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Coluber atayevi Sp. Nov. (Ophidia, Colubridae) from the Kopet-Dag Mountains of Turkmenistan

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Abstract. -An examination snakes, formerly considered to be *Coluber najadum*, from the Kopet-Dag Mountains of Turkmenistan, leads us to believe that this population represents an undescribed species. We here describe this population as *Coluber atayevi*.

Key words: Reptilia, Ophidia, Colubridae, *Coluber*, Turkmenistan, systematics.

Introduction

During field work in the Kopet-Dag Mountains, Turkmenistan, we observed and analyzed many individuals of *Coluber najadum* under natural conditions. Comparison of these individuals with Caucasian material led to the conclusion that the Kopet-Dag snakes belong to a previously unrecognized species. This conclusion is supported by significant morphological divergence from the other representatives of the *najadum-rubriceps* complex.

Methods

We analyzed 10 specimens of *Coluber najadum* (Eichwald) from various areas of the Caucasian Isthmus and 10 specimens from the Kopet-Dag belonging to the new taxon. Morphometric data were compared with the available information in the literature about *Coluber najadum* in its natural habitat throughout its range (Terentjev and Chernov, 1949; Bannikov et al., 1977) and for separate regions (Ananjeva and Orlov, 1977; Muzskheleshvili, 1970).

The following features and indices have been used: 1) L. = length of body, mm; 2) L. cd. = length of tail, mm; 3) Sq.= number of scales around body; 4) Ventr.= number of ventral scutes; 5) S. cd.= number of subcaudal scutes; 6) Lab.= number of upper labials; 7) Sublab.= number and size of sublabials; 8) form of mandibular scutes; 9) shape of the head; 10) distribution of scutes on throat; 11) L/L. cd.= body length/tail length; 12) Pr. oc.= number of preorbital scales; 13) Post. oc.= number of postorbital scales; 14) Temp.= number of temporal scales; 15) A.= form of anal scutes.

For numerical features and indices, we have calculated the mean (x), mean error (m), mean square deviation (S^2), using the formulas for small samples (Lakin, 1980)

When describing the biotopes, we determined the plant species according to Nitikin and Geldykhanov (1988); the general vegetation type follows Korovin (1934), with some corrections.

History of the Study of "*Coluber najadum*" in the Kopet-Dag

Zamenis dahli Fitzinger was first mentioned from the environs of Sulukli Spring and the Kuchan road by Varentzov (1894). Nikolskij (1905, 1916) observed this species in the vicinity of Ashkhabad. On the basis of these records, *Coluber najadum* (Eichwald) was included in the list of the Turkmenistan herpetofauna (Chernov, 1934; Terentjev and Chernov, 1949; Bogdanov, 1962). All previous collections from the territory of Turkmenistan and the neighboring parts of Iran have been analyzed by Ananjeva and Orlov (1977). They added the localities of

TABLE 1. Morphometry of *Coluber atayevi* paratypes in the collection of the Caucasian Reserve, Sochi, Russia (see text for abbreviations).

No.	L.	L.cd.	Sq.	L./L.cd	Ventr.	S.cd.	Lab.	Preoc.	Postoc.	Temp.	Sublab.
421	533	201	19	2.65	208	102	8/8	1/1	2/2	2+2/2+1	10/11
422	455	143	19	3.18	214	90	8/8	1/1	2/2	2+1/2+2	10/10
423	381	141	19	2.70	210	106	8/8	1/1	2/2	2+1/2+3	10/10
424	392	122	19	3.21	190	90	8/8	1/1	2/2	2+1/1+2	9/9
425	246	78	19	3.15	207	105	8/8	1/1	2/2	2+1/2+3	10/10
426	242	73	19	3.31	209	102	8/8	1/1	2/2	2+1/2+1	10/10
427	238	74	19	3.22	197	96	8/8	1/1	2/2	2+2/2+1	9/9
428	242	73	19	3.31	204	101	8/8	1/1	2/2	2+3/1+3	10/10
429	250	79	19	3.16	203	100	8/8	1/1	2/2	2+1/2+3	10/10

Firuza settlement and, tentatively, Dzhebel Station to the distribution of *Coluber najadum*. The last locality was doubtful (Shcherbak and Golubev, 1981; Ataev 1985). Rustamov and Shammakov (1979) and Shcherbak and Golubev (1981) mentioned it from Dushak Mountain. Recent localities include the Babazon region in the Kopet-Dag Reserve (Shcherbak, et al., 1986), Saivan and Imarat villages and Kara-Kala settlement (Ataev, et al., 1991). During almost a century, less than 20 representatives of this taxon have been recorded, half of them in recent years (Ataev et al., 1991).

The small amount of preserved material, part of which had been lost (Ananjeva and Orlov, 1977), dissociation of time of collection and place of storage of specimens, led to the opinion that *Coluber najadum* was the taxon distributed in the Kopet-Dag. This form was included in the nominate form, and had never even been considered as a separate subspecies (Bannikov et al., 1977). It is interesting to note that Bannikov et al. (1977) included *C. n. rubriceps* Mertens (now recognized as a distinct species [Engelman et al., 1986; Rehak, 1986; Ananjeva et al., 1988]) in the synonymy of *Coluber najadum*.

Coluber atayevi Tuniyev and Shammakov, sp. nov.

Zamenis dahli: Varentzov, 1894:27; Nikolskij, 1905:233; 1916:92.

Coluber najadum: Chernov, 1934:273; Terentjev and Chernov, 1949:240-241 (part); Bogdanov, 1962:167; Bannikov et al., 1977:262-263 (part); Ananjeva and Orlov, 1977:14-16; Rustamov and Shammakov, 1979:144; Shcherbak and Golubev, 1981:70-72; Ataev, 1985:242-243; Shcherbak et al., 1986:98-100; Latifi, 1991:102-103.

We name the new species in honor of the famous Turkmen herpetologist, Chary Ataevich Ataev, who studies reptiles of the mountains of Turkmenistan.

Holotype: Collection of the Caucasian Reserve, Sochi, Russia, No. 420, adult male, environs of Saivan Village, Saivan-Nokhur Plateau, western Kopet-Dag, Bakharden Region, Turkmenistan, 12 May 1991, collected by B. S. Tuniyev (Fig. 1).

Paratypes: Twenty two specimens. Collection of the Caucasian Reserve, Sochi, Nos. 421-429, 4 adults and 5 juveniles, same data as holotype, collected by C. A. Ataev and B. S. Tuniyev; California Academy of Sciences (CAS) Nos. 182948-182950, same locality as holotype, May 1990; CAS 185185-185194, 5 adults and 13 juveniles, Elev. 1200-1300 m, 38° 30' N, 56° 47' E, 2 km SE (airline) of Saivan, Ashgabad Region Turkmenistan, 21 May 1992, collected by B. S.. Tuniyev, S. M. Shammakov, N. B. Ananjeva, T. J. Papenfuss and R. Macey (Plate 1).

Adult *Coluber atayevi*.

Type locality of *Coiluber atayevi*, environs of Saivan Village, Saivan-Nokhur Plateau, western Kopet-Dag, Bakharden Region, Turkmenistan.

FIG. 1. Holotype of *Coluber atayevi* sp. nov. (Collection of the Caucasian Reserve no. 420).

Description of holotype: Snout-vent length 500 mm, tail 172 mm; head length 19.6 mm, head width 8.4 mm, head height 6.2 mm. Head smoothly rounded, narrow, covered with large regular scutes; 8 upper labials, 5th upper labial touches lower postorbital and large lower temporal with its extended upper posterior side; 9 lower labials, 6th largest, last two pairs almost covered by upper labials; a single preorbital on either side, 2 small scutes below; posterior pair of upper temporals slightly larger than anterior one; seen from above, rostral extends slightly between internasals. Narrow genial scutes in contact along mental groove, no space between posterior genials.

Nineteen scale rows at midbody; 206 abdominal scutes; 97 pairs of subcaudals; anal divided. Scales bordering abdominal scutes of same size as other lateral scales; body scales smooth, rhombic; ridge on lateral aspect of abdominal scutes indistinct, almost absent.

Coloration in preservative: Dorsum gray, venter grayish; 5 large dark ocelli bordered with light circles on sides of neck; lateral row of small black dots ending abruptly on anterior third of body. Eye outlined with white lines extending anteriorly and posteriorly; lower white stripe extends over upper labials; a narrow black streak running posteriorly and down from eye, situated on 5th upper labial and slightly touching 6th.

Description of paratypes: Counts and measurements of the paratypes in the collection of the Caucasian Reserve, Sochi, Russia are given in Table 1.

Diagnosis: Comparatively small snake (Fig. 2), smaller than *C. n. najadum*, *C. n. dahli*, and *C. r. rubriceps* in dimensions. It is comparable in size with the European subspecies, *C. rubriceps thracius*. In contrast to *C. najadum*, whose tail constitutes 1/3 of its total length, *C. atayevi* has a comparatively short tail,

FIG. 2. Representatives of the "*najadum-rubriceps*"-complex. Left- Largest specimen of *Coluber atayevi* sp. nov. (Collection of the Caucasian Reserve no. 421). Right- Medium-sized specimen of *Coluber najadum* (Sochi environs, Maly Akhun, Collection of the Caucasian Reserve no. 94).

approximately 1/4 of total length, also characteristic of *C. rubriceps*.

Habitus and elements of coloration of *C. atayevi* are intermediate between *C. najadum* and *C. rubriceps*; its narrow, sharp, and flat head with the rostrum beveled downward is closer to the *C. rubriceps* head shape than to that of *C. najadum*, with its comparatively wide, rounded, and high head, where the upper and lower surfaces of head are parallel. Color pattern of *C. atayevi* resembles that of *C. najadum*, but brown colors prevail instead of olive-green ones. Lateral abdominal ridges are practically absent in *C. atayevi*, in contrast to the above-mentioned species, and consequently the body is round in cross-section and not rectangular as in *C. najadum* and *C. rubriceps*.

Genial scutes of *C. atayevi* contact one another along the mental groove, rarely having a few isolated granules between the posterior pair, whereas between the widely separated posterior genials of *C. najadum* there are always 2-4 rows of well-developed scales (Fig. 3). Posterior upper labials of *C. atayevi* are weakly

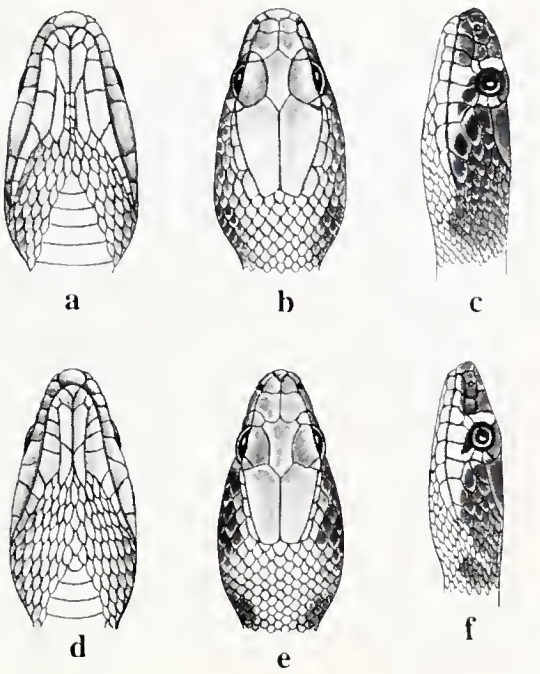

FIG. 3. Distribution of head scales on representatives of the *Coluber najadum-Coluber rubriceps*-complex: a, b, c- a young specimen of *C. najadum*; d, e, f- a young specimen of *C. atayevi* sp. nov.

distinguished from the throat scales, whereas all upper labials of *C. najadum* are strongly pronounced.

Geographic distribution: The range of *Coluber atayevi* includes the western and central Kopet-Dag, from the surroundings of the Kara-Kala settlement in the west to the Sulukli Spring in the east. This is an upland species, associated with such vegetation types as "prashiblyak," "broad-leaved forest" (Kamelin, 1970) and "phrygana," and in the western part of the uplands, where these plant associations occur at lower elevations, individuals of *C. atayevi* are found at elevations of 400-1600 meters (Shcherbak et al., 1991). At the eastern end of its range (Dushak Mountain), the snake has been found at 2000 meters elevation (Shcherbak et al., 1986).

Biotopes: According to our observations, *Coluber atayevi* is found on the highest parts of the Saivano-Nokhur Plateau and on the crests of mountains at 900-1400 meters elevation. The most typical biotopes of the species are ecotones of mesophilous derivatives of deciduous forest and meadow-steppe coenosis along the edges of small ravines having deposits of limestone and argillaceous slates. Indicators of the deciduous forest are isolated old trees of Oriental plane (*Platanus orientalis*) and English walnut (*Juglans regia*). Forest plots of "prashiblyak" are typified by *Aceretum fruticans* and *Acer turcomanicum*, a subdominant role played by *Crataegus turcomanica, Lonicera floribunda, Prunus cerasifera, Cotoneaster nummularioides, Cotoneaster ovatus,* and *Rubus anatolicus*. In the herb layer, there are such species as *Alliaria petiolata, Lamium album, Geranium pussilum, Arum juquemontii,* and *Allium paradoxum.*

Rocky-shrubby vegetation is usual for the ecotone of forest ravines on the rocky and scree slopes, with isolated trees of *Celtis caucasica* and many different shrubs and semi-shrubs: *Colutea gracillis, Ephedra equisitina, Thelycrania meyeri, Rhamnus coriacea, Hymenocrater bituminosus,* and *Artemisia turcomanica.*

Representatives of *Coluber atayevi* are found in *Cousinia smirnovii* associations and *Astragalus piletoclados* groups (phrygana type) in the immediate vicinity of the forest and shrubby communities with steppe wedges, mainly in overgrazed places. The region is comparatively well-watered, because almost every ravine has a spring or stream.

The vegetation of the eastern border of the distribution of *C. atayevi* is described by Korovin (1934): "Dushak mountain is an isolated massif, formed by light limestone. Its steep slopes serve as a home for typical mountainous xerophytes. Here we find juniper, both isolated trees and groups of them. A number of semishrubs and xerophytic herbs form flora of these mountains." Later, the author mentions the domination of shrubs of *Astragalus piletoclados*, as well as groups of different species of *Acantholimon* and here very common gray cushion-like groups of *Onobrychis cornuta.* Korovin concludes

that the cushion-like xerophytes of the Kopet-Dag are better developed on the tops of mountains (about 2000 meters elevation). This is higher than the steppe zone, so phrygana belongs to high-altitude vegetation.

To our regret, absence of data about the biotopes of species from the other places gives us no opportunity to characterize the Cenozoic ties of the species throughout the whole area.

Population density: *Coluber atayevi* is the most numerous snake species on the Saivano-Nokhur Plateau. Six specimens were found during a three-hour excursion in the vicinity of Saivan village in May, 1990; 12 specimens were noticed during the same period of time in May, 1991. The largest number of snakes (as many as 5 specimens per 300 meters) was among the shrubs of rocky-scree plots of ravines. Isolated specimens of snakes were met in stoneless places. The fact that this species is rather common for the western Kopet-Dag is proved by the data of Ataev et al. (1991). All other authors mention only isolated findings, reckoning it among the rarer species of the Kopet-Dag. Apparently, the sporadic distribution of the species and the considerable altitudes at which its habitat occurs, are the reasons why it is rarely met. It is not excluded that its population density in the eastern part of its range is significantly lower than in its western part.

Seasonal and daily activity: Presumably, the species' activity begins in the middle of April, considering temperature conditions of this mountain zone (Babaev, et al., 1982) and preferable temperatures of daily activity, noted in May, 1990-1991. *Coluber atayevi* is a diurnal species with two-peak activity in May; the morning peak (9:00-11:00) is strongly pronounced and the evening one is feebly marked. The snakes are active in sunny, windless weather. We have never seen them when it rains, there are strong winds, or heavy overcast. In bad weather the snakes are absent not only on the surface, but from under the plates of slate, where they are usually met in sunny weather.

Diet: Lizards in the habitat of *Coluber atayevi* are *Ablepharus pannonicus, Stellio caucasicus,* and *Pseudopus apodus. Cyrtopodion caspius* and *Eremias strauchi* are common, though not so numerous, while *Mabuya aurata* and *Eumeces taeniolatus* are rare. Considering the small size of the head and body of *Coluber atayevi*, the bulk of its diet must be formed only of *Stellio caucasicus*, young specimens of *Eremias strauchi*, and possibly *Cyrtopodion caspius*. Evidently, *C. atayevi* is a saurophage exclusively, since the common and abundant *Microtus socialis* and *Saxetania cultricolis* (a micromammal and an orthopteran insect, respectively) are too large to be eaten by this snake.

Syntopical species of snakes: Subdominants of *Coluber atayevi* are *C. nummifer, C. ravergieri* and *Vipera lebetina; Typhlops vermicularis* is common; *Agkistrodon halys caucasicus* and *Natrix tesselata* are rare. At the borders of the species' biotopes *Eirenis meda, Psammophis lineolatum, Naja oxiana,* and *Eryx miliaris* are met. These species are more characteristic for smaller hypsometric marks.

Discussion

Coluber atayevi is most closely related to *C. najadum* and *C. rubriceps*, possessing features of both species; in habitus (head shape, in particular) it resembles *C. rubriceps*, but it is similar to *C. najadum* in color pattern. We should note that these features are characteristic for juvenile specimens as well as adults; in other words, we cannot distinguish ancestral features that would allow us to unite *C. atayevi* with either of the species mentioned (Table 2, Fig. 3).

Judging from the contemporary distribution of the three species, we propose that the center of the complex is the Eastern Mediterranean region, so-called dry land of Asia Minor or Balkan-Caucasian

TABLE 2. Comparative morphometry of representatives of the *"najadum-rubriceps"* species complex (see text for abbreviations).

Species	L.	L. cd.	L.+L. cd.	L./L. cd.	Sq.	Ventr.	S. cd.	Lab.	Sublab.	Temp.
Coluber ataevi sp.nov.	381-533 452.2±29.6	122-201 155.8±13.8	514-734 608	2.65-3.31 3.08±0.08	19	197-214 206.7±1.5	90-106 98.9±1.8	8, 8 (100%)	10 (75%) 9 (20%) 11 (5%)	2+1 (55%) 2+3 (20%) 2+2 (15%) 1+2 (5%) 1+3 (5%)
C. najadum (Terentjev & Chernov)	to 1000	-	-	2.09-2.9	19	205-238	98-135	8 (7, 9)	-	2+3 (2+2, 1+2, 1+3)
C. najadum (Muskhelishvili, 1970)	M to 689 F to 720	M to 282 F to 267	-	2.3-2.6	19	214-229	M 110-130 F 102-119	8 (88.8%) 7 (11.1%)	-	2+3 (88.3%) 1+3 (11.1%)
C. najadum (Sochi area)	578-870 735±28.4	175-320 239.6±27.0	-	-	19 (87.5%) 21 (12.5%	211-224 216.6±1.7	-	8 (87.5%) 9 (12.5%)	-	-
C. rubriceps rubriceps (Rehak, 1986)	-	-	960-1119 1040	2.43-2.51 2.47	19	207-211 209	104-105 104.5	8/8 (100%)	10/10 11/11	2+2
C. rubriceps thracius (Rehak, 1986)	-	-	412-710 562	2.53-3.03 2.8	19	186-192 189	84-94 88	7/7 (18.75%) 7/8 (37.5%) 8/7 (12.5%) 8/8 (25.0%) 8/9 (25.0%)	9 (6.25%) 10 (81.25%) 9/10 (12.5%)	1+1 (6.25%) 1+2 (12.5%) 2+1 (6.25%) 2+2 (75.0%)
C. rubriceps thracius (Rehak, 1986)	-	-	443-625 538	2.81-3.52 3.11	19 (90.9%) 21 (9.1%)	198-203 203	79-91 85	7/7 (27.3%) 7/8 (18.2%) 8/8 (54.5%)	9 (18.2%) 9/10 (18.2%) 10 (63.6%)	1+1 (18.2%) 1+2 (18.2%) 2+2 (63.6%) 3+2 (9.1%)
C. najadum (Arnold & Burton, 1978)	-	-	to 1350	-	19	205-235	-	-	-	-

dry land. The ancestral form could have been widespread in the Upper Miocene-Pliocene over subtropical semiarid regions of Asia Minor united with the Central Asian Massif, Caucasian Island and the Balkan Mountains in the Miocene. Mixed savanna-hylile landscape, combining alternation of open spaces with subtropical forests were characteristic for the northern parts of the Iranian Plateau in that period. Fossil mammals and birds testify to this fact (Vereshchagin, 1959). In Vereshchagin's opinion, similarity of the Upper Miocene fauna unites Central Asia, the Caucasus, the Crimea, and the Balkan Mountains. Analysis of fossil tortoises testifies to the presence of a bridge between the Balkan-Caucasian dry-land and an Iranian-Pakistanian Peninsula (Chkhikvadze, 1991).

Alpine orthogenesis that has led to the formation of mountain relief over the whole area of study, from the Balkan Mountains to the Kopet-Dag, evidently promoted the breakup of the original area of the ancestral form of the *najadum-rubriceps* complex. A number of populations along the sea coasts of that time (Mediterranean, Black, and Caspian Seas) could already have been isolated in the Pleistocene. The event has been connected with aridization of the continental interior and the formation of new ecological conditions. These conditions have given impetus to the development of the highland xerophytic vegetation of Iran and the formation of the fauna of arid mountains. It should be noted that the vegetation of the central and western Kopet-Dag has more features in common with the vegetation of southern and western territories than with the other mountain massifs of Central Asia. Korovin (1934) emphasizes that the Kopet-Dag forests are the connecting link with Mediterranean macchias. The provenance of highland xerophytes (phrygana), as well as forest vegetation, Korovin stated to be Persia and Armenia.

Pleistocene cataclysms, connected with the glaciation in the Caucasus, Asia Minor, and the Iranian Plateau, as well as the changes in the basins of the Black and Caspian seas, could have favored the secondary overlapping of the diverged *C. najadum* and *C. rubriceps*. This sympatry, which can be seen today in some areas, served to reinforce the species divergence. In the east, representatives of this complex could survive only in relict populations on the northern (Caspian) slope of the Alborz Range and, in isolated form, in the derivatives of forest coenosis in the western Kopet-Dag that were never subjected to glaciation (Gvozdetzkij and Mikhailov, 1987). In the Iranian part of the Turkmen-Khorasan mountains there are islands of gyrkana forests to the east of Astrabad, reaching the longitude of Gombedezh-Kabus. Some islands of oak forests reach Bodgenurd in Khorasan (Menitskij, 1984). Anderson (1968) wrote about possible preservation of lizard refuges since the Pleistocene in the Kopet-Dag mountains.

Increasing climatic aridization in the Holocene can be the cause of disappearance of *C. atayevi* in the foothills and severe restriction of its area in the middle-altitude and high-altitude parts of the western and central Kopet-Dag and, possibly, to the breakup of the area into several local refuges. The "primitive" morphological features were preserved in the absence of contacts with closely related forms. In any case, only further study of species variability in specific localities of the Kopet-Dag can throw light on this question.

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