and the Hazro anticlines in the southeastern Turkey, respectively (Fig.
79 1A). The Diyarbakır Group consists of three formations (Perinçek et al., 1991), i.e., Dadaş,
80 Hazro, and Kayayolu formations (Fig. 1B). Surface and subsurface fossil records dominated
81 by acritarch, chitinozoans, cryptospores, miospores, conodonts, graptolites, brachiopods and
82 bivalves indicate that marine conditions were prevailed during the Silurian-Devonian time in
83 the Diyarbakır area (Tolun, 1949; Lebkuchner, 1976; Steemans et al., 1996; Hoşgör, 2014;
84 Oktay and Wellman, 2019). The Diyarbakır Group represents a change from the inner shelf to
85 lagoon deposition (Perinçek et al., 1991).

86 The Dadas Formation rich in fossils comprising spores, conodonts, ostracods, brachiopods,
87 crinoids among others (Çoruh et al., 1997; Yalçın and Yılmaz, 2010) is Early Silurian—Early
88 Devonian (Bozdoğan et al., 1987). Deposition of the Dadaş Formation, which consists of
89 dominantly organic rich shales, sandstones, limestones and dolomite of restricted marine
90 environment, is completed by a regressive cycle during the Early Devonian (Perinçek et al.,
91 1991; Hoşgör, 2014). Lithofacies, sedimentary structures and fossil content suggest a
92 restricted inner shelf, which became shallower and grade to a tidal flat towards the top of the
93 sequence (Yılmaz and Duran, 1997). Hitherto trilobites were unknown from this formation.
94 Within the Dadaş Formation, three members are distinguished based on different lithological
95 composition, which are reflected in log characteristics (Fig. 1B). The Dadaş-1 Member
96 consists of dark coloured, organic rich shales with some limestone interbeds; the Dadaş-2

97 Member is composed of similar shales alternating with some sandstones and the Dadaş-3
98 Member consists of an alternation of sandstones, marls and calcareous siltstones (Hoşgör,
99 2014). The sedimentary sequence of the Dadaş-1 and Dadaş-2 members cuttings were studied
100 from several deep wells and they are not exposed on the surface, limited top Dadaş-2 and
101 Dadaş-3 are exposed the Korudağ and Hazro outcrops (Bozdoğan et al., 1994; Steemans et al.,
102 1996). The overlying Hazro Formation is subdivided into five members, named F1 to F5 from
103 the bottom to the top of the unit (Bozdoğan et al., 1987). The Kayayolu Formation, the upper
104 part of the Diyarbakır Group, is composed mostly of shales, marls and dolomites (Bozdoğan
105 et al., 1987). First trilobite-bearing discoveries are reported from the Dadaş Formation at
106 Hazro anticlines, from a shale dominant lithology with some thin sandstone beds in the
107 uppermost part of the formation (Fig. 2A).

108 A second field work has resulted in the description of a previously known macrofossil-bearing
109 outcrop, between the towns of Hakkari and Çukurca which are situated close to the Iraq
110 border (Hoşgör et al., 2014). Trilobites recently collected from this area (Fig. 2B) were found
111 in the lower part of the Yıgınlı Formation (Fig. 1B) from thin lenticular bioclastic patches that
112 were recorded below a brachiopod bed. In this Formation poor in fossil remains, the described
113 brachiopods (Gourvenec and Hoşgör, 2012) allowed establishing a Middle Devonian
114 (Eifelian-Givetian) age for the middle part of the Yıgınlı Formation, thus making the new
115 trilobite remains older than the brachiopod bed. In previous studies or more recently,
116 palynomorphs, fish remains and crinoids from the upper part of the Yıgınlı Formation indicate
117 a Famennian age (Janvier et al., 1984; Higgs et al., 2002; Ausich and Göncüoğlu, 2020).
118 Lithofacies, sedimentary structures and fossil content suggest an intra-littoral to shallow
119 marine depositional environment (Bozdoğan et al., 2005). Hitherto trilobites were unknown
120 from this formation.

121 The illustrated specimens were stained with black ink and then coated with ammonium
122 chloride before being photographed with the use of a digital camera Canon. The described and
123 figured material is housed in the collections of Sivas Cumhuriyet University, Natural History
124 Museum, Turkey (collection numbers “CTF-HY022-01-03”) The morphological terminology
125 follows Whittington and Kelly (1997).

126 **3. Trilobite content from Turkey**

127 Trilobites remain rare in the Devonian of Turkey, with only few families reported from the
128 entire continent. From NW Turkey, several trilobite families have been reported by Haas
129 (1968) from the Silurian and Devonian of Bithynia, i.e., Istanbul area (Haas, 1968; Gandl,
130 1973) and especially in the Early Devonian (upper Emsian; Haas, 1982; van Viersen and
131 Holland, 2016), including *Kettneraspis leucothea* (Haas, 1968) (Odontopleuridae), *Cyphaspis*
132 *goerlichii* (Haas, 1968) (Otarioninae, Aulacopleuridae), *Gravicalymene euona* Haas, 1968
133 (Calymenidae), *Echinopyge cathamma* Haas, 1968 (Dalmanitidae), *Centauropyge pronomaea*
134 Haas, 1968 (Dalmanitidae), and potential species of *Morocops* (e.g., Haas, 1968, pl. 30, figs
135 6-7; Phacopidae) according to van Viersen and Holland (2016). Dalmanitidae is the most
136 diverse and abundant family in this area. *Trimerocephalus mastophthalmus* Richter, 1856
137 (Phacopidae) was also reported from the Upper Devonian (Gandl, 1973).

138 From SW Turkey (Eastern Taurides), Yılmaz and Demircan (2005) reported only trilobite
139 trace fossils in the Upper Devonian. *Pseudophillipsia* Gemmellaro, 1892 (Ditomopyginae,
140 Phillipsiidae) was reported in the Antalya Province (Southwestern Taurides) during the
141 Permian (Lerosey-Aubril and Angiolini, 2009).

142 From NE Turkey, only a pygidium of *Ditomopyge?* sp. indet. (Ditomopyginae, Phillipsiidae)
143 was described in the Carboniferous of Eastern Pontides (Kandemir and Lerosey-Aubril,
144 2011).

145 In SE Turkey, trilobites were described from the Cambrian and Upper Ordovician outcrops
146 from the Hakkari-Çucurka area (Dean and Zhou, 1988; Dean, 2006). A poorly preserved
147 pygidium from the Hazro region obviously belongs to an undetermined Permian species of
148 *Pseudophillipsia*, as proposed by Canuti et al. (1970) and accepted by Lerosey-Aubril and
149 Angiolini (2009). Hitherto trilobites were unknown from these areas during the Devonian.
150 By comparison with other areas from the northern peri-gondwanian margin, such as Morocco
151 (Crônier and Feist, 1997; Crônier and Clarkson, 2001; Crônier et al., 2013, 2018a, 2018b;
152 Khaldi et al., 2016; Bault et al., 2021), the trilobite remains from the the Arabian Plate, SE
153 Anatolia are rare.

154 **4. Systematic paleontology**

155 Order Phacopida Salter, 1864

156 Superfamily Calymenoidea Milne Edwards, 1840

157 Family Calymenidae Milne Edwards, 1840

158 Subfamily Calymeninae Milne Edwards, 1840

159

160 **Remarks:** Siveter (1976) assigned taxa with fixigenal buttresses to the glabellar lobes to
161 Calymeninae and the remainder of taxa to Flexicalymeninae. According to Adrain et al.
162 (2020), Calymeninae appears likely monophyletic and Flexicalymeninae paraphyletic, a group
163 left over by removal of Calymeninae. Here we follow Adrain (2013), Adrain et al. (2020), and
164 Holloway et al. (2020) considering all the taxa in question as Calymeninae. As recognized by
165 Smith and Ebach (2020), classifying calymenids remains a difficulty without a comprehensive
166 analysis using all diagnostic features.

167 The early history of putative members of the subfamily Calymeninae Milne Edwards, 1840, is
168 sparsely known (see Adrain, 2013, Adrain et al., 2020). First calymenines are known from the
169 Floian, all from Gondwanan Armorica. The subfamily became increasingly more common

170 thereafter especially during the Katian. Calymenines appeared in Laurentia during the
 171 Dapingian and achieved thereafter a global distribution (Adrain, 2013, Adrain et al., 2020).
 172 They still greater number during the Siluro-Devonian (Adrain, 2013).

173

174 Genus *Gravicalymene* Shirley, 1936

175 **Type species:** *Gravicalymene convolva* Shirley, 1936, from the Ashgill, Upper Ordovician,
 176 Birdshill Quarry, South Wales; by original designation.

177 **Remarks:** *Gravicalymene* is a genus currently known from the Late Ordovician to the Early
 178 Devonian (or lowest Eifelian); an unusually long temporal range for a trilobite genus.

179 According to Smith and Ebach (2020), such longevity may be related to occupation of a
 180 persistent niche space, such as a stable generalist lifestyle; or an artefact of insufficient
 181 morphological characters required for differentiation. *Gravicalymene* has been described from
 182 Avalonia, Baltica, Laurentia and East Gondwana (e.g., Chapman, 1915; Etheridge and
 183 Mitchell, 1917; Shirley, 1936; Gill, 1940, 1945; Stumm and Kauffman, 1958; Dean, 1962,
 184 1963; Vaněk, 1965; Ross, 1967; Haas, 1968; Alberti, 1969, 1981; Schrank, 1970; Chatterton,
 185 1971; Ingham, 1977; Chatterton et al., 1979; McNamara, 1979; Ross, 1979; Chatterton and
 186 Campbell, 1980; Holloway and Neil, 1982; Šnajdr, 1981, 1982; Price, 1982; Holloway, 1994;
 187 Sandford, 2000; Edgecombe and Wright, 2004; Zhou and Zhen, 2008; Owens et al., 2010;
 188 Smith and Ebach, 2020). Some species of Early Devonian age have been described, i.e.,
 189 *Gravicalymene euona* Haas 1968 from Bithynia (NW Turkey) and *Gravicalymene maura*
 190 Alberti 1969 from Morocco.

191 According to Kobayashi and Hamada (1977), *Gravicalymene* is a prominent genus in the
 192 macrofaunas of Japan (Koizumi and Kakegawa 1970), South China (Gill, 1945, Lu et al.,
 193 1965; Zhang, 1974) and North Viet-Nam. It occurs in North China (Nan, 1980), probably in
 194 Eastern Burma (Sahni in Héron, 1936), but unknown in South Asia except for Bithynia, NW

195 Turkey (Haas, 1968). This genus was also reported in Australia and New Zealand from
 196 Lochkovian to early Eifelian (Gill, 1945; Kobayashi and Hamada, 1977). These two areas are
 197 closely related to those of Southeastern and Eastern Asia as indicated by *Gravicalymene* and
 198 other genera (Kobayashi and Hamada, 1977).

199

200 *Gravicalymene?* sp. ind.

201 Fig. 3a-d

202 **Material:** One poorly preserved pygidium coming from the Lochkovian of Hazro section,
 203 Diyarbakir group, Dadas Formation, southeastern Turkey, north margin of Arabian Plate.
 204 Unfortunately, no cephalon is available.

205 **Remarks:** According to the revised diagnosis provided by Smith and Ebach (2020),
 206 *Gravicalymene* is characterized by a pygidium lenticular in dorsal view, strongly convex; a
 207 pygidial axis with deep axial furrows, fading around terminal piece; and a pygidial pleural
 208 field with faint to distinct pleural ribs. The pygidium figured here is imperfectly preserved
 209 showing a slight distortion and matches more or less to this diagnosis. The absence of
 210 complete and better-preserved specimens prevents an accurate assignment.

211 *Gravicalymene?* with a pygidium subrhomboidal in outline in dorsal view, rather flattened by
 212 deformation especially for the left side. Antero-lateral margin rather rounded. Length
 213 (excluding articulating half ring)/width ratio about 60% rather long. Its maximum width
 214 behind the midlength (sag.) across fifth segment. Posterior outline apparently broadly rounded
 215 backwards. Axial furrows deep and wide, which fade backwards. Pygidial axis not well
 216 preserved, strongly tapered (35°), gently convex, and probably not quite reaching the
 217 posterior margin. First axial ring very wide (42% sag. as percentage of maximum pygidial
 218 width), and flexed slightly forwards. Pseudo-articulating half rings apparently suggested by
 219 expanded inter-ring furrows that are deepest abaxially. Five preserved axial rings (plus

220 terminal piece not preserved) and four pleural ribs gently but more convex (tr.) anteriorly,
221 shorter posteriorly and depressed abaxially; subsequent pleural segments progressively less
222 clearly defined, overall shorter (exsag.) adjacent to axis. Pleural furrows rather wide and deep
223 from axis, past fulcrum, shallowing and narrowing abaxially, extending to pygidial margin;
224 subsequent pleural furrows progressively shallower, but remaining deep and discernible
225 adjacent to axial furrow. Interpleural furrows only distinct abaxially, extending to pygidial
226 margin. Postaxial region and posterior margin not preserved. Pygidium covered with sculpture
227 of fine granules, closely spaced on posterior pygidial border (Fig. 3d).

228 In comparison with Early Devonian Gondwana taxa, *Gravicalymene maura* Alberti, 1969
229 from Morocco differs and appears to possess a paradoublural line at which the deep pleural
230 furrows are truncated becoming abaxially narrow and shallow. *Gravicalymene euona* Haas,
231 1968 from Bithynia (NW Turkey) also seems to possess these features; a feature not observed
232 on our specimen.

233

234 Order Proetida Fortey and Owens, 1975

235 Superfamily Proetoidea Hawle and Corda, 1847

236 Family Proetidae Salteri 1864

237 Subfamily Proetinae Salter, 1864

238

239 **Remarks:** Proetines are among the most widespread and most frequent trilobites on the
240 continental margins of southern Laurussia and peri- and northern Gondwana during the
241 Pragian to Givetian (van Viersen, 2021). Data on the earliest Devonian (Lochkovian)
242 members of the subfamily are relatively limited and the supraspecific classification continues
243 to be a topic of debate (van Viersen, 2021).

244

245 Genus *Podoliproetus* Šnajdr, 1980

246 **Type species:** *Proetus perinsignis* Chlupáč and Vaněk, 1965 from the Pragian, Early
247 Devonian, Czech Republic; by original designation.

248 **Remarks:** Relationships among *Podoliproetus* and its allied genera have been reviewed by
249 Van Viersen (2021). Based on limited and poorly preserved cranidia and pygidia, Šnajdr
250 (1980) erected *Podoliproetus* for Pragian proetines from the Barrandian and Morocco with
251 spiny median nodes on the pygidial axis. More recently, Johnson and Fortey (2012) described
252 two new species on complete specimens from Morocco providing a better description.
253 According to Van Viersen (2021), *Podoliproetus* is characterized by a hypertrophied and
254 posteriorly strongly vaulted glabella with a strongly vaulted (sag., tr.) posterior section of
255 glabella and primitive cephalic traits. *Podoliproetus* and the oldest *Dohmiella* species from
256 the Eifelian share several cephalic characters and spiny median nodes on the anterior pygidial
257 axial rings, narrow (tr.) horizontal plane of pygidial pleural field abaxially demarcated by a
258 steeply inclined part, concave border furrow, and an inflated, primitively broad border.

259

260 ***Podoliproetus?* sp. ind.**

261 Fig. 3e-h

262 **Material:** One poorly preserved pygidium coming from the Lochkovian of Hazro section,
263 Diyarbakir group, Dadas Formation, southeastern Turkey, north margin of Arabian Plate.
264 Unfortunately, no cephalon is available.

265 **Remarks:** According to Van Viersen (2021), *Podoliproetus* is characterized by a pygidium
266 with spiny median nodes on the anterior axial rings, a narrow (tr.) horizontal plane of pleural
267 field abaxially demarcated by a steeply inclined part, concave border furrow, and an inflated,
268 primitively broad border. The pygidium figured here is imperfectly preserved especially the

269 pygidial axis. The absence of complete and better-preserved specimen prevents a reliable
270 assignment.

271 *Podoliproetus?* with a pygidium semi-elliptical in outline in dorsal view, with a well-defined
272 border. Length (excluding articulating half ring)/width ratio about 65.5% long. Its maximum
273 width in front of the midlength (sag.). Posterior outline rounded backwards. Axial furrows
274 rather deep. Pygidial axis not preserved but apparently strongly tapered (around 40°). First
275 axial ring wide (41% sag. as percentage of maximum pygidial width) defined by deep furrows
276 abaxially (not preserved medially). Five discernible pleural ribs anteriorly almost planar (tr.)
277 in adaxial half, and steeply sloping downwards in abaxial half towards border furrow;
278 subsequent pleural segments progressively less clearly defined, overall shorter (exsag.)
279 adjacent to axis and (tr.) posteriorly. Pleural bands of low convexity in cross-section. Pleural
280 furrows rather wide and deep; the first one crossing the border furrow onto the border, the
281 others dying out at border furrow. Interpleural furrows well defined, dying out at border
282 furrow. Border furrow distinct but rather shallow. Postaxial region not preserved. Pygidial
283 border rather wide with rounded edges. In frontal view, posterior margin curved dorsally
284 medially. Pygidium covered with sculpture of fine granules on the border.

285 In comparison with Early Devonian Gondwana taxa, *Podoliproetus mirdani* Johnson and
286 Fotery, 1992 from the Pragian of Morocco is similar to that of the studied specimen from
287 Turkey but the border seems to be more rounded, and the border widens slightly adaxially as
288 far as the postaxial area where it becomes narrower. Without cranidium, it is not possible to
289 say more.

290

291 Family Proetidae Salter, 1864

292 Subfamily Dechenellinae Přibyl, 1946

293

294 **Remarks:** If several authors (Hupé ,1953; Yolkin, 1968, 1983; Maximova ,1970, 1977;
 295 Ormiston, 1972, 1976) have considered Dechenellinae to have family status within the
 296 Proetoidea. Following Thomas in Thomas and Narbonne (1979) and Zhou et al., (2020), the
 297 subfamily closely related to the Proetinae is maintained within the Proetidae family. The
 298 detailed interrelationships between various genera of the Dechenellinae remain to be resolved.

299

300 *Genus Basidechenella* Richter, 1912

301 **Type species:** *Basidechenella kayseri* Richter, 1909, from uppermost Emsian, Lower
 302 Devonian, Wetteldorf, Eifel, Germany; by original designation.

303 **Remarks:** *Dechenella* and relatives including *Basidechenella* is one of the most diversified
 304 genera among Devonian proetids. The considerable number of species makes the taxonomy
 305 and the evolutionary relationships of *Basidechenella* clouded (Lieberman, 1994). Several
 306 authors have improved the systematics, with the identification of several subgenera such as *D.*
 307 (*Basidechenella*) Richter 1912. On the basis of several ancestral characters, including a thin
 308 and rounded pygidial posterior border, this subgenus was subsequently removed from
 309 *Dechenella* and given generic status by Lieberman (1994), who considered *Basidechenella* to
 310 be distantly related. More systematic investigations need to be performed to solve the
 311 evolutionary relationships.

312 The earliest occurrences of *Basidechenella* are known in Morocco (Alberti, 1967), maybe in
 313 Germany (Richter and Richter, 1950) and in North America from the Lower Devonian (upper
 314 Emsian) and diversified during the Middle Devonian (Eifelian and Givetian) in North
 315 America (Stumm, 1953a, 1953b, 1964; Lieberman 1994). According to Lieberman (1994),
 316 most *Basidechenella* are associated with reefal or carbonate shallow water deposits from
 317 Laurentia.

318 *Basidechenella?* sp. ind.

319 Fig. 3i-m

320 **Material:** One preserved pygidium coming from the Givetian of Hakkari-Çucurka area,
321 Yiginli Formation, southeastern Turkey, north margin of Arabian Plate. Unfortunately, no
322 cephalon is available.

323 **Remarks:** According to the diagnosis provided by Lieberman (1994), *Basidechenella* is a
324 genus characterized by a high number of pygidial axial rings (10-14); medially, anterior
325 margin of axial rings weakly deflected posteriorly, weakly deflected forward distally; pygidial
326 interpleural furrows weakly incised. The pygidium figured here is well preserved and matches
327 rather well to this diagnosis. However, the absence of complete preserved specimens prevents
328 an accurate assignment.

329 *Basidechenella?* with a pygidium subpentagonal in outline in dorsal view, subparabolic in
330 outline posteriorly, moderately vaulted sagittally and transversely, with a well-defined border.
331 Length (excluding articulating half ring)/width ratio about 63% long. Its maximum width in
332 front of the midlength (sag.) across fourth segment. Posterior outline broadly rounded
333 backwards. Axial furrows straight and deep. Pygidial axis strongly tapered (38°), convex and
334 subconical in shape. First axial ring wide (37% sag. as percentage of maximum pygidial
335 width), and flexed strongly forwards and highly convex; subsequent axial rings more weakly
336 forwardly curved and convex. Pseudo-articulating half rings suggested by expanded inter-ring
337 furrows anteriorly. Nine discernable axial rings (plus terminal piece) defined by narrowest
338 furrows posteriorly. Seven pleural ribs more vaulted (tr.) anteriorly and adaxially, shorter
339 posteriorly and depressed abaxially, strongly sloping downwards towards border furrow;
340 subsequent pleural segments progressively less clearly defined, overall shorter (exsag.)
341 adjacent to axis. Pleural furrows rather wide and deep from axis, dying out at border furrow;
342 subsequent pleural furrows remaining deep and discernible adjacent to axial furrow.
343 Interpleural furrows distinct, dying out at border furrow. Border furrow rather wide and deep.

344 Pygidial border rather narrow and convex with scaly ridges ventrally (Fig. 3m). Pygidium
345 covered with sculpture of fine granules. Each axial ring with a distinct axial node medially
346 (Fig. 3k).

347 In comparison with Middle Devonian taxa, *Basidechenella?* sp. ind. resembles to the Givetian
348 *Basidechenella pulchra* Stumm, 1953a from North America, by having a similar pygidial
349 outline and medial tubercles on all pygidial axial rings but differs in having 11 pygidial axial
350 rings. As stated by Stumm (1953a), *Basidechenella pulchra* was very similar to
351 *Basidechenella nodosa* Stumm, 1953a in having also medial tubercles on all pygidial axial
352 rings. *Basidechenella?* sp. ind. differs from *Basidechenella nodosa* by having posterior
353 portion of pygidium straight, transverse in dorsal view and eight pygidial pleural segments.

354 **4. Conclusion**

355 The present paper contributes to the systematic study of the few Devonian trilobites collected
356 recently on the field from the northern part of the Arabian Plate of Gondwana, SE Anatolia,
357 SE Turkey. The freshly collected material comes from two different sections, i.e., Diyarbakır-
358 Hazro and Hakkari-Çukurca, respectively in two different formations, i.e., Dadaş (oldest) and
359 Yığınlı (youngest) formations. Devonian trilobites were unknown hitherto in these areas.
360 According to brachiopods and other organisms, the age of the newly collected trilobites
361 ranges between the Lochkovian and the Givetian. The relatively well-preserved calymenid
362 pygidium and two proetid pygidia are assigned to undetermined species of *Gravicalymene*
363 (Calymenidae) and *Podoliproetus* (Proetidae), two genera known in the Lochkovian; and
364 *Basidechenella* (Proetidae), a genus known in the Givetian, taking into account their pygidial
365 outline, axis shape and ornamentation, thus becoming an additional report for a northern peri-
366 gondwanian margin but also for a worldwide distribution. Their occurrence in the Lower-
367 Middle sequences of Turkey is compatible with a shallow shelf to tidal flat facies. By

368 comparison with other areas from the northern peri-gondwanian margin, such as Morocco
 369 (Bault et al. 2021), the trilobite remains from the the Arabian Plate, SE Anatolia remain rare.

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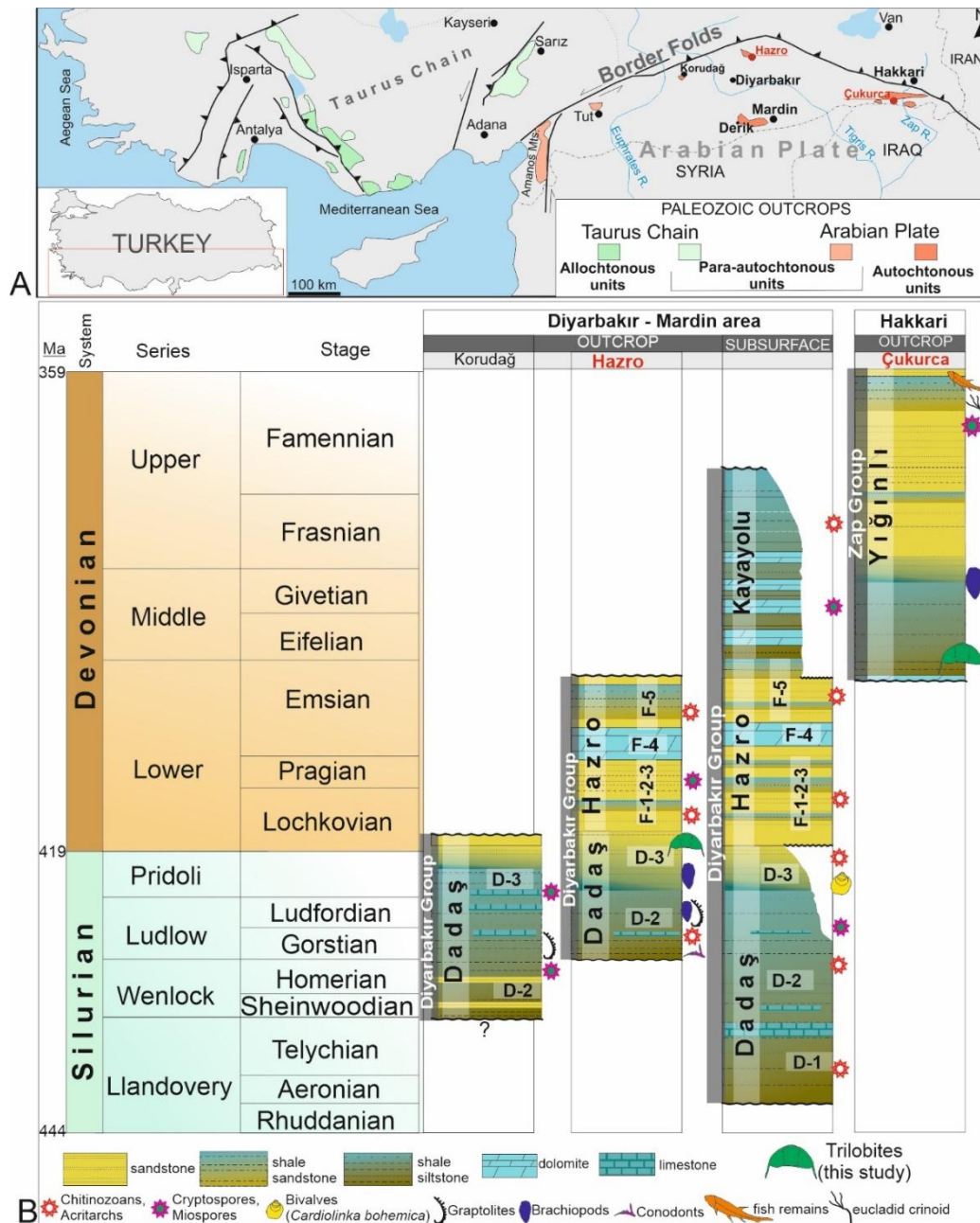
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668 **Figure 1.** A-Location of the main Paleozoic outcrops in southern Turkey showing the Hazro
669 and Hakkari-Çukurca areas of the Arabian Plate (Ghienne et al., 2010; Hoşgör 2014; Hoşgör
670 et al., 2014). B-Generalized stratigraphic sections of the Silurian to Devonian rocks of the
671 Arabian Plate, in southeastern Turkey with the localities studied yielding Devonian trilobites
672 in the Hazro and Çukurca regions. Lithostratigraphical sections showing the main fossils and
673 occurrences of trilobite-bearing levels (Tolun, 1949; Steemans et al., 1996; Higgs et al., 2002;

674 Gourvenec and Hoşgör, 2012; Hoşgör 2014; Hoşgör et al., 2014; Oktay and Wellman, 2019;
675 Ausich and Göncüoğlu, 2020).

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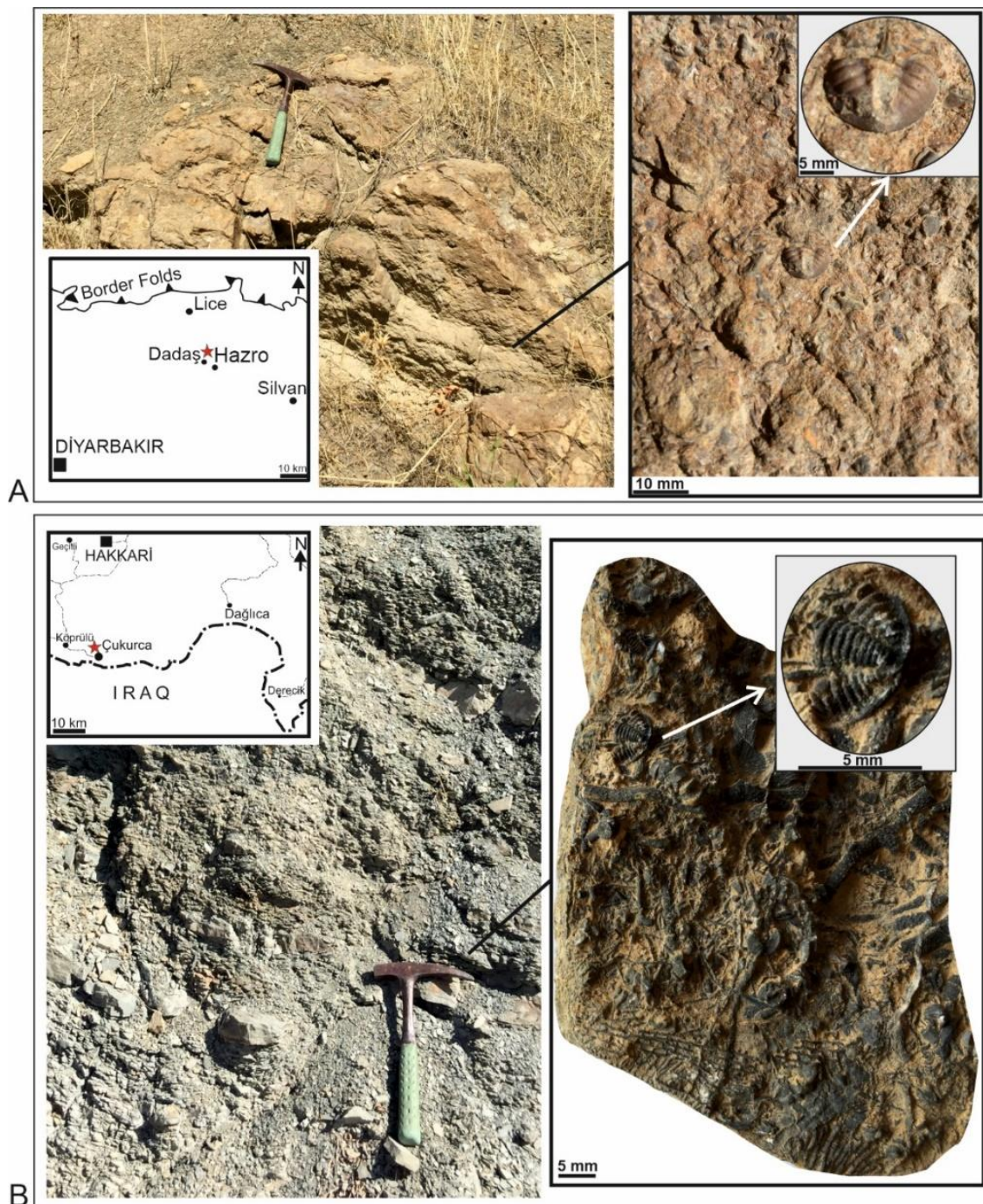
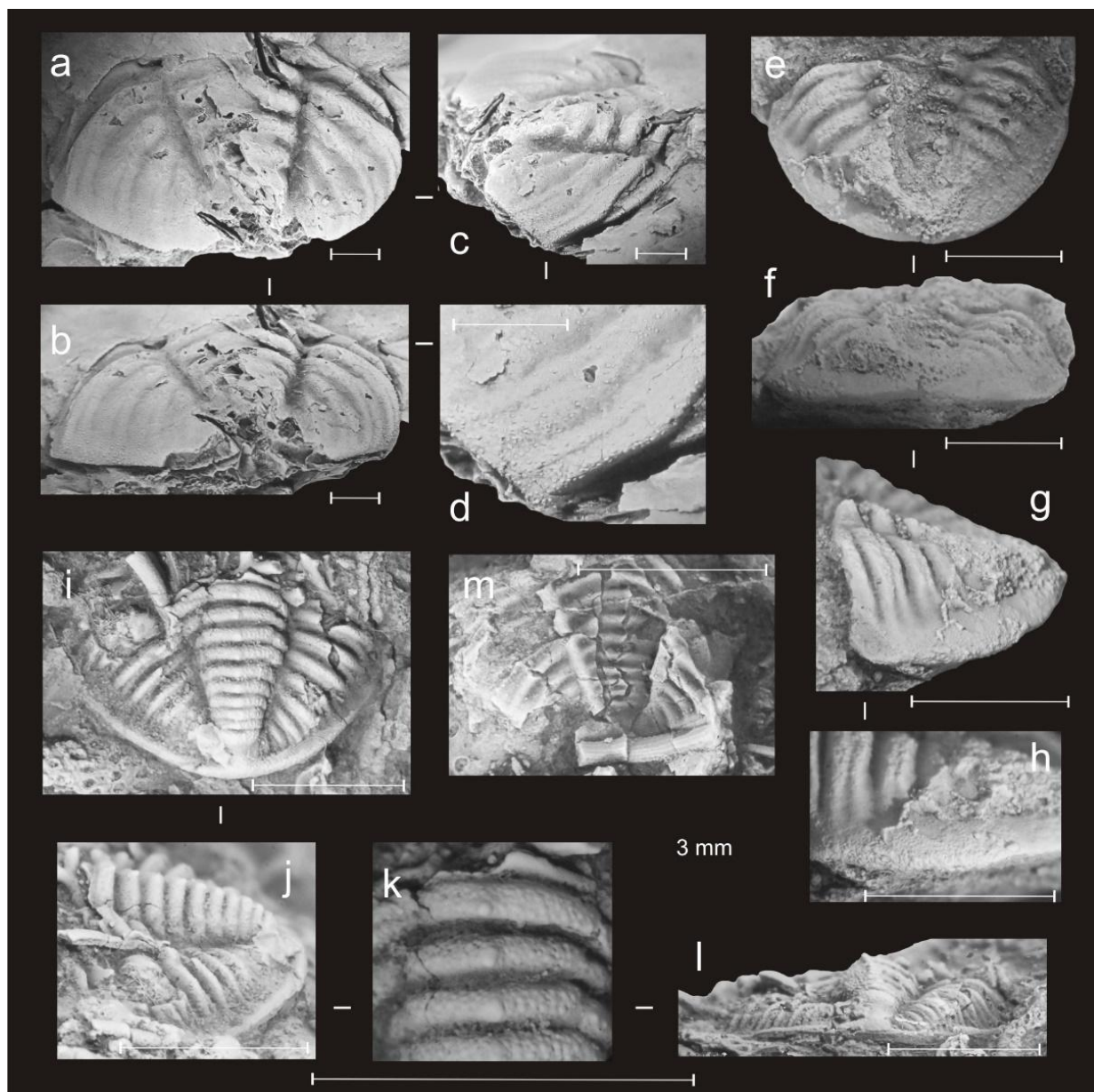


Figure 2. General view of the Devonian trilobite-bearing successions to the northwestern of the A-Hazro and B-Çukurca areas.



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690 **Figure 3.** (a-d) *Gravicalymene?* sp. ind., Hazro section, southeastern Turkey, north margin of
 691 Arabian Plate, Diyarbakir Group, Dadas Formation, Lochkovian; pygidium in (a) dorsal, (b)
 692 frontal, (c) and lateral views; (d) detail of postero-lateral border. (e-h) *Podoliproetus?* sp. ind.,
 693 Hazro section, southeastern Turkey, north margin of Arabian Plate, Diyarbakir Group, Dadas
 694 Formation, Lochkovian; pygidium in (a) dorsal, (b) frontal, (c) and lateral views; (d) detail of
 695 lateral border. (i-m) *Basidechenella?* sp. ind., Çucurka section, southeastern Turkey, north
 696 margin of Arabian Plate, Zap Group, Yığınlı Formation, Givetian; pygidium in (i) dorsal, (j)

697 lateral, and (l) frontal views; (k) detail of pygidial axis; (m) another pygidium in ventral view.

698 Scale: 3 mm.