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A NEW SUBSPECIES OF *PHRYNOCEPHALUS ORNATUS* BOULENGER (REPTILIA: AGAMIDAE) FROM EASTERN IRAN, WITH A KEY TO SOUTH-WESTERN AND MIDDLE ASIAN MICROPHRYNOCEPHALIDS

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(with three text-figures)

ABSTRACT.- A new subspecies of *Phrynocephalus ornatus, P. o. vindumi* is described from Iran. It can be distinguished from other south-western and Middle Asian "microphrynocephalids" by having a rose-coloured spot with blue edges on the neck. The species inhabits eastern Iran from Kavir-i-Namak Desert to the Sistan Basin.

KEY WORDS.- *Phrynocephalus ornatus vindumi* ssp. n., Agamidae, Iran, Afghanistan, taxonomy.

INTRODUCTION

Phrynocephlus ornatus, described from Nushki and Helmand, at the borders of Baluchistan, (Pakistan) and Afghanistan (Boulenger, 1887), was first reported from eastern Iran by Nikolsky (1897). Leviton and Anderson (1970), who described the sympatric species, *P. clarkorum* (Anderson and Leviton, 1967), however, noted that Nikolsky's data needed verification.

Nikolsky (1897) noted important differences in colouration between his specimens and the illustration of the lizard published by Boulenger (1891). The Iranian specimens have two horse-shoe-shaped blue spots divided by a red spot on the neck. He mentioned later that his new specimens' "variability of pattern consists in a red spot, longitudinally arranged, which divides the blue ones, is broader in some or narrower in other specimens" (Nikolsky, 1900: 393). Anderson (1998) also described this character in his work on the Iranian herpetofauna. According to these data, this spot is rose-coloured with a blue edge in life, whereas one to three pairs of orange or "raspberry" coloured or dark spots may be present on the anterior third of the dorsum in populations from Afghanistan and Pakistan (Smith, 1935; Minton, 1966, Clark, 1992). A single spot of the same colouration may sometimes be present in the interscapular region (Fig. 1). Boulenger (1891), Clark et al. (1969), and others also do not mention the neck spot in lizards from the eastern part of the range.

Having studied over 100 specimens of these agamas from various parts of the range, including 26 specimens from eastern Iran, I found that colour pattern and other characters of Iranian agamas are stable, for which reason these lizards are being described as a new subspecies of *Phrynocephalus ornatus*.

ABBREVIATIONS USED

CAS- California Academy of Sciences, San Francisco, California, USA

FMNH- Field Museum of Natural History, Chicago, Illinois, USA

MHNG- Museum d'Histoire Naturelle, Geneve, Switzerland

NMBA- Naturhistorisches Museum Basel, Basel, Switzerland

NMW- Naturhistorisches Museum Wien, Wien, Austria

ZIL- Zoological Institute, St. Petersburg, Russia

ZMB- Museum für Naturkunde, Humboldt Universität, Berlin, Germany

ZMMGU- Moscow State University Zoological Museum, Moscow, Russia.

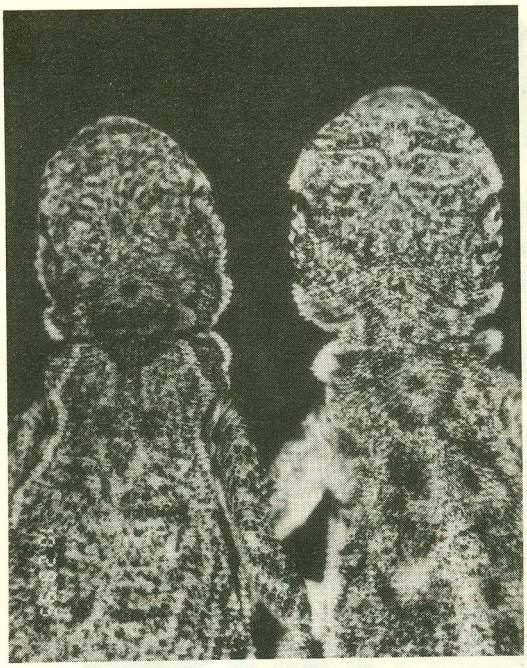

FIGURE 1. 1a: Holotype of *Phrynocephalus ornatus vindumi* (CAS 141204); left; 1b: *Phrynocephalus o. ornatus* (CAS 120204); right.

Phrynocephalus ornatus vindumi
ssp. nov.
(Figs. 1-2)

Holotype (Fig. 1a). CAS 141204. Adult male. Iran: Khorasan Prov.: 35 km. N of Gonabad on road to Torbat-E. Heydariyeh (ca. 34° 49' N, 58° 47' E), 850 m. elevation, S. C. Anderson coll.

Paratypes (Fig. 2). CAS 141204. Adult female. Iran: Khorasan Prov.: 39 km N of Gonabad on road to Torbat-E. Heydariyeh (ca. 34° 41' N, 58° 48' E), October 1975, R. McCullers and S. C. Anderson coll.; MHNG 1591.47. Adult male. Iran: 15 km N Belun (Gonabad), alt. 850 m, 16 April 1974, J. Garzoni and A. de Chambrier coll; NMBA 4950. Adult male. Chous in terra Zirckuh (Iran); NMW 24796: 1-2. Adult male and female. "Ost Persien" (= eastern Iran); ZIL 8768* two adult males, four adult females, subadult female. Eastern Persia: Zirkuh: after Gyarmakh, 30 June, 1896, N. Zarudny coll. (in Russian); 5207. Four adult males, adult female. E. Persia: Zirkuh Region, khous, 18 April, 1898, N. Zarudny coll.; ZIL 9920. Six adult males. E. Persia: Neh-i-Bendan Region: Khadji-i-du-chaghi Wall, 2 June, 1901, N. Zarudny coll.; ZIL 9921. Nine juveniles. E. Persia: Zirkuh Region: Bamrud aryk ("aryk" = a type of irrigation canal), 20 June, 1901, N. Zarudny coll.; ZMMGU 2114. Adult male. E. Persia, A. Nikolsky det.; ZMB 15375. Adult female. "Ost Persien" (= eastern Iran), F. Werner coll.

Diagnosis.- V-shaped, horse-shoe shaped or crescentic light spot, rose with blue edges in life, on neck (Fig. 2); small brick-rose dots (faded in alcohol), sometimes edged with dark, scattered spots on dorsum; lower surface of tail tip white in juveniles and adults; snout-vent length (SVL) to tail length (Lcd) ratio of adult males 0.75-0.90, of adult females 0.81-0.89; three to five small subocular shields; no spiny scales along flanks of body, on back of head or thighs; several enlarged scales without spines on front edge of shoulder fold; no light dorso-lateral stripes from eye to tail.

Description of holotype.- Adult male. SVL 34.0 mm.; Lcd 43.5 mm.; SVL/Lcd 0.78; distance between knee-joints (thighs situated at right angle to longitudinal axis of body) 16.1 mm; length of straightened hind limb from tip of fourth toe (without claw) to hip joint 30.4 mm; width of hood 6.3 mm; internostril distance 0.5 mm; 18 scales across midhood (without upper ocular shields); eight scales across hood between rudimentary parietal eye and upper nasal shields; upper nasal shields in contact with each other; lower nasals separated by a scale; four/five small subocular shields which are not differenciated in size from surrounding ones; 99 scales along midbelly from chin to vent; 26 subdigital lamellae under fourth toe.

Head scales keeled, heterogeneous, distinctly enlarged near parietal shield. Keels on scales along dorsum gradually disappear posteriorly; from midback to flanks scales become gradually smaller in size but on flanks they are distinctly

* Six specimens (four catalogued as ZIL 5207 and two as ZIL 8768) are decapitated; the latter series contains a specimen of *Phrynocephalus interscapularis*; all ZIL 9921 specimens are dehydrated and therefore were not studied.

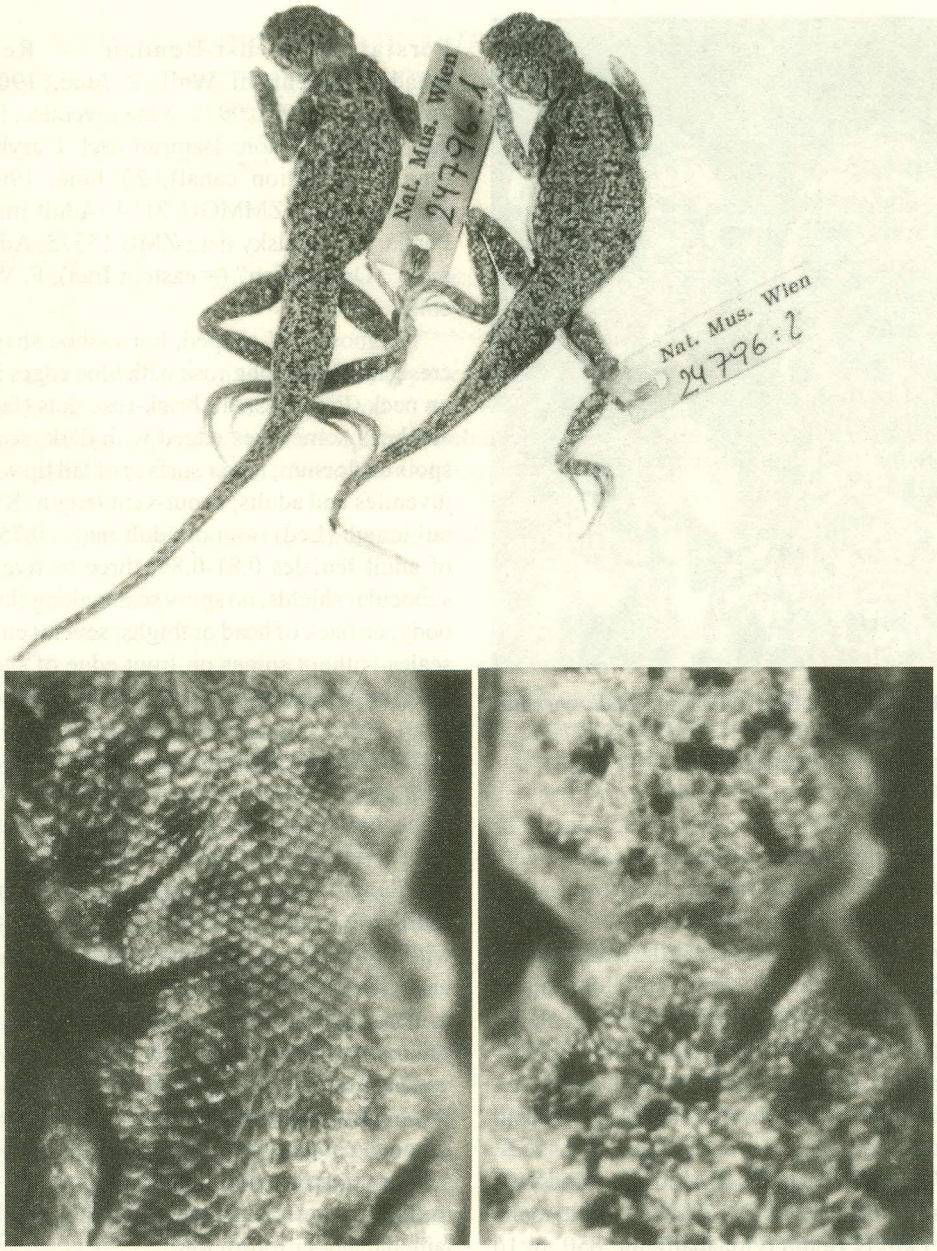

FIGURE 2: The paratypes of *Phrynocephalus ornatus vindumi* (NMW 24796: 1-2): a.- dorsal view (top); b.- and c.- (bottom left and right, respectively); nuchal spot (b- ZIL 5207; c - ZIL 9920).

smaller than other scales. No spiny scales on back of head, on thighs or along flanks; enlarged, smooth scales in front of shoulder fold.

Gular scales large, without keels, granulated. Behind mental are rows of distinct postmental shields, which do not contact lower labials, and end at edge of mouth edge (Fig. 1); one to two rows of elongated scales, almost equal in size to postmentals, between these rows of chin-shields and lower labials. No distinct keels on abdominal scales.

Caudal scales, both above and below, with distinct keels; upper surfaces of some scales of limbs also with keels. Each subdigital lamella

with single keel which, with other similar keels, form an indistinct row along digit; fringes poorly developed on both sides of fourth toe; claws long and thin.

Colour and pattern of holotype not preserved. In the paratypes (Fig. 2), transverse pattern of light markings (characteristic of a majority of phrynocephalid species) on head; V-shaped, horseshoe-shaped or crescentic light spot on neck; small brick-rose dots (faded in alcohol), sometimes edged with dark, scattered spots on dorsum. Light crescentic spot on neck (covered with skin fold in holotype).

Variation (based on 25 specimens).- SVL (both males and females) 37.5 mm; SVL/Lcd: adult males 0.75-0.90 (0.799 ± 0.019), adult females 0.81-0.89 (0.867 ± 0.049); 18-22 (20.00 ± 0.30) scales across hood (without upper ocular shields); 7-11 (8.61 ± 0.26); scales along hood from parietal eye shield to nasal shields; 90-105 (98.78 ± 0.96) scales along midbelly from mental to vent; 23-31 (26.25 ± 0.38) subdigital lamellae under fourth toe from left side and 23-30 (26.58 ± 0.34) from right side.

Upper nasal shields (n-19) in contact with each other in 94.4%, lower ones- only 33.3%. Orbit of eye (n-19) usually with three to five

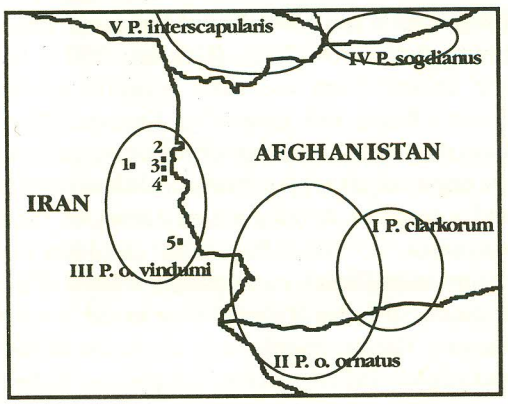

FIGURE 3: Map showing distribution of *Phrynocephalus ornatus vindumi*. Legends are as follows: 1- N of Gonabad on Road to Tarbat-E. Heydariyeh; 15 km. N of Gonabad; 2- Zirkuh Region: Garmah (this locality is plotted from N. Zarudny's, 1896 description of his route); 3- Mozhnabad (W shore of Lake Namakzar); 4- Bamrud; Magomedabad; 5- Neh-i-Bendan Region: Hadji-i-du-chagi.

small scales (96%) below; the single specimen (NMW 24796:2) has two (from left) and one (from right) enlarged shields (5.4%).

Along each side of body, a light stripe passes through eye, to shoulder fold, above forelimb, and on flanks to base of hindlimb; lower (ventral) part of this stripe between limbs is edged with indistinct dark stripe, and above (dorsal) side, light stripe is edged with indistinct light stripe; the latter becomes more distinct and zigzag-shaped on sacrum and extends approximately to level of mid-tail; light transverse stripe borders sometimes present at regular intervals between longitudinal stripes after tail base on tail dorsum. There are several black transverse bands on lower surface of tail, but tip is always white in juveniles as well as adults of both sexes.

Distribution.- Besides the localities previously noted for the type series, this lizard has also reported from desert of Zirkuh Region between Villages of Germah (Gyarmah) and Buniabad (Zarudny, 1897), Mudznabad (Mojnabad) and Fenduct, Mudznabad and Bamrud, Bamrud and Magomedabad, Ahangerun and Charakhs, and on the Tag-i-Doroh Plain (Zarudny, 1904). Thus, *Phrynocephalus ornatus vindumi* is distributed in the eastern part of Kavir-i-Namak Desert (E. Iran), along north-eastern slopes of Kelat (Qalat) Range and Kayen Mountains to Iranian-Afghanistan border; it is likely it also occurs in adjoining areas of Afghanistan. The south-eastern part of its range does not extend beyond the Sistan Basin and Farah-Rud River: the allied *P. o. ornatus* inhabits the left bank of this river (CAS 120192-120193 Afghanistan: Juvain).

Habitat.- *Phrynocephalus ornatus vindumi* inhabits "crumbly and soft" sands (Zarudny, 1901, 1904), which is also characteristic of *P. o. ornatus* (Minton, 1966). Nevertheless, the latter is also found "on the bare stony terrain bordering the sand" (Clark et al., 1969: 297).

Comparative notes.- The primary differentiating character of the new subspecies is the colour spot on the back of the head. It is well known that colour spots (the signal spots on the upper surface of the body, spots in the armpits and the colouration of the tail underside) are widely used

in the intrageneric systematics of *Phrynocephalus*. Recently it was pointed out that axillary colour spots are not reliable as characters for geographical separation among these lizards (Golubev, 1993a). This indicates that this character, as well as tail ventrum colouration (Golubev, 1993b; unpubl.) is of doubtful value in the systematics of the group. On the contrary, the position of the colour spots on the dorsum is consistent, and when present, is usually of systematic value as indicator of specific differences: *Phrynocephalus boettgeri* and *P. raddei* (scapular region, difference in size), *P. scutellatus* (entire dorsum), *P. helioscopus* (nuchal region), *P. interscapularis* and *P. sogdianus* (scapular region). In *P. o. ornatus*, as was earlier noted, the paired bright raspberry or orange spots are located on the dorsum of body, the unpaired, in the interscapular region (Fig. 1b). In the closely related *P. clarkorum*, these spots are significantly reduced. In two other related species, both found further north in Middle Asia, *P. sogdianus* and *P. interscapularis*, small orange spots are scattered throughout the dorsum (as in *P. o. vindumi*). However, these spots, unlike the nuchal or the scapular spots, are unlikely to be "signal" spots, but are used as camouflage. In one other allied species of "microphrynocephalids", *P. luteoguttatus*, both signal and bright camouflaging spots are absent (Minton, 1966; Clark, 1990). Thus, the nuchal colour spots in the east Iranian populations clearly distinguishes them as a group. It should be mentioned, however, that the presence of such a character of the species level in *P. o. vindumi*, does not necessarily indicate the independence of this species. The absence of spiny fringes on the scales of shoulder folds, along the sides of the body, rear thigh surfaces and head (characteristic of both Middle Asian species), as well as the white tail tip below, pattern of upper surfaces and other characters indicate that *P. o. vindumi* is closely related to the southern *P. ornatus/clarkorum* lineage of phrynocephalids. Despite the range of this form, which occupies an intermediate position between the pairs of northern and southern species (Fig. 3), *P. o. vindumi* seems closer to both Middle Asian microphrynocephalids, if its unpaired interscapular spot is treated not as camouflage but as an emerging signal spot.

The range of the new subspecies lies entirely within the boundaries of the eastern-north-eastern parts of the so called "East Iranian quadrangle" (Harrison, 1968: 143; 153-156).

Even though a large number of species are found here, *Phrynocephalus ornatus vindumi* is probably the only endemic one. At a first glance this can be easily explained by the openness of this area to penetration of the south-eastern (Afghan-Pakistani), as well as the north-western (Iran-Turanian) elements. At the same time, certain peculiarities of the reptile dispersal in this "corridor" should be noted (the discussion of these is beyond the scope of this article). For example, the complex of most closely related psammophilous forms of "microphrynocephalids" (*P. clarkorum, P. ornatus, P. sogdianus, P. interscapularis*), macrophrynocephalids" (*P. euptilopus, P. mystaceus*), lacertids (*Eremias fasciata, E. lineolata, E. scripta*) or gekkonids (*Crossobamon orientalis, C. eversmanni lumsdenii, C. e. eversmanni*), which apparently have dispersed from the south-east to the north, have formed a semi-circle around the area of the Paropamisus and Hindukush Mountains, penetrating further into Turan (Golubev, 1995), but are absent from the sand massifs of the Dasht-i-Kavir and Dast-i-Lut Deserts. These facts suggest the existence of recent obstacles to the dispersal of the plain psammophilous reptiles and a complex developmental history of these territories. Stöcklin (1968: 1256) considers this region to be "much more closely related to the Baluchistan-Indus Ranges" than to the Iranian Plateau. The geomorphologic evolution of Iran and Afghan-Pakistan plains, the changes in their landscapes and climate, have not been studied in sufficient detail. Recently, evidence of glacial moraines was found in the territory of Iran (Kerman; Djebalbarez), and no fewer than three pluvial periods of the Pleistocene were noted (Selivanov, 1980; 1982; 1983). On the Iranian uplands, the length of the Quaternary glaciers would have reached 15 km, the periglacial relief

on their periphery was distributed at the elevations of 3,800-1,800 m, whereas at present, small glaciers remain on Elbrus Mountain (Ananyev and Leontyev, 1987). Three to four stages of change in the climate conditions in the Pleistocene is indicated for Sistan and Baluchistan (Sarvati, 1993). Earlier, Sarvati (1986) mentioned that the Kevire Nemek Depression experienced tectonic settling throughout the Pleistocene. The events of that time were, in all probability, determined the shaping of the region's herpetofauna (Anderson, 1968; Leviton and Anderson, 1984).

Etymology.- The author takes pleasure in naming this new form for Jens V. Vindum, Collections Manager, Department of Herpetology, California Academy of Sciences, San Francisco.

Key to SW and Middle Asian forms of microphrynocephalids.-

1a. SVL/tail ratio > 0.93 (0.93-1.07; mean 0.99) in adult males, 1.03 (1.03-1.16; mean 1.09) in adult females; dorsum reticulated
. . . . . *P. luteoguttatus* Boulenger

1b. SVL/tail ratio < 0.96 in adult males, adult 1.04 in females 2

2a. Spiny scales along flanks, back of head, thighs and front of shoulder folds; lower surface of tail tip black 3

2b. No spiny scales along flanks, on back of head, thighs and on front of axillary folds; lower surface of tail tip white 4

3a. Signal spot on scapular region always present; one or two (rarely, three) enlarged subocular scales; pattern of dorsum includes small dark and light dots
. . . . . *P. interscapularis* Lichtenstein

3b. Signal spot on scapular region sometimes absent; four or five (rarely, three) enlarged subocular scales; pattern of dorsum includes dark-brown dots
. . . . . *P. sogdianus* Chernov

4a. Light dorsolateral stripes from eye to tail; one or two enlarged subocular scales
. . . . . .*P. clarkorum* Anderson & Leviton

4b. No dorsolateral stripes from eye to tail; three to five subocular scales 5

5a. Several paired orange or raspberry coloured spots along dorsum, unpaired spot of same colour may be presented on shoulders; SVL/tail ratio 0.71-0.78 (0.75) in adult males, 0.73-0.82 (0.78) in females
. . . . . *P. o. ornatus* Boulenger

5b. Single rose with blue edged spot on neck; SVL/tail ratio 0.75-0.90 (0.80) in adult males, 0.81-0.89 (0.87) in adult females
. . . . . *P. o. vindumi* ssp. n.

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