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Comparative skeletal osteology of *Darevskia parvula* (Lantz & Cyren, 1913) and *Darevskia adjarica* (Darevsky & Eiselt, 1980) (Squamata: Lacertidae)

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Abstract

A detailed description of cranial and postcranial osteology of Darevskia parvula and D. adjarica is provided osteological data for further comparative studies of other lizards. The descriptions and comparisons are based on 12 specimens, of which 10 adult and 2 juveniles for each species. Darevskia parvula and D. adjarica are highly conservative species and they have similar osteological features. The differences in the current study are the number of teeth for the cranial skeleton and the number of vertebrae for the postcranial. Darevskia parvula has a lower number of teeth than D. adjarica.

Keywords: *Lacertidae, Darevskia parvula, Darevskia adjarica, osteology, Turkey.*

Darevskia parvula (Lantz & Cyren, 1913) ve *Darevskia adjarica* (Darevsky & Eiselt, 1980)'nın karşılaştırmalı iskelet osteolojisi (Squamata: Lacertidae)

Özet

Darevskia parvula ve D. adjarica türlerinin kranial ve postkranial osteolojilerinin

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detaylı tanımlaması diğer kertenkele türlerinin karşılaştırmalı çalışmaları için osteolojik veriler sağlamaktadır. Tanımlamalar ve karşılaştırmalar her bir tür için 10 erişkin ve 2 jüvenil bireylerden oluşan 12 örneğe dayanmaktadır. Darevskia parvula ve D. adjarica oldukça korunmuş türleridir ve benzer osteolojik özelliklere sahiptirler. Bu çalışmadaki farklılıklar kranial iskelet için diş sayısı ve postkranial iskelet için de omur sayısıdır. Darevskia parvula'nın D. adjarica'dan daha az dişi vardır.

Anahtar Kelimeler: *Lacertidae, Darevskia parvula, Darevskia adjarica, osteoloji, Türkiye.*

1. Introduction

The Lacertidae is one of the most common lizard families in the world. So far, numerous studies investigated the phylogeny of the family Lacertidae using both morphological and molecular approaches. However, intra- and interspecific relationships within the genus *Darevskia* are still unclear. The lacertid genus *Darevskia* includes 32 species that exist in Armenia, Azerbaijan, Bulgaria, Georgia, Greece, Iran, Kosovo, Romania, Russia, Serbia, Turkey and Turkmenistan [1, 2]. The herpetofauna of Turkey includes 15 species of the genus *Darevskia* [6, 9]. Formerly, *Darevskia parvula* had two subspecies: *D. p. parvula* and *D. p. adjarica*. The distribution sites of these two taxa include Northeastern Turkey (Rize, Artvin, Ardahan and Bayburt proviences) and Georgia. *Darevskia adjarica* was originally described as a subspecies of *D. parvula* [16]. Based on its morphological, osteological and molecular data, it was elevated it to the species level [7].

Darevskia parvula is a widely studied species [7, 15, 16, 21, 23]. It was formerly considered as a member of the *Lacerta saxicola* group [23]. Since then, the taxonomy of the species examined here has been revised so many times [7, 10, 12, 13, 15, 16, 21]. Furthermore, numerous molecular studies have been conducted for the species examined [18, 19, 26, 27]. Although there are many studies conducted on their taxonomy, genetics and morphology, detailed and comprehensive osteological studies of the lizard families including Lacertidae received relatively limited attention [5, 6, 22, 28]. In this study, we aim to provide detailed comparative osteological descriptions of *D. parvula* and *D. adjarica,* and to shed some more light on the osteology and phylogeny of these lacertids.

2. Materials and methods

In this study, we used ten adult (5 ♂♂ and 5♀♀) and two juvenile specimens of *D. adjarica* collected from 24 km W of Ortacalar, Artvin, northeastern Anatolia. We also used ten adult (5 ♂♂ and 5♀♀) and two juvenile specimens of *D. parvula* captured from 30 km SW of Yusufeli, Artvin, northeastern Anatolia. These specimens were museum materials deposited in Biology Department, Dokuz Eylül University. All specimens were cleared and double stained following the methodology described by [33]. We followed the osteological terminology described by [4, 11, 20, 31, 32]. All illustrations were taken using a Leica DFC295 camera. Illustrations were digitized and arranged in CORELDRAW (Ver. X4).

3. Results

3.1. The skull roof of Darevskia adjarica and D. parvula

Frontal. The frontal is described as a paired median bone that articulates with the nasals anteriorly, the prefrontals anterolaterally, the postfrontals posterolaterally and the parietal posteriorly. The bone forms the roof of the anterior portion of the braincase and the dorsolateral edge of the orbit. The width of frontal is the largest where the bone contacts the parietal and the postfrontals. The bone carries two processes: the anterolateral process that extends the angle formed by the nasal, the prefrontal and the facial process of the maxilla and the posterolateral process that is slightly rounded in the two lacertids (Figure 1A and B). The length of the bone is longer than the parietal.

Parietal. The parietal is a single bone that forms the posterior roof of the skull (Figure 1A and B). The bone carries two processes: the anterolateral and the supratemporal processes. The anterolateral process of the parietal is shorter than the supratemporal process. The length of the bone is shorter than its width. The posterodorsal edge of the braincase is not covered by the parietal. The post-temporal fenestra is open in the two lacertids. The supratemporal process of the parietal is slender and contacts the supratemporal with its posterolateral margin. The bone articulates with the postfrontal laterally, the frontal anteriorly, the supraoccipital posteriorly. All specimens examined here have a parietal foramen in the dorsal view.

3.2. Nasal region of Darevskia adjarica and D. parvula

Premaxilla. The premaxilla is an unpaired bone that is the anteriormost elements of the snout (Figure 1A and B). Bones have an alveolar and a nasal process. The premaxilla carries a slender nasal process and a broad alveolar process. The nasal process of the premaxilla extends between the nasals. This process reaches only one-forth of the anterior part of the nasals. The alveolar process of the premaxilla is thinner and carries teeth along its ventral surface. These parts are similar in both lacertid species (*D. parvula* and *D. adjarica*). The premaxilla articulates with the maxilla posterolaterally, the vomer posteroventrally and the nasals posteriorly. The maxillary process of the premaxilla articulates with the premaxillary process of the maxilla. The premaxilla carries 7 premaxillary teeth in both *D. parvula* and *D. adjarica*.

Maxilla. The maxilla is a paired bone that forms the lateral side of the snout (Figure 1A and B). The bone reaches almost half of the skull. Each maxilla carries three processes: the premaxillary, the orbital, and the facial processes. The facial process of the maxilla extends to the nasal and its posterior end is concave in the two lacertids. In the anterior to posterior sequence, the bone articulates with the premaxilla, nasal, anterolateral process of the frontal and prefrontal. The orbital process forms the posterior part of the maxilla. Each maxilla articulates also with the platine medially, the lacrimal, jugal and ectopterygoid posteriorly. Ventrally, the alveolar portion of the maxilla carries an average of 17.1 maxillary teeth in *D. parvula* and an average of 15.8 maxillary teeth in *D. adjarica*.

Nasal. The nasal is a paired and thin bone that articulates with the premaxilla anteriorly, the frontal posteriorly, the maxillae anterolateally and the prefrontals posterolaterally (Figure 1A and B). The one-fourth of the anterior part of the nasal is separated from other part of the nasal by the nasal process of the premaxilla. The posterior end of the nasal overlaps the anterior part of the frontal. The lateral edges of the nasals connect with the facial processes of the maxillae. The anterior edge of the facial process of the maxilla and the anterior edge of the nasal forms the dorsal edge of the nares.

3.3. Orbital region of Darevskia adjarica and D. parvula

Prefrontal. The prefrontal is a paired bone and is approximately triangular in the two lacertids (Figure 1A and B). The bone forms the anterodorsal edge of the orbit. The prefrontal encloses the orbital cavity with the frontal, the postfrontal, the postorbital and the jugal. The posterodorsal process is slender and elongated and extends to the lateral margin of the frontal in the two species.

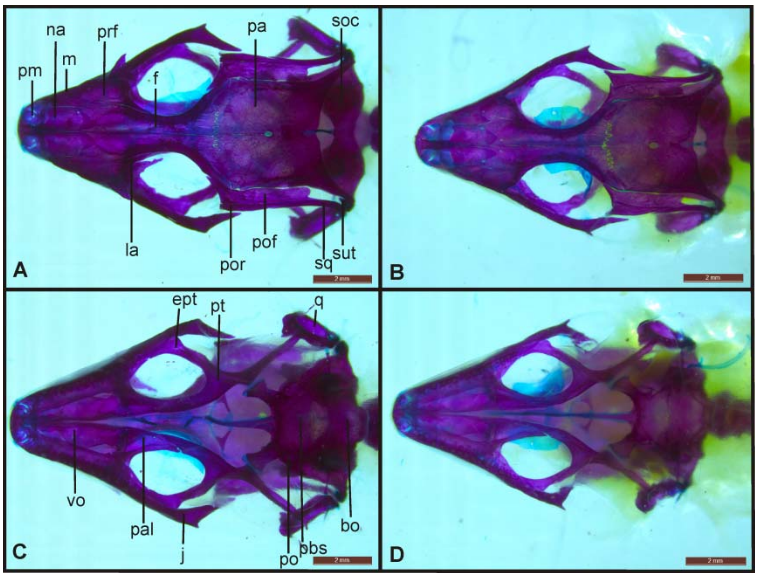

Figure 1. Skull of *D. adjarica* (A and C) and *D. parvula* (B and D). A. and B. Dorsal view, C. and D. Ventral view. bo, basioccipital; ept, ectopterygoid; f, frontal; j, jugal; l, lacrimal; m, maxilla; na, nasal; pfr, prefrontal; pa, parietal; pal; palatine; pbs, parabasisphenoid; pm, premaxilla; po, prootic; pof, postfrontal; por, postorbital; pt, pterygoid; q, quadrate; soc, supraoccipital; sq, squamosal; sut, supratemporal; vo, vomer (scale bar = 2 mm).

Lacrimal. The lacrimal is a large and triangular cranial element in each lacertids (Figure 1A and B). The bone forms the anterior orbit edge and is located between the prefrontal and jugal. In the dorsal view, the lacrimal articulates with the maxilla anterolaterally, the jugal posterolaterally and the prefrontal medially.

3.4. Temporal region of Darevskia adjarica and D. parvula

Postfrontal. The postfrontal is a paired bone that is approximately rectangular in the dorsal view (Figure 1A and B). The anterior part of the postfrontal forms the posteromedial portion of the orbit whereas the posterior part of the bone forms the anterior edge of the supratemporal fenestra. Unlike the parietal, the bone does not get longer posteriorly. The bone exists between the parietal and postorbital and articulates with the frontal, the parietal and the postorbital.

Postorbital. The postorbital is thin and its posterior edge, which meets with the squamosal, is sharp (Figure 1A and B). Anterolaterally, the bone extends up to the jugal but these two bones do not connect with each other. In both species, the postorbital connects with the postfrontal medially and with the anterior process of the squamosal posterolaterally. The postorbital is not fused with the postfrontal in the two lacertids we examined.

Squamosal. The squamosal is a paired and thin bone that has a sharp anterior process and a curved posterior process (Figure 1A and B). The anterior process extends up to the postorbital, whereas the posterior process is lying through the quadrate ventrally and supratemporal laterally.

Supratemporal. The supratemporal is a small bone with a sharp anterior end (Figure 1A and B). The bone exists between the squamosal and supratemporal process of the parietal. The postfrontal is not connecting with the supratemporal. The anterior edge of the bone forms the posterior part of the supratemporal fenestra.

Quadrate. The quadrate is a paired bone that forms the posterolateral angle of the skull (Figure 1C and D). The bone is flattened and approximately in rectangular shape. The bone articulates with the lower jaw.

Epipterygoid. The epipterygoid is a long and rod-like element of the skull (Figure 1C and D). The bone extends anterior to the prootic.

Jugal. The jugals are approximately L-shaped bones in the lateral view (Figure 1C and D). However, there is a small protuberance at the level of the posterior process in the two lacertid taxa we examined here. The bone forms the posteroventral edge of the orbit. The bone has anterior and posterior processes. The anterior process articulates with the posterodorsal part of the maxilla anterolaterally and the lacrimal anteriorly. The posterior process that articulates with the anterolateral process of the ectopterygoid extends to the postorbital.

3.5. Palatal region of Darevskia adjarica and D. parvula

Vomer. The vomer is a paired and elongated bone that forms the anterior potion of the palate (Figure 1C and D). The anterior part and the end of the vomer are sharp but it is broadening posteriorly. In the ventral view, the vomer is surrounded by the premaxilla, the maxilla and the palatine. The anterior margin of the vomer meets the medial part of the premaxilla whereas, the posterior edge of the vomer articulates with the vomerine process of the palatine. The connection between the maxilla and the vomer is floppy. The anterior part is fused to each other, while the remaining part of the bone is separated medially.

Palatine. The palatine occupies the middle part of the skull floor (Figure 1C and D). The palatines do not contact one another in the midline because of the pyriform space. The posterior part of the bone is wider than its anterior part. The vomerine process of the palatine overlaps with the posterior edge of the vomer, whereas the pterygoid process of the palatine overlaps with the palatine process of the pterygoid.

Pterygoid. The pterygoid forms the posterior part of the palate and does not bear teeth (Figure 1C and D). The pterygoids are separated by the pyriform space. The Y-shaped bone carries the palatine, the transverse, and the quadrate processes. The posteromedial part of the orbital fenestra is formed by the palatine process that articulates with the pterygoid process of the palatine and transverse process. The transverse process connects to the medial process of the ectopterygoid. The quadrate process of the pterygoid is longer than other processes and meets the quadrate in the posterolateral part of the skull.

Ectopterygoid. The ectopterygoid is a triradiate bone that forms the lateral margin of the orbital fenestra (Figure 1C and D). Anterolaterally, the ectopterygoid articulates with the orbital process of the maxilla. Posterolaterally, the bone connects the transverse process of the pterygoid. Each ectopterygoid carries anterolateral, posterolateral and medial processes, which articulate with the maxillae, jugals and pterygoids, respectively.

3.6. Oto-occipital region of *Darevskia adjarica* and *D. parvula*

Prootic. The prootic forms the anterolateral portion of the braincase (Figure 1C and D). The alar process of the bone articulates with the supraoccipital dorsally. The anteroventral process meets with the basioccipital ventrally. The prootic also contacts the parabasisphenoid anteroventrally and the otooccipital posteriorly.

Supraoccipital. The supraoccipital is an unpaired bone that creates the posterior roof of the braincase (Figure 1A and B). The bone exists posteriorly to the parietal and forms the dorsal edge of the foramen magnum. All of the specimens we examined have a posttemporal fenestra.

Basioccipital. The basioccipital is an unpaired bone that forms the posterior end of the braincase (Figure 1C and D). The bone articulates with the parabasisphenoid anteriorly and is lying anteriorly to the occipital condyle.

Parabasisphenoid. The parabasisphenoid is a single bone that is composed of the parasphenoid and the basisphenoid (Figure 1C and D). The bone presents anterior of the basioccipital and forms the anterior floor of the braincase. The basipterygoid process lies anterolaterally to medial and connects with the pterygoid. A long cultriform process is located at the anteromedial part of the parabasisphenoid.

3.7. Mandible of Darevskia adjarica and D. parvula

Dentary. The dentary is the largest mandibular bones and carries teeth on its dorsal surface (Figure 2A and B). The dentary creates the anterior half of mandible. The bone articulates with the angular ventromedially, the surangular ventrolaterally and the coronoid dorsally. The dentary carries an average of 19.5 dentary teeth in *D. parvula* and an average of 20.8 dentary teeth in *D. adjarica*.

Coronoid. The coronoid is a small V-shaped bone that exists in the middle of the mandible (Figure 2A and B). The bone occupies the space between the surangular and the dentary. The coronoid carries a large dorsal process and the height of the process has approximately the maximum height of the dentary. The labial process of the bone is approximately equal in width for both lacertid species and extends to the dentary. The anteromedial and posteromedial processes are present in the lingual view. The anteromedial process (or anterior lingual process) contacts several bones like the dentary anteriorly, splenial ventrally, surangular posterodorsally. The posteromedial process (or posterior lingual process) overlaps to the surangular and articular.

Angular. The angular locates the ventral surface of the mandible (Figure 2A). The bone forms approximately one-third the length of the mandible. The bone in the labial view is more likely apparent than the lingual view. The articular contacts the surangular posterodorsally and posterior end of the dentary anterodorsally.

Surangular. The surangular is contact with the coronoid anteriorly, the articular posteriorly and the angular laterally (Figure 2A and B). The surangular forms the posterior half of the mandible. The length of the bone is approximately same length as the dentary.

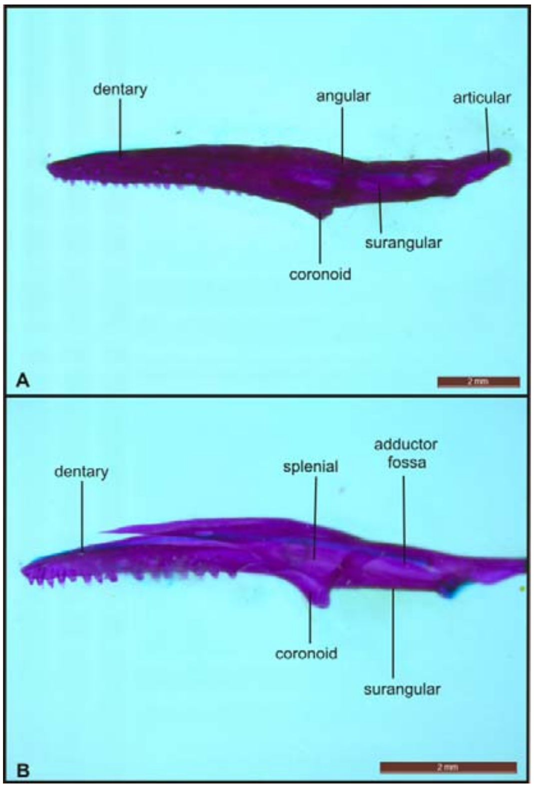

Figure 2. Mandible of *D. adjarica* and *D. parvula.* A. Labial view of *D. adjarica* and B. Lingual view of *D. parvula* (scale bar = 2 mm).

Splenial. The splenial is a long and thin bone that is seen in the anteromedial part of the mandible (Figure 2B). The bone meets the anterior lingual process of the coronoid posterodorsally and dentary anterodorsally.

3.8.Hyoid apparatus

The hyoid occupies beneath the lower jaw (Figure 3A). It consists of several elements. The basihyal is the central triradiate element and is calcified in all specimens (Figure 3C and D). The basihyal carries the glossohyal that is a long and thin medial process (Figure 3C and D). The hypohyal that is oriented anterolaterally and the ceratohyal that is oriented posterolaterally form the first visceral arch (Figure 3C and D). The hypohyal articulates with the basihyal anterolaterally (Figure 3C and D). The posterolaterally oriented first ceratobranchial and first epibranchial form the second visceral arch. The first ceratobranchial articulates with the basihyal posterolaterally. The second ceratobranchial and second epibranchial constitute the last visceral arch of the hyoid apparatus. In some younger specimens, the second ceratobranchial is cartilaginous.

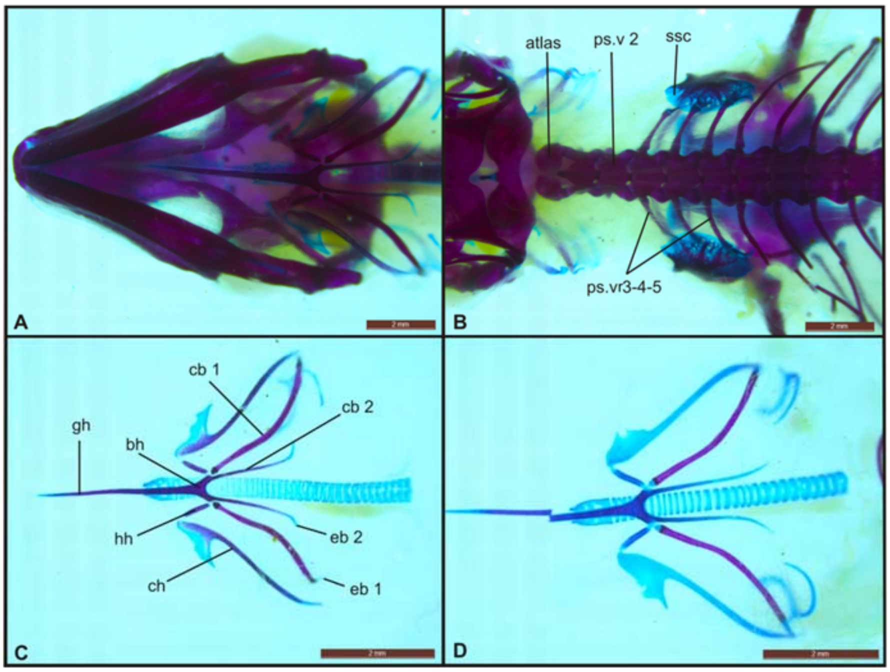

Figure 3. Hyoid apparatus and presacral vertebrae of *D. adjarica* and *D. parvula.* A. Ventral view of the adult of *D. parvula,* B. Dorsal view of the adult *D. adjarica,* C. Dorsal view of the juvenile of *D. parvula,* D. Dorsal view of the adult of *D. parvula.* bh, basihyal; cb 1- 2, ceratobranchial 1-2; ch, ceratohyal; eb 1-2, epibranchial 1-2; gh, glossohyal; hh, hypohyal; ps.v, presacral vertebrae; ps.vr, presacral vertebral ribs; ssc, suprascapula cartilage (scale bar = 2 mm).

3.9.Vertebrae

The number of the vertebrae in *D. adjarica* is similar with those of *D. parvula.* Both *D. parvula* and *D. adjarica* have 27-28 presacral vertebrae. The morphology of the vertebrae is also similar with each other. The atlas is the first vertebra and is constituted by the intercentrum and the neural arches. Dorsally, the paired neural arches of the atlas do not contact with one another. The atlas lies through the axis that has wide neural arches in the dorsal view. The prezygaphophysis occupies the anterior edge of the vertebra, whereas the postzygaphophysis are present on the posterior edge of the vertebra. The axis has a transversal process without the ribs (Figure 3B). The following three and the last six vertebrae have short ribs in the examined species. In some specimens, the ribs on the last presacral vertebra are reduced. Interspecific variation is caused by the number of the remaining vertebrae, that have long ribs. There was a interspecific variation between male and female specimens with respect to the number of vertebrae. *Darevskia.parvula* and *D. adjarica* had 27-28 vertebrae for males and females, respectively.

3.10. Pectoral and pelvic girdles

The pectoral girdle consists of a single interclavicle, paired clavicles, scapulae, coracoids, epicoracoids and suprascapulae (Figure 4A and D). The clavicle and interclavicle are the only ossified elements in all specimens (Figure 4B and E). However, the epicoracoid, suprascapula, sternum, and xiphisternum are partly ossified or cartilaginous in some specimens we examined (Figure 4B and E). The morphology of the pectoral girdle in both species is similar with each other. The clavicle is closed and simple rounded shaped, whereas the interclavicle is cruciform in the species examined here (Figure 4A and D). The lengths of the anterior interclavicular process are shorter than the posterior interclavicular process in *D. parvula* and *D. adjarica* (Figure 4B and E). The sternal-xiphisternal costal formula is (3+2) that is three pairs of ribs are attached directly to the sternum and two pairs of ribs are attached to the xiphisternum. A sternal fontanelle that is oval in shape is also present in the two lacertid species (Figure 4A and B).

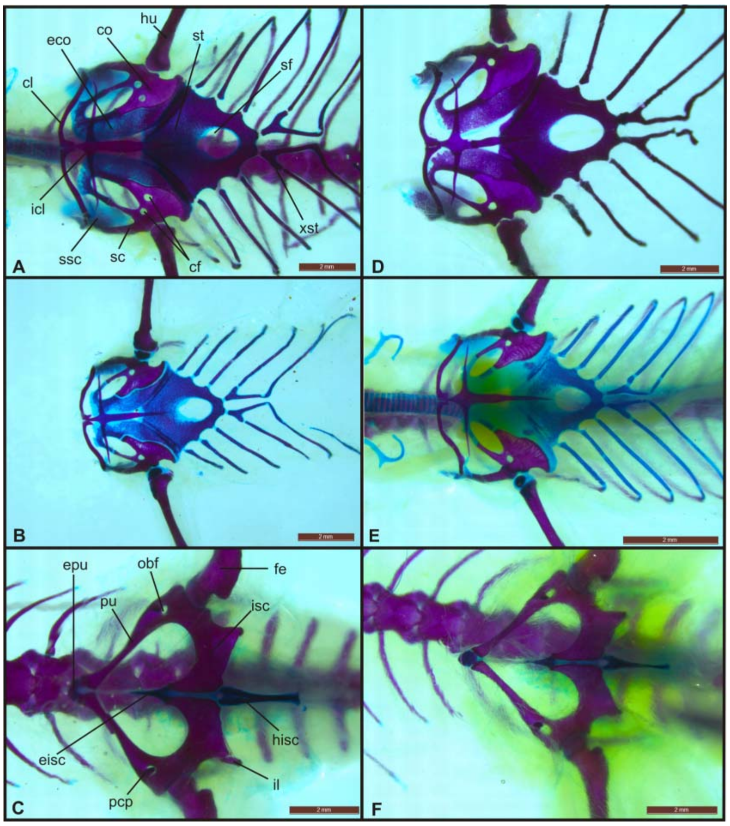

Figure 4. Pectoral and pelvic girdles of *D. adjarica* and *D. parvula.* A. adult of *D. adjarica,* B. juvenile of *D. adjarica,* C. adult of *D. adjarica,* D. adult of *D. parvula,* E. juvenile of *D. parvula* F. adult of *D. parvula.* cf, coracoid foramen; cl, clavicle; co, coracoid; eco, epicoracoid; eisc, epiischium; epu, epipubis; fe, femur; hisc, hipoischium; hu, humerus; icl, interclavicle; il, ilium; isc, ischium; obf; obturator foramen; pcp, pectinal process; pu, pubis; sc, scapula; sf, sternal fontanella; ssc, suprascapula, st, sternum, xst, xiphisternum (scale bar = 2 mm).

The pelvic girdle is constituted by the epipubis, pubis, ilium, hypoischium, epiischium and ischium (Figure 4C and F). In the pubis of both species examined here, the pectinal process and obturator foramen are present. The ilium is rod-like in shape and meets the sacral vertebra. The epipubis presents in the anterior end of the pubis. The epiischium and hypoischium occupy anterior and posterior side of the ischium, respectively. The single and large ischio- pubic fenestra is surrounded by the pubis and ischium. The pelvic girdle is similar in the two lacertid species.

3.11. Forelimb and hindlimb

The forelimb is composed of the humerus, radius, ulna, metacarpals and digits (Figure 5A and C). The first segment of the forelimb is the humerus whereas the intermediate segments are the radius and ulna. The carpal, metacarpal and phalanges form the distal segment of the forelimb. The proximal end of the humerus articulates with the glenoid fossa whereas the distal ends articulate with the radius and ulna. The ulna is larger than the radius. The carpal region in the distal segment constitutes the proximal and distal row bones. The radiale, ulnare and centrale are in the proximal row whereas the distal carpals 1, 2, 3, 4 and 5 are in the distal row. The centrale is found between radiale and ulnare. A big pisiform occupies ventral to the ulna. The digits comprise of the long metacarpals and phalanges. The phalangeal formulae for the forelimbs is as follows; 2, 3, 4, 4, 3.

The hindlimb consists of the femur, tibia, fibula, metatarsals and digits (Figure 5B and D). The tarsus comprises the fibulare, tibiale and two distal tarsals. The first segment of the hinlimb is the femur and the intermediate segment is the fibula and tibia. The tarsal, metatarsal and phalanges form the distal segment of the hindlimb. The fibulare and ulnare are present at the distal ends of the tibia and fibula. The phalangeal formulae for the hindlimbs is as follows; 2, 4, 4, 3, 2.

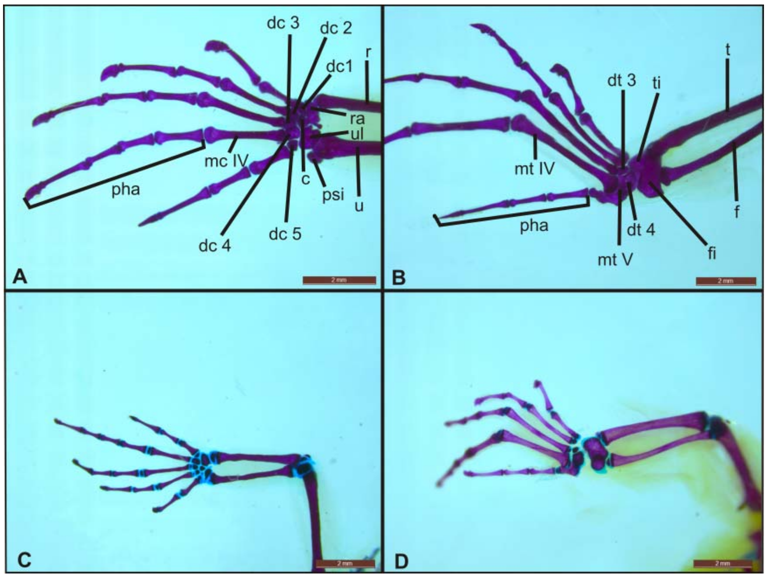

Figure 5. Fore- and Hind-limb of *D. adjarica* and *D. parvula*. A. Adult of *D. adjarica*, B. Adult of *D. parvula*, C. Juvenile of *D. adjarica* and D. Juvenile of *D. parvula*. c, centrale; dc 1-2-3-4-5, distal carpal 1-2-3-4-5; dt 3-4; distal tarsal 3-4; f, fibula; fi, fibulare; mc IV metacarpal IV; mt IV-V metatarsal IV-V; pha, phalange; psi, psiform; r, radius, ra, radiale; t, tibia; ti, tibiale; u, ulna; ul, ulnare (scale bar = 2 mm).

4. Discussion

The skull is the most complicated skeletal element and provides important data for phylogenetic analysis. [14]. The phylogeny of reptiles has some contradiction. Osteological studies have paved the way for molecular works. The genus *Darevskia* [3] which have some taxonomic revisions, have been investigated in numerous studies. Most of the subspecies were evaluated to species rank because of the detailed morphological and molecular studies [3, 6, 15, 17, 26]. Although osteological data have an important role to address its taxonomic position and attain a better understanding of the evolution of lizards, the literature on skeletal osteology of lizard is quite limited. Among all lizard families, Gymnophthalmidae is one of the most commonly studied families [11, 20, 25, 29, 30].

There is an intraspecific variation in *D. parvula* and *D. adjarica*. Some authors found that there is variation during ontogeny of lizards [8]. There are some differences between juvenile and adult *Darevskia* species we examined here with regard to cranial bones (frontal, parietal). The closure of the frontoparietal suture does not occur and frontoparietal fenestra remains open in the juvenile specimens. This openness seems like a plus sign. This variation is important to elucidate individual characteristics of each specimen. The number of teeth also varies among specimens. In the pectoral girdle of juvenile specimens, the suprascapula, epicoracoid and sternum are partly ossified or cartilage. Moreover, in the hyoid apparatus, the ceratohyal and second ceratobranchial are cartilaginous in most juvenile specimens, whereas they are ossified in all adult specimens examined.

The genus *Darevskia* is intricate because of the taxonomic position of specimens. In previous studies, all of the rock lizards were known as a single group, *Lacerta saxicola.* As studies on these species were started to be carried out, the taxonomic position of many species was changed or renamed to another species. Arribas et al. [7] studied *D. parvula* by using morphology, osteology and genetics approaches and suggested that two subspecies had to be evaluated as two distinct species (*D. parvula* and *D. adjarica*). They found that *D. parvula* and *D. adjarica* show similar osteological characters with each other. However, difference is caused by having an extra vertebra in both sexes of Ardahan specimens of *D. adjarica.* Specimens examined here also have the same number of presacral vertebrae. Both species have 27-28 vertebrae for males and females, respectively. This difference in the number of vertebrae is explained with the climatic conditions. According to Lourdais et al. [24] this condition affected the vertebral number which is related with the snout-vent length during embryogenesis. The number of teeth also differs from *D. parvula* and *D. adjarica*. The number of teeth in *D. adjarica* is more than *D. parvula* except for the premaxilla. The alveolar surface of *D. parvula* carries 7 teeth in the premaxilla, 15 to 16 teeth in the maxilla and 17 to 21 teeth in the dentary. In *D. adjarica* the number of teeth is as follows: 7 teeth in the premaxilla, 16 to 19 teeth in the maxilla and 18 to 23 teeth in the dentary.

Darevskia species analyzed also share some osteological characters. These characters have largely protected in the two species. They have similar osteological characters and these similarities are as follows: 1) The frontal bone separate from one another, 2) the pineal fontanelle present in the parietal, 3) The postorbital and postfrontal separate from each other, 4) The sternum has an oval-shaped fontanelle and the sternal formula is (3+2), 5) The clavicle is open in shape, 6) The interclavicle is cruciform and posterior process in two species is longer than anterior one, 7) the post-temporal fenestra is available, 8) supratemporal fenestra present, 9) the nasal and orbital openings are not equal in size, 10) the jugal is triradiate with a small posterior process, 11) the premaxilla-maxilla articulation is simple. Despite these similarities, the skeletal elements of species here show differences when they compared with other lacertids from the literature. Müller [28] investigated skull osteology of *Parvilacerta parva* and found a large braincase, a short parietal table, closed post-temporal openings and a large lacrimal. Similarly, species analyzed here have a parietal table and large lacrimal. However, the post-temporal opening is open in all examined species. Khosravani [22] worked on skull osteology of the two lacertids *Eremias persica* and *Mesalina watsonana.* In this study, the authors found that there are some differences between the two lacertid species. In *E. persica*, the nasals contact with each other whereas the bones do not contact in *M. watsonana,* Also, a big pyriform space in *M. watsonana* is larger than those of *E. persica.* But, these osteological differences are not present in our species examined here. Osteology of *Darevskia defilippi* was treated by Arribas [5] and some osteological characters are as follows: 7-8 teeth in premaxilla, 13-17 teeth in maxilla and 19-20 teeth in dentary; the postfrontal and postorbital bones separate from one another and are subequal; the maxillojugal suture is smooth; the squamosal overlap one third of the postorbital; the number of the presacral vertebra is

27 in males and 28-29 in females. Our species examined here share similar osteological characters with *D. defilippi* except from the number of the presacral vertebra and teeth.

The osteological morphology of *D. parvula* and *D. adjarica* is described carefully in the current study. Our work provides important and detailed data about the osteology of these lacertid species. But, we still need more information to better understand morphology of the skeleton of lacertid taxa and his variation among the groups of this conservative family. Despite the number of lizards and importance of such studies, these kind of osteological studies are scarce. Moreover, the cranial and postcranial skeleton provides useful data for lacertid phylogeny and for relationship among species.

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