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COMMUNICATION

HERPETOFAUNAL INVENTORY OF VAN PROVINCE, EASTERN ANATOLIA, TURKEY

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Herpetofaunal inventory of Van Province, eastern Anatolia, Turkey

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Abstract: In this study, amphibian and reptile diversity in the province of Van (eastern Anatolia, Turkey) was surveyed. For this purpose, four herpetological excursions (20 days in total) were conducted covering all the districts of the province in 2014. In this paper, up-to-date herpetofaunal inventory of Van Province, including two urodelian, four anuran, two chelonian, 15 saurian (lizards), and 14 ophidian (snakes) species (six amphibians and 31 reptiles in total) is presented. To the best of our knowledge, *Salamandra infraimmaculata*, *Heremites auratus*, *Dolichophis jugularis*, *Eirenis modestus*, and *Telescopus fallax* were recorded for the first time in the province of Van. Additionally, the first published print record of *Stellagama stellio* in Van Province is presented. The major threat to the herpetofaunal diversity in surveyed habitats was found as human-origin habitat degradation. With the georeference database obtained in this study, it will be possible to determine the actual distribution ranges of the species and to guide decision-makers. The results of the study will provide a useful basis for future monitoring studies and distribution information will contribute to the conservation of the species of interest.

Keywords: Amphibia, biodiversity, check-list, distribution, new record, Reptilia.

Abbreviations: CITES—The Convention on International Trade in Endangered Species of Wild Fauna and Flora | DD—Data Deficient | GPS—Geographical Positioning System | IUCN—The International Union for Conservation of Nature and Natural Resources | LC—Least Concern | NE—Not Evaluated | NT—Near Threatened | VU—Vulnerable | WGS84—World Geodetic System of 1984.

Turkish: Bu çalışmada, Van ilinin (Doğu Anadolu, Türkiye) kurbağa ve sürüngen biyoçeşitliliği araştırılmıştır. Bu amaçla, 2014 yılında tüm ilçeleri kapsayacak şekilde toplam 20 gün olmak üzere dört arazi çalışması gerçekleştirilmiştir. Bu yayında Van iline ait güncel herpetofauna envanteri sunulmaktadır. Elde edilen verilere göre güncel olarak Van ilinde iki kuyruklu kurbağa, dört kuyruksuz kurbağa, iki kaplumbağa, 15 kertenkele ve 14 yılan olmak üzere toplam altı amfibi ve 31 sürüngen türü bulunmaktadır. *Salamandra infraimmaculata*, *Heremites auratus*, *Dolichophis jugularis*, *Eirenis modestus* ve *Telescopus fallax* türleri bu çalışma ile Van'dan ilk defa kaydedilmiştir. Ayrıca daha önce Van ilinden fotoğraf ile kaydedilen *Stellagama stellio* ise basılı makale kaydı olarak ilk kez verilmiştir. Çalışma yapılan habitatlarda herpetofauna çeşitliliğini tehdit eden en önemli faktör insan kaynaklı habitat parçalanması olarak bulunmuştur. Bu çalışmada elde edilen coğrafi referans veri tabanı ile türlerin güncel dağılımlarının belirlenmesi mümkün olacaktır ve bu veriler karar-vericileri yönlendirecektir. Çalışmanın sonuçları gelecekte yapılacak izleme çalışmaları için temel oluşturacaktır ve dağılım verileri türlerin koruma planlarına katkı sağlayacaktır.

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Competing interests: The authors declare no competing interests.

For **Author details & Author contribution** see end of this article.

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Note: Preliminary results of this study was presented in 12th National Ecology and Environment Congress, held in Muğla, Turkey between the dates 14–17 September 2015.

INTRODUCTION

Amphibians and reptiles are important parts of various ecosystems and make up a considerable part of the global vertebrate diversity. Their central role is to maintain the energy flow and nutrient cycling between trophic levels (Valencia-Aguilar et al. 2013). Additionally, as they depend on the habitat microstructure, they are good indicators to monitor the ecosystem health (Budak & Göçmen 2008). Therefore, inventory and monitoring amphibian and reptile diversity are important to assess the species' population statuses and provide useful information for ecosystem management (Morrison et al. 2008). The identification and protection of any species are constrained by the lack of information regarding the abundance, distribution, and habitat requirements of the threatened species (Smith et al. 1997). The course of future management strategies for the threatened species depends on this type of baseline information (Blamford & Gaston 1999) that comes from the inventory and monitoring studies (Morrison et al. 2008). Short-term monitoring studies are more feasible and draw a general framework for a species or habitat, while long-term monitoring studies produce more valuable data allowing to assess the change in ecological communities over time. Both approaches are essential for developing evidence-based species conservation programs (Smith et al. 1997; Blamford & Gaston 1999; Morrison et al. 2008; Magurran et al. 2010).

Turkey has a very rich floral and faunal diversity due to its special biogeographical features which makes this region one of the important intersections of biodiversity hotspots (Ambarlı et al. 2016; Gür 2016). Herpetofauna surveys have been conducted in Turkey by many researchers (Venzmer 1922; Bird 1936; Bodenheimer 1944; Clark & Clark 1973; Başoğlu & Baran 1977, 1980; Başoğlu et al. 1994; Baran & Atatür 1998; Eksilmez et al. 2017; Avcı et al. 2018; Yıldız et al. 2019; Akman et al. 2020; Gidiş & Başkale 2020; Üçeş & Yıldız 2020). Many new findings, especially after 2000, provided the most recent information and revealed the rich herpetofauna diversity of Turkey (e.g., Sindaco et al. 2000; Baran et al. 2004; Göçmen et al. 2007; Yıldız et al. 2007; Hür et al. 2008; Göçmen et al. 2009; Afsar and Tok 2011; Akman et al. 2013; Göçmen et al. 2013a,b, 2014; Cihan & Tok 2014; Tok & Çiçek 2014; İğci et al. 2015; Yıldız & İğci 2015; Akman et al. 2016; Kumlutaş et al. 2017; Sarıkaya et al. 2017; Akman et al. 2018; Avcı et al. 2018; Yıldız et al. 2018a,b; Mebert et al. 2020; Üçeş & Yıldız 2020; Yıldız 2020).

East Anatolian region is a transitional zone between

the continents, and its high mountainous structure produces different types of habitats for the flora and fauna elements. These special features make the region one of the hotspots for biodiversity (Şekercioğlu et al. 2011; Ambarlı et al. 2016). Van Province is located in eastern Turkey and on the closed basin of Lake Van, the largest lake of the country. Van is surrounded by high mountains; 53% of the province consists of mountains, 33% of plateaus, and 14% of the plains, approximately. High mountains are mainly located on the south and north, and there are high plateaus in the eastern part of the province. The average altitude of Van Province is approximately 2,000 m (Baylan et al. 2013). The province has a continental climate with an average temperature ranging 3.3–11.7 °C and the main vegetation is the steppe (Baylan et al. 2013; Kalkan et al. 2019). Locality records of some amphibians and reptiles from Van Province were previously published in herpetofauna notes or species-oriented studies (e.g., Clark & Clark 1973; Franzen & Sigg 1989; Schmidtler & Lanza 1990; Schmidtler et al. 1994; Uğurtaş 2001; İlgez et al. 2007; Tayhan et al. 2011; Yıldız & İğci 2015; Akman et al. 2016) and books (Başoğlu & Baran 1977, 1980; Başoğlu et al. 1994; Budak & Göçmen 2008). The herpetofauna of the province, however, has not been studied in detail. Since inventory studies are important for developing species conservation plans, it is aimed in this study to determine the herpetofauna diversity of the province and provide an updated species list and distribution data.

MATERIALS AND METHODS

Four herpetological surveys between 25 May and 20 September (20 days in total) were conducted in the province of Van in 2014 (in May, June, August, and September). The area was divided into 150km² (1: 25.000) grids and at least one suitable site in each grid was surveyed for amphibians and reptiles. Field studies were conducted in various habitats (e.g., wetlands, forests, steppes, dune, high mountains, settlements, and agricultural areas). A total of 283 localities, ranging 1,252–2,990 m, were surveyed during these excursions. One-hundred-and-seven localities in which at least one amphibian and/or reptile species was observed are shown on a map (Figure 1). Different sites within the range of 5km² are shown as one point to obtain a comprehensible map. The geographical coordinates of the stations were recorded by using the geographical positioning system (GPS) device (Garmin Montana 650). Coordinates were recorded as latitude and longitude in

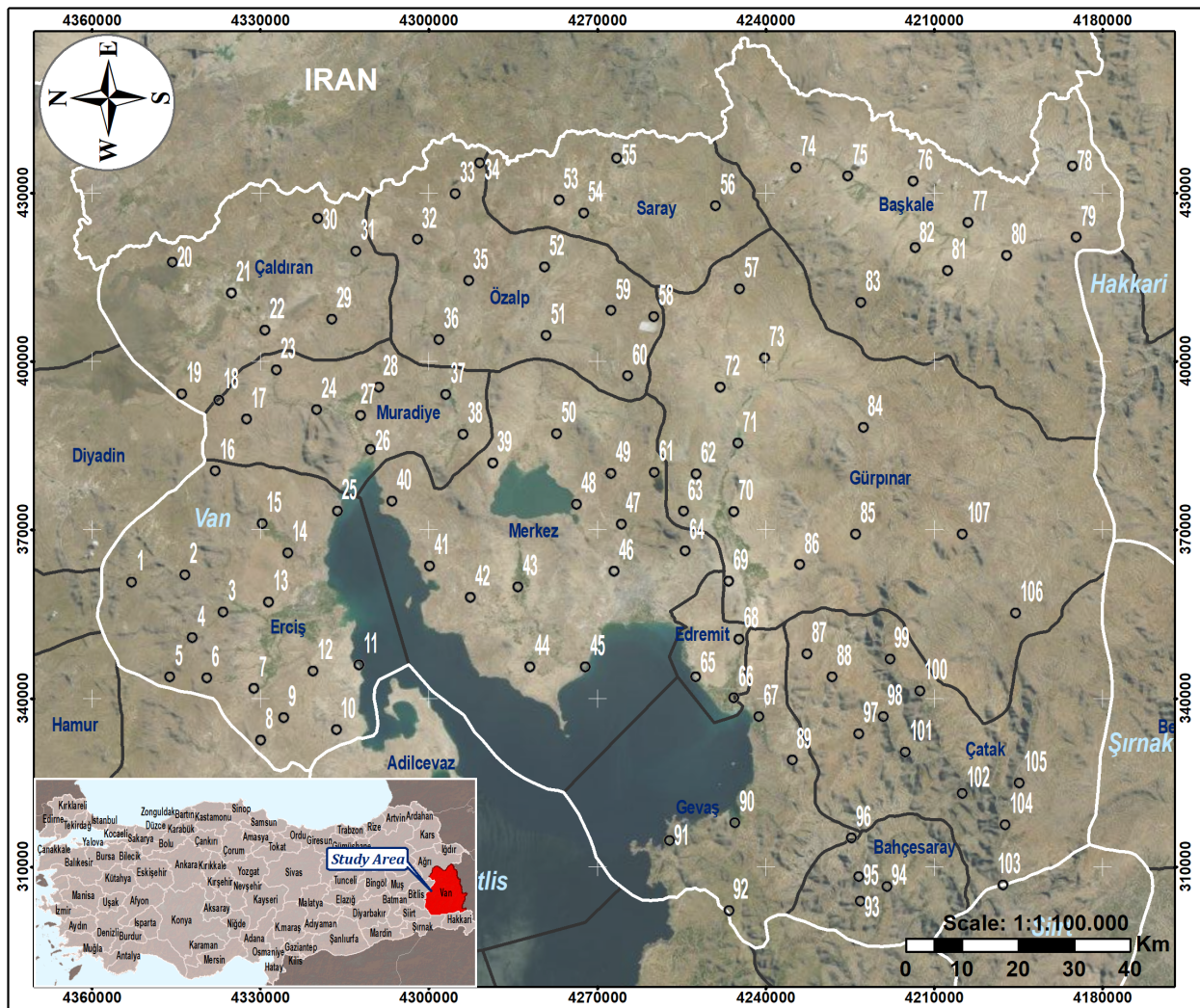


Figure 1. Localities of the species observed in the present study. The numbers correspond to the locality numbers in Table 1 and Appendix 1.

decimal degrees and referenced to the World Geodetic System of 1984 (WGS84) datum. The coordinates were deposited in The Noah’s Ark Biodiversity Database (The Republic of Turkey, Ministry of Agriculture and Forestry, General Directorate of Nature Conservation and National Parks).

During the field studies, reptiles were identified by either visual encounter or caught by hand for detailed examination if needed. Amphibians were identified by the visual encounter and anuran calling surveys or caught. Sampling from lakes was done by using a scoop if needed. Opportunistic records (e.g., by the way) and road-kills were also obtained. Photographs of the live animals were taken on-site using digital cameras. After the examination and photographing, the animals were released at the same locality where they had been captured.

Identification of the common species was performed by referencing the literature (Başoğlu & Baran 1977, 1980; Leviton et al. 1992; Baran & Atatür 1998; Budak & Göçmen 2008). The species were grouped into chorotype categories as proposed by Vigna Taglianti et al. (1999). Species endemic to Anatolia were categorized as “Anatolian endemic”, one species (*Parvilacerta parva* (Boulenger, 1887)) was assigned to “Armeno-E-Anatolian endemic” and main chorotypes were used for other species. Additionally, the conservation status of the amphibians and reptiles was noted according to the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, version 2020.2 (IUCN 2020), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (CITES 2020), and the Convention on the Conservation of European Wildlife and Natural

Habitats (BERN Convention 2020).

RESULTS

As a result of the literature and field surveys, a total number of six species of amphibians and 31 species of reptiles belonging to 13 different families were recorded in the province of Van in this study. Species list with their locality numbers, conservation status, and related references is given in Table 1 and in situ photographs of the observed species are demonstrated in Images 1, 2, and 3. Briefly, six species of amphibians (Families: Salamandridae (two), Bufonidae (one), Pelobatidae (one) and Ranidae (two)), two species of chelonians (Families: Testudinidae (one) and Geomydidae (one)), 15 species of lizards (Families: Agamidae (two), Scincidae (three), Lacertidae (10)), and 14 species of snakes (Families: Typhlopidae (one), Natricidae (two), Colubridae (s.l.) (10), Viperidae (one)) were inventoried.

All three anurans that were observed during the field studies (*Bufo* *sitibundus* (Pallas, 1771), *Pelophylax* *ridibundus* (Pallas, 1769), and *Rana* *macrocnemis* Boulenger, 1885) were common in the province, based on the number of the localities. As a salamander species, *Neurergus* *strauchii* (Steindachner, 1887) was recorded from two different localities and *Salamandra* *infraimmaculata* (Mertens, 1948) from only one locality. *Testudo* *graeca* Linnaeus, 1758 was found in 12 and *Mauremys* *caspica* (Gmelin, 1774) was recorded in three localities in different parts of the province of Van. Among lizards, *Ophisops* *elegans* Ménétries, 1832 and *Paralaudakia* *caucasica* (Eichwald, 1831) were the most common species with 31 and 19 localities, respectively. *Darevskia* *raddei* (Boettger, 1892) was observed as the most common rock lizard in the province of Van, with 15 localities. *Natrix* *tessellata* (Laurenti, 1768) was the most common snake species in the province of Van, with 25 different localities. *Dolichophis* *jugularis* (Linnaeus, 1758) and *D. schmidtii* (Nikolsky, 1909) were also common with 11 and 10 locality records.

According to the IUCN Red List (IUCN 2020), one species (*Darevskia* *bendimahiensis* (Schmidtler, Eiselt & Darevsky 1994)) is categorized as Endangered (EN), two species (*S. infraimmaculata* and *Montivipera* *raddei* (Boettger, 1890)) are Near Threatened (NT), and two species (*N. strauchii* and *T. graeca*) are classified as Vulnerable (VU). The IUCN categories of other species (LC, DD, or NE) are listed in Table 1. All of the species are under protection according to the BERN convention appendices II and III; however, only one species (*T.*

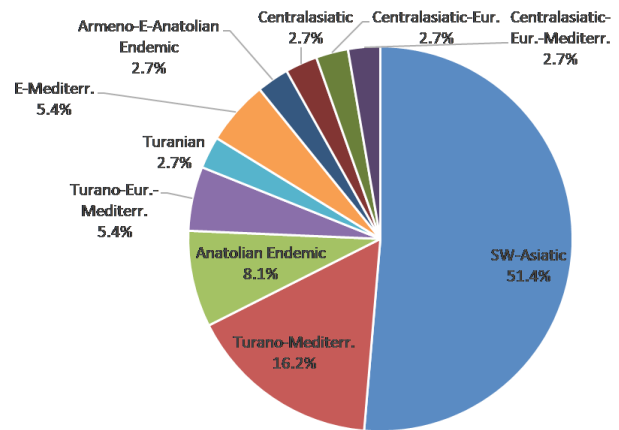


Figure 2. Chorotype distribution of amphibians and reptiles occurring in Van Province.

graeca) is regulated by CITES.

The species of amphibians and reptiles in the province of Van can be grouped into 10 chorotype categories (Table 1, Figure 2). SW-Asiatic is the main chorotype (51.4%), which is represented by 19 species. Chorotype with the second highest percentage (16.2%) is Turano-Mediterranean, which is represented by five species. Anatolian endemic chorotype includes three species (8.1%). A pie chart of all the chorotypes is presented in Figure 2.

DISCUSSION

Eastern and southeastern Anatolia is a hotspot region for amphibian and reptile biodiversity with many endemic species (Ilgaz 2019). This study presents the results of a detailed herpetofaunal survey in the province of Van (eastern Anatolia). It provides an updated herpetofaunal inventory of the province with five new provincial records and many new localities of some poorly known species. Among 37 species inventoried, three of them are endemic to Turkey (east Anatolia). Recent studies in east Anatolia recorded 27 species of amphibians and reptiles in the province of Iğdır (Tosunoğlu et al. 2010), 35 species in Ağrı (Yıldız et al. 2018a), and 36 species in Bitlis (Akman et al. 2018). Van Province is bordered by Bitlis Province on the west and Ağrı on the north. According to the results of the Jaccard similarity index (Jaccard 1912), it is not surprising that herpetofauna species of the province of Van is similar to Bitlis (Akman et al. 2018) and Ağrı (Yıldız et al. 2018) with percentages of 58.6% and 56.5%, respectively. With 37 species of amphibians and reptiles in total, it can be

Table 1. The list of the species of amphibians and reptiles occurring in Van Province based on this study and bibliographic data. The localities where the specimens were observed and identified, their status according to Bern Convention and IUCN criteria and their chorotypes are presented. Additionally, selected references reporting the occurrence in Van for each species are given. Appendices II and III of the Bern Convention refer to “strictly protected fauna species” and “protected fauna species”, respectively. The abbreviations for IUCN criteria are explained in the Abbreviations section of the article.

Family	Species	BERN	IUCN	Chorotype	Localities (in this study)	Elevation range (m)	References
Salamandridae	<i>Neurergus strauchii</i> (Steindachner, 1887)	III	VU	Anatolian Endemic	93, 95	1,676–1,791	Olgun et al. 2015; Yıldız et al. 2018b
Salamandridae	<i>Salamandra infraimmaculata</i> (Mertens, 1948)	III	NT	SW-Asiatic	103	1,245	New record
Bufo	<i>Bufo sibiricus</i> (Pallas, 1771)*	III	DD	Turano-European-Mediterranean	2, 4, 5, 6, 10, 11, 13, 16, 20, 28, 29, 30, 31, 33, 34, 36, 37, 39, 40, 41, 42, 44, 45, 50, 53, 54, 55, 56, 58, 63, 68, 69, 70, 71, 72, 74, 75, 76, 77, 78, 79, 80, 81, 84, 85, 86, 87, 90, 91, 92, 94, 99, 100, 102, 104, 105, 106	1,454–2,897	Baçoğlu et al. 1994; Mulder 1995; Baran & Atatür 1998; Budak & Göçmen 2008; Adizel et al. 2017
Ranidae	<i>Pelophylax ridibundus</i> (Pallas, 1769)	III	LC	Turano-European-Mediterranean	4, 5, 6, 8, 9, 14, 15, 16, 18, 20, 21, 22, 23, 24, 25, 26, 29, 30, 31, 36, 38, 39, 42, 43, 45, 46, 47, 49, 50, 51, 52, 55, 57, 61, 62, 63, 64, 66, 67, 70, 78, 79, 80, 89, 90	1,652–2,575	Baçoğlu et al. 1994; Mulder 1995; Baran & Atatür 1998; Budak & Göçmen 2008; Adizel et al. 2017
Ranidae	<i>Rana macronemis</i> Boulenger, 1885	III	LC	SW-Asiatic	1, 6, 12, 16, 18, 19, 20, 26, 27, 29, 30, 31, 39, 49, 56, 57, 58, 59, 62, 70, 72, 74, 75, 76, 80, 81, 83, 84, 85, 88, 93, 96, 97, 98, 99, 101, 102, 104, 105, 106, 107	1,782–2,972	Baçoğlu et al. 1994; Mulder 1995; Baran & Atatür 1998; Budak & Göçmen 2008
Pelobatidae	<i>Pelobates syriacus</i> Boettger, 1889	II	LC	Turano-Mediterranean	Literature record, not observed in the present study.	–	Mertens 1953; Uğurtaş 2001; Adizel et al. 2017
Geoemydidae	<i>Mauremys caspica</i> (Gmelin, 1774)	II	NE	Turano-Mediterranean	26, 39, 102	1,574–1,803	Baçoğlu & Baran 1977; Fritz & Freytag 1993; Sindaco et al. 2000; Budak & Göçmen 2008; Adizel et al. 2017
Testudinidae	<i>Testudo graeca</i> Linnaeus, 1758	II	VU	Turano-Mediterranean	4, 5, 11, 16, 25, 39, 87, 90, 92, 93, 99, 102	1,574–2,273	Baçoğlu & Baran 1977; Sindaco et al. 2000; Türkozan et al. 2004a; Budak & Göçmen 2008; Adizel et al. 2017
Agamidae	<i>Stellagama stellio</i> (Linnaeus, 1758)	III	LC	E-Mediterranean	Web record, not observed in the present study	–	New print published record. (Previously published in www.turkherptil.org as a photographic record by Ufuk Karaca)
Agamidae	<i>Paralaudakia caucasica</i> (Eichwald, 1831)	III	LC	Turanian	14, 15, 16, 17, 24, 25, 37, 39, 50, 56, 57, 68, 70, 71, 74, 79, 81, 83, 102	1,574–2,741	Baçoğlu & Baran 1977; Mulder 1995; Sindaco et al. 2000; Budak & Göçmen 2008
Scincidae	<i>Ablepharus bivittatus</i> (Ménétries, 1832)	III	LC	SW-Asiatic	35, 36, 56, 59, 61, 76, 82, 96	2,047–2,741	Sindaco et al. 2000; Ilgaz et al. 2007; Budak & Göçmen 2008
Scincidae	<i>Ablepharus chernovi</i> Darevsky, 1953	III	LC	SW-Asiatic	Literature record, not observed in the present study	–	Schmidtler 1997; Sindaco et al. 2000
Scincidae	<i>Heremites auratus</i> (Linnaeus, 1758)	III	LC	SW-Asiatic	4, 8, 101, 102	1,574–2,062	New record
Lacertidae	<i>Lacerta media</i> Lantz & Cyrén, 1920	III	LC	SW-Asiatic	1, 2, 3, 5, 8, 12, 16, 62, 92, 97, 99, 100, 101, 102, 106	1,574–2,504	Baçoğlu & Baran 1977; Mulder 1995; Sindaco et al. 2000; Budak & Göçmen 2008; Adizel et al. 2017

Family	Species	BERN	IUCN	Chorotype	Localities (in this study)	Elevation range (m)	References
Lacertidae	<i>Apathya cappadocica</i> (Werner, 1902)	II	LC	SW-Asiatic	78, 79, 90, 93, 94, 95, 96, 99, 101, 102, 104	1,252–2,523	Baçoğlu & Baran 1977; Eiselt 1979; Sindaco et al. 2000; Budak & Göçmen 2008
Lacertidae	<i>Darevskia bendimahiensis</i> (Schmidtler, Eiselt & Darevsky, 1994)	III	EN	Anatolian Endemic	23	2,002	Schmidtler et al. 1994; Budak & Göçmen 2008
Lacertidae	<i>Darevskia raddei</i> (Boettger, 1892)	III	LC	SW-Asiatic	18, 24, 37, 41, 50, 51, 55, 57, 58, 61, 71, 76, 77, 83, 85	1,663–2,575	Eiselt et al. 1993; Schmidtler et al. 1994; Sindaco et al. 2000; Arnold et al. 2007
Lacertidae	<i>Darevskia sapphirina</i> (Schmidtler, Eiselt & Darevsky, 1994)	III	LC	Anatolian Endemic	6, 8	1,887–2,345	Schmidtler et al. 1994; Sindaco et al. 2000; Arnold et al. 2007; Budak & Göçmen 2008; Akman et al. 2016
Lacertidae	<i>Darevskia valentini</i> (Boettger, 1892)	III	LC	SW-Asiatic	16, 20	2,155–2,239	Baçoğlu & Baran 1977; Schmidtler et al. 1994; Mulder 1995; Sindaco et al. 2000; Arnold et al. 2007; Budak & Göçmen 2008
Lacertidae	<i>Eremias suphani</i> Baçoğlu & Hellmich, 1968	III	LC	SW-Asiatic	30, 71, 82, 83	1,937–2,163	Baçoğlu & Baran 1977; Mulder 1995; Sindaco et al. 2000; Budak & Göçmen 2008; Rastegar-Pouyani et al. 2013
Lacertidae	<i>Ophisops elegans</i> Ménétries, 1832	II	LC	E-Mediterranean	4, 7, 9, 10, 11, 18, 26, 43, 45, 47, 48, 50, 53, 57, 64, 65, 68, 69, 70, 71, 77, 79, 85, 87, 97, 98, 99, 100, 101, 102, 104	1,252–2,374	Baçoğlu & Baran 1977; Sindaco et al. 2000; Budak & Göçmen 2008; Adizel et al. 2017
Lacertidae	<i>Parvilacerta parva</i> (Boulenger, 1887)	II	LC	Armeno-E-Anatolian Endemic	16, 17, 18, 20, 30, 33	2,049–2,422	Baçoğlu & Baran 1977; Sindaco et al. 2000; Kumlutaş et al. 2004; Budak & Göçmen 2008
Lacertidae	<i>Iranolacerta brandtii</i> (De Filippi, 1863)	III	DD	SW-Asiatic	31, 52, 59, 72	2,041–2,309	Yıldız & İğci 2015; Avcı et al. 2015; Rato et al. 2015
Typhlopidae	<i>Xerotyphlops vermicularis</i> (Merrem, 1820)	III	LC	Turano-Mediterranean	90	1,868	Baçoğlu & Baran 1980; Sindaco et al. 2000; Budak & Göçmen 2008
Colubridae	<i>Hemorrhois ravergieri</i> (Ménétries, 1832)	III	LC	Centralasiatic	5, 6, 23, 49, 70, 81, 102, 106	1,574–2,504	Baçoğlu & Baran 1980; Sindaco et al. 2000
Colubridae	<i>Dolichophis schmidtii</i> (Nikolsky, 1909)	III	LC	SW-Asiatic	16, 39, 44, 45, 81, 92, 97, 99, 102, 106	1,574–2,504	Clark & Clark 1973; Baçoğlu & Baran 1980; Sindaco et al. 2000; Adizel et al. 2017
Colubridae	<i>Dolichophis jugularis</i> (Linnaeus, 1758)	II	LC	SW-Asiatic	47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57	1,574–2,441	New record
Colubridae	<i>Eirenis thospitis</i> Schmidtler & Lanza, 1990	III	DD	SW-Asiatic	47	1,903	Schmidtler & Lanza 1990; Sindaco et al. 2000; Nagy et al. 2003; Mahlow et al. 2013
Colubridae	<i>Eirenis eiselti</i> Schmidtler & Schmidtler, 1978	III	LC	SW-Asiatic	Literature record, not observed in the present study.	–	Sindaco et al. 2000; Budak & Göçmen 2008; Tayhan et al. 2011
Colubridae	<i>Eirenis punctatolineatus</i> (Boettger, 1892)	III	LC	SW-Asiatic	68	1,821	Baçoğlu & Baran 1980; Sindaco et al. 2000; Budak & Göçmen 2008
Colubridae	<i>Eirenis modestus</i> (Martin, 1838)	III	LC	SW-Asiatic	4	1,969	New record
Colubridae	<i>Platyceps najadum</i> (Eichwald, 1831)	II	LC	Turano-Mediterranean	2, 8	1,887–1,961	Baçoğlu & Baran 1980; Sindaco et al. 2000; Budak & Göçmen 2008
Colubridae	<i>Elaphe urartica</i> Jablonski et al. 2019	III	NE	SW-Asiatic	Literature record, not observed in the present study.	–	Jablonski et al. 2019
Colubridae	<i>Telescopus fallax</i> (Fleischmann, 1831)	II	LC	Turano-Mediterranean	4	1,893	New record

Family	Species	BERN	IUCN	Chorotype	Localities (in this study)	Elevation range (m)	References
Natricidae	<i>Natrix tessellata</i> (Laurenti, 1768)	II	LC	Centralasiatic-European	5, 7, 8, 16, 18, 21, 24, 26, 27, 38, 39, 43, 48, 49, 51, 71, 81, 85, 90, 92, 94, 95, 97, 99, 106	1,507–2,504	Baçoğlu & Baran 1980; Sindaco et al. 2000; Budak & Göçmen 2008; Adızel et al. 2017
Natricidae	<i>Natrix natrix</i> (Linnaeus, 1758)	III	NE	Centralasiatic-European-Mediterranean	21, 26, 55, 61, 63	1,665–2,575	Baçoğlu & Baran 1980; Sindaco et al. 2000
Viperidae	<i>Montivipera raddei</i> (Boettger, 1890)	III	NT	SW-Asiatic	Literature record, not observed in the present study.	–	Franzen & Sigg 1989; Sindaco et al. 2000

* According to a recent phylogenetic study by Dufresnes et al. (2019), populations in the Anatolia (except Thrace and some parts of Bosphorus region) formerly identified as *Bufotes variabilis* are assigned to *Bufotes sitibundus*. It is not included in the IUCN Red List yet, so we used the data given for *B. variabilis*.



Image 1. Photographs of the observed amphibians and chelonians during the field studies in the province of Van (eastern Turkey): a—*Neurergus strauchii* | b—*Salamandra infraimmaculata* | c—*Salamandra infraimmaculata* | d—*Bufotes sitibundus* | e—*Pelophylax ridibundus* | f—*Rana macrocnemis* | g—*Mauremys caspica* | h—*Mauremys caspica* | i—*Testudo graeca*. © a,e,f,h—M. Z. YILDIZ; b,c—S. YILDIZ; d,g,i—N. İÇCİ.

stated that Van has a rich herpetofauna diversity and it is the only province in Turkey inhabited by *Iranolacerta brandtii* (De Filippi, 1863). The first observation of *I. brandtii* in Turkey was made in the province of Van, and results were published independently by two groups the same year (Avcı et al. 2015; Yıldız & İğci 2015).

Based on the results of the study, *Salamandra infraimmaculata*, *Heremites auratus* (Linnaeus, 1758), *Dolichophis jugularis*, *Eirenis modestus* (Martin, 1838), and *Telescopus fallax* (Fleischmann, 1831) were recorded

for the first time in the province of Van. Additionally, *Stellagama stellio* was published from Van province as a photographic voucher and the first published print record is presented in this paper. Three species (*N. strauchii*, *D. bendimahiensis*, *Darevskia sapphirina* (Schmidtler, Eiselt & Darevsky, 1994)) covered in the present study are endemic to Anatolia, Turkey. *Eirenis eiselti* Schmidtler & Schmidtler, 1978 was known as an endemic species of Turkey until the paper by Mahlow et al. (2013), that reports the species from Syria. *Eirenis thospitis*



Image 2. Photographs of the observed lizards during the field studies in the province of Van (eastern Turkey): a—*Paralaudakia caucasia* | b—*Ablepharus bivittatus* | c—*Heremites auratus* | d—*Lacerta media* | e—*Apathya cappadocica* | f—*Darevskia raddei* | g—*Darevskia sapphirina* | h—*Darevskia valentini* | i—*Eremias suphani* | j—*Ophisops elegans* | k—*Parvilacerta parva* | l—*Iranolacerta brandtii*. © a–f,i,k,l–N. İĞCI; g, h,j—M. Z. YILDIZ.

Schmidtler & Lanza, 1990 is a rare species with a limited number of vouchers. After its original description in 1990 (Schmidtler & Lanza 1990) based on the specimens from the province of Van, the first additional observation was made during the field excursions of the present study and presented before as a preliminary finding (Yildiz et al. 2015). Afterwards, *E. thospitis* was also recorded from Bitlis, a neighboring province of Van (Akman et al. 2018). Two recent papers by Mohamad & Afrasiab (2015) and Asadi et al. (2020) reported its occurrence in northern Iraq and Iran, respectively.

The taxonomy of the Anatolian mountain frogs belonging to the genus *Rana* is still controversial. Mountain frogs (*Rana* sp.) both with and without a vertebral stripe in the same locality at some of the

stations were observed during the present study. In this paper, we considered *R. camerani* to be conspecific with *R. macrocnemis*, following Veith et al. (2003).

The occurrence of *Testudo perses* Perälä, 2002 in Turkey was reported by Türkozan et al. (2004b) based on the specimens collected in the province of Hakkari. One of the two localities presented in that paper is very close to the Van border (district Başkale), suggesting the occurrence of this species was also in Van Province. Although genetic analyses did not support the validity of *T. perses* as a separate species (Fritz et al. 2007), morphological assessments revealed this taxon was a distinct species (Türkozan et al. 2010). The same authors, however, considered this taxon a synonym of “*buxtoni*” clade after their comprehensive morphological and



Image 3. Photographs of the observed snakes during the field studies in the province of Van (eastern Turkey): a—*Xerotyphlops vermicularis* | b—*Hemorrhois ravergieri* | c—*Dolichophis schmidtii* | d—*Dolichophis jugularis* | e—*Eirenis thospitis* | f—*Eirenis thospitis* | g—*Eirenis punctatolineatus* | h—*Eirenis modestus* | i—*Platyceps najadum* | j—*Telescopus fallax* | k—*Natrix tessellata* | l—*Natrix natrix*. © a,b,e,g,i-l—N. İĞÇİ; c—M. GÜL; d,f,h—M.Z. YILDIZ.

genetic studies and they did not use the name *T. perses* in their map (Türkozan et al. 2018). We followed the most recent study by Türkozan et al. (2018) in this regard and omitted *T. perses* in the species list considering all the tortoise observations as *T. graeca*.

One *H. auratus* specimen collected from locality 101 (Akçabüyük, Çatak) during the field studies has the following morphological characteristics: third supraocular shields are separated from the frontal shield, the dorsal pattern consists of four longitudinal rows of small spots rather than bigger rectangular shaped markings and has a higher number of gular scales. These characters are in agreement with those in the literature given for *H. a. transcaucasicus* (Moravec et al. 2006; Durmuş et al. 2011). Longitudinal rows

of small spots on the dorsum is also a colour-pattern characteristics of *Heremites septemtaeniatus* (Moravec et al. 2006); however, the reliability of the contact position of third supraocular and frontal as a distinctive character between *H. auratus* and *H. septemtaeniatus* and the occurrence of *H. septemtaeniatus* in Turkey was considered doubtful by Durmuş et al. (2011). Although taxonomic reorganization is still needed for the aforementioned taxa (Güçlü et al. 2014), it is considered that the sample in the present study resembles *H. a. transcaucasicus*, which is not mentioned from Turkey in the previous literature (Moravec et al. 2006; Durmuş et al. 2011; Güçlü et al. 2014). Since any additional specimens from the site could not be found, the morphological variation could not be assessed.

Ablepharus bivittatus (Ménétries, 1832) was known only from two localities in Turkey (both in the province of Van) previously (Ilgaz et al. 2007) until Yıldız et al. (2018a) reported this species in the province of Ağrı (eastern Anatolia). Recently, Bozkurt & Olgun (2020) combined the taxon with the genus *Asymblepharus* based on some shared characters, but we follow the former taxonomic arrangement in our species list. In the present study, eight new localities of this species from different districts in Van (Özalp, Saray, Başkale, İpekyolu, Gevaş) are added and it is shown that *A. bivittatus* can be found in different locations in the province of Van above 2,000m where the habitat is suitable.

Darevskia sapphirina, an Anatolian endemic species of rock lizards was firstly described from a locality close to Van-Ağrı border (Erciş), and no additional sites were reported until the publication by Akman et al. (2016). During the herpetological surveys, which were conducted in the provinces of Van and Ağrı, new sites of this species were discovered and published previously (Akman et al. 2016). We also reported some of the localities within the species' known range in Van province in the present paper.

Populations of *Elaphe sauromates* (Pallas, 1811) in eastern Anatolia were assigned to a new species, *Elaphe urartica* Jablonski et al. 2019, by a recent study. Its type locality is Kısıklı, a village nearby Süphan Mountain in Bitlis province (Jablonski et al. 2019). The province of Van also lies within the distribution area of *E. urartica*, according to the abovementioned study. Although no individuals were observed during the field surveys of this study, it was possible to confirm the occurrence of this species in the province based on the reliable questionnaire results obtained through conversation with the locals.

Based on their known distributions in adjacent provinces (Akman et al. 2018; Yıldız et al. 2018a) and the world, it is possible that some other species of amphibians and reptiles such as *Hyla savignyi* (Audouin, 1829), *Trapelus lessonae* (De Filippi, 1865), *Mediodactylus heterocercus* (Blanford, 1874), *Heremites vittatus* (Olivier, 1804), *Eryx jaculus* (Linnaeus, 1758), *Malpolon insignitus* (Geoffroy De St-Hilaire, 1809), and *Macrovipera lebetinus* (Linnaeus, 1758) may be found in Van Province.

The present study was carried out within the scope of the National Biodiversity Inventory and Monitoring Project in Turkey. This project was launched in 2013 under the coordination of the Republic of Turkey Ministry of Agriculture and Forestry (formerly Ministry of Forestry and Water Affairs), General Directorate of Nature

Conservation and National Parks, and aims to obtain the most recent biodiversity information in all the provinces of Turkey as well as to determine the major threats. The project is almost completed now and has resulted in the production of invaluable new information regarding Turkey's flora and fauna. Most of the Van Province is rural and generally used as grassland (Kalkan et al. 2019). During the project, the major threat to herpetofaunal diversity in surveyed habitats in Van Province was found as human-origin habitat degradation generally caused by overgrazing, construction, and pollution. Human-caused habitat degradation is considered as the major threat for amphibians and reptiles worldwide (Gibbons et al. 2000; Gidiş & Başkale 2020).

The knowledge of the actual distribution range and the locality coordinates (as obtained in this study) is important and guides the species conservation action plans (Mebert et al. 2020). Once the georeference databases are created for every species of interest, it will be easier for authorities to make ecosystem master plans and to make their decisions while giving construction permissions. Moreover, more realistic distribution modeling studies can be carried out with this kind of data. In this regard, the results of this study provide a useful basis for future monitoring studies and distributional information will contribute to the conservation of the species of interest.

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Appendix 1. Village and district names of the localities shown on the map in Figure 1.

1. Gergili/Erciş, 20.09.2014, 2123m asl; 2. Doğançırı/Erciş, 20.09.2014, 1961m asl; 3. Ağaçören/Erciş, 20.09.2014, 1852m asl; 4. Köycük/Erciş, 20.09.2014, 1893m asl; 5. Ağırkaya/Erciş, 20.09.2014, 2273m asl; 6. Pınarlı/Erciş, 20.09.2014, 2334m asl; 7. Kırkpınar/Erciş, 20.09.2014, 1934m asl; 8. Duracak/Erciş, 16.09.2014, 1887m asl; 9. Kayaboyun/Erciş, 16.09.2014, 2051m asl; 10. Akçayuva/Erciş, 16.09.2014, 1948m asl; 11. Bayramlı/Erciş, 16.09.2014, 1681m asl; 12. Dinlence/Erciş, 16.09.2014, 1858m asl; 13. Oyali/Erciş, 20.09.2014, 1809m asl; 14. Keklikova/Erciş, 16.08.2014, 1751m asl; 15. Payköy/Erciş, 16.08.2014, 2038m asl; 16. Yankitepe/Erciş, 16.08.2014, 2422m asl; 17. Güllüçimen/Muradiye, 16.08.2014, 2200m asl; 18. Hıdırmenteş Gölü/Çaldıran, 21.08.2014, 2351m asl; 19. Yukarıyanıktaş/Çaldıran, 21.08.2014, 2343m asl; 20. Soğuksu/Çaldıran, 27.05.2014, 2155m asl; 21. Oruçlu/Çaldıran, 27.05.2014, 2049m asl; 22. Sellik/Çaldıran, 15.09.2014, 2041m asl; 23. Gümüştepe/Muradiye, 27.05.2014, 2002m asl; 24. Kemerköprü/Muradiye, 15.09.2014, 1736m asl; 25. Aşağıkozluca/Erciş, 27.05.2014, 1666m asl; 26. Karahan/Muradiye, 27.05.2014, 1665m asl; 27. Balaklı/Muradiye, 25.06.2014, 1664m asl; 28. Beydağı/Muradiye, 25.06.2014, 1717m asl; 29. Yuvacık/Çaldıran, 15.09.2014, 2084m asl; 30. Baydoğan/Çaldıran, 15.09.2014, 2368m asl; 31. Gülyolu/Çaldıran, 15.09.2014, 2233m asl; 32. Yumruklu/Özalp, 16.09.2017, 2060m asl; 33. Eğribelen/Özalp, 16.09.2014, 2149m asl; 34. Yukarıtulgalı/Özalp, 16.09.2014, 2147m asl; 35. Çubuklu/Özalp, 16.09.2014, 2084m asl; 36. Çırakköy/Özalp, 16.09.2014, 2047m asl; 37. Çakmak/Muradiye, 16.09.2014, 2092m asl; 38. Sarımemet/Muradiye, 16.09.2014, 1969m asl; 39. İlikaynak/Merkez, 16.08.2014, 1974m asl; 40. Çolpan/Merkez, 15.09.2014, 1733m asl; 41. Gedikbulak/Merkez, 27.05.2014, 1764m asl; 42. Tabanlı/Tuşba, 15.09.2014, 1843m asl; 43. Otluca/Tuşba, 16.08.2014, 1690m asl; 44. Alaköy/Tuşba, 15.09.2014, 1724m asl; 45. Çitören/Tuşba, 25.06.2014, 1652m asl; 46. Bostaniçi Göleti/Merkez, 26.05.2014, 1784m asl; 47. Köşebaşı/İpekyolu, 21.06.2014, 1903m asl; 48. Baklatepe/İpekyolu, 22.06.2014, 1904m asl; 49. Gövelek Gölü/İpekyolu, 21.06.2014, 2242m asl; 50. Kaymaklı/İpekyolu, 26.05.2014, 1952m asl; 51. Aşağımollahasan/Özalp, 26.05.2014, 1949m asl; 52. Tepedam/Özalp, 26.05.2014, 2026m asl; 53. Kazımpaşa/Saray, 26.05.2014, 2125m asl; 54. Değirmigöl/Saray, 22.06.2014, 2236m asl; 55. Yamanıyurt/Saray, 26.05.2014, 2248m asl; 56. Karahisar/Saray, 22.06.2014, 2501m asl; 57. Topsakal/Gürpınar, 22.06.2014, 2401m asl; 58. Akgöl/Gürpınar, 23.06.2014, 2371m asl; 59. Gültepe/Özalp, 23.06.2014, 2380m asl; 60. Karlıyamaç/Özalp, 22.06.2014, 2275m asl; 61. Ekece/İpekyolu, 25.05.2014, 2575m asl; 62. Savacık/Gürpınar, 23.06.2014, 2156m asl; 63. Gölardı/Gürpınar, 25.05.2014, 2317m asl; 64. Bakraçlı/İpekyolu, 25.05.2014, 1836m asl; 65. Kiyicak/Edremit, 25.05.2014, 1668m asl; 66. Uğurveren/Gevaş, 25.05.2014, 1662m asl; 67. Atalan/Gevaş, 24.06.2014, 1807m asl; 68. Köprüler/Edremit, 25.05.2014, 1821m asl; 69. Koyunyatağı/Gürpınar, 25.05.2014, 1917m asl; 70. Erkaldı/Gürpınar, 22.06.2014, 1829m asl; 71. Ortaköy/Gürpınar, 22.06.2014, 1955m asl; 72. Çörekli/Gürpınar, 23.06.2014, 2122m asl; 73. Sevindik/Gürpınar, 22.06.2014, 2090m asl; 74. Yanal/Başkale, 18.09.2014, 2166m asl; 75. Konuksayar/Başkale, 18.09.2014, 2432 m a.s.l; 76. Güleçler/Başkale, 18.09.2014, 2322m asl; 77. Açıkağıl/Başkale, 18.09.2014, 2026m asl; 78. Esenyamaç/Başkale, 20.08.2014, 2047m asl; 79. Çaldıran/Başkale, 20.08.2014, 1865m asl; 80. Aşağıküme/Başkale, 19.09.2014, 2897m asl; 81. Ereğ/Başkale, 20.08.2014, 2017m asl; 82. Aşalan/Başkale, 20.08.2014, 2097m asl; 83. Gedikbaşı/Başkale, 20.08.2014, 2370m asl; 84. Yedisalkım/Gürpınar, 17.09.2014, 2314m asl; 85. Merkez/Gürpınar, 19.08.2014, 2115m asl; 86. Kuşdağı/Gürpınar, 19.08.2014, 1900m asl; 87. Onağıl/Çatak, 17.08.2014, 1973m asl; 88. Derebaşı/Çatak, 17.08.2014, 2171m asl; 89. İliköy/Gevaş, 24.06.2014, 1781m asl; 90. Göründü/Gevaş, 24.06.2014, 1686m asl; 91. İnköy/Gevaş, 24.06.2014, 1683m asl; 92. 700 m west of Söğütlü/Tatvan, 18.08.2014, 1856m asl; 93. Çatbayır/Bahçesaray, 18.08.2014, 1774m asl; 94. Elmayaka/Bahçesaray, 18.08.2014, 1562m asl; 95. Bahçesaray, 21.08.2014, 1676m asl; 96. Arpit/Gevaş, 18.08.2014, 2972m asl; 97. Uzuntekne/Çatak, 17.08.2014, 2319m asl; 98. Aşağınarlıca/Çatak, 17.08.2014, 2028m asl; 99. Bilgi/Çatak, 17.08.2014, 1674m asl; 100. Alacayar/Çatak, 17.08.2014, 1636m asl; 101. Akçabüyük/Çatak, 17.08.2014, 1782m asl; 102. Gökçedal/Çatak, 17.08.2014, 1454m asl; 103. Dalbastı/Çatak, 17.08.2014, 2183m asl; 104. Sugeldi/Çatak, 17.08.2014, 1702m asl; 105. Beşbudak/Gürpınar, 19.08.2014, 2482m asl; 106. Geziyurt/Gürpınar, 19.08.2014, 2379m asl.





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– Palassery Suresh Aravind, George Joe, Ponnu Dhanesh & Rajamani Nandini, Pp. 17827–17831

Notes

High altitude wetland migratory birds in the Sikkim Himalaya: a future conservation perspective

– Prem K. Chhetri, Kusal Gurung, Thinlay Namgyal Lepcha & Bijoy Chhetri, Pp. 17832–17836

Tawny Fish-owl *Ketupa flavipes* Hodgson, 1836 (Aves: Strigiformes: Strigidae): recent record from Arunachal Pradesh, India

– Malyasri Bhattacharya, Bhupendra S. Adhikari & G.V. Gopi, Pp. 17837–17840

First report of *Lipotriches (Rhopalomelissa) parca* (Kohl, 1906) (Halictidae: Nomiinae) from India

– Bhaswati Majumder, Anandhan Rameshkumar & Sarfrazul Islam Kazmi, Pp. 17841–17842

Addition of four species to the flora of Andaman Islands, India

– Mudavath Chennakesavulu Naik, Lal Ji Singh, Gautam Anuj Ekka & C.P. Vivek, Pp. 17843–17846

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