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Description of six new species from *Mesalina watsonana* complex in the Iranian plateau and neighboring regions

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Abstract

Mesalina watsonana is a species complex with a wide distribution range in Iran, some parts of Turkmenistan, Afghanistan, Pakistan, and northwest India. Recent molecular and morphological investigations detected remarkable hidden diversity among the geographical populations of the complex, more likely referring to the persistence of undescribed species. In this study, we conducted a very detailed sampling of localities and carried out a morphological study to investigate populations within the complex. Investigation of morphological features within the *M. watsonana* species complex indicated that it consists of seven distinct populations. They include the West-Southeast-South, East-Northeast, East Dasht-e Kavir, West Dasht-e Kavir, and two central groups (Halil and Kerman groups). Considering our findings, each of the seven populations corresponding to distinct geographic regions should be recognized as species. The six new species include *Mesalina khuzestanensis* **sp. nov.**, *Mesalina halilica* **sp. nov.**, *Mesalina kermanensis* **sp. nov.**, *Mesalina ardestanica* **sp. nov.**, *Mesalina bardaskanensis* **sp. nov.**, *Mesalina esfarayensis* **sp. nov.** which are distinctive from each other due to their unique morphological characteristics.

Key words: Taxonomy, *Mesalina khuzestanensis* sp. nov., *Mesalina halilica* sp. nov., *Mesalina kermanensis* sp. nov., *Mesalina ardestanica* sp. nov., *Mesalina bardaskanensis* sp. nov., *Mesalina esfarayensis* sp. nov., Middle East

Introduction

Mesalina is a genus of a large family (Lacertidae, Eremiadinae; Gray, 1838) and currently includes 20 described species (Uetz *et al.*, 2023), subdivided into seven species complexes: 1- *Mesalina adramitana* (Boulenger, 1917), 2- *Mesalina brevirostris* Blanford, 1874, 3- *Mesalina guttulata* (Lichtenstein, 1823), 4- *Mesalina martini* (Boulenger, 1897), 5- *Mesalina olivieri* (Audouin, 1829), 6- *Mesalina rubropunctata* (Lichtenstein, 1823) and 7- *Mesalina watsonana* (Stoliczka, 1872) (Simó-Riudalbas *et al.*, 2019). The genus consists of fast, small, and diurnal lizards that adapted well to the desert and dry scrubland. They are broadly distributed from the Atlantic Sahara through North Africa, the Middle East, and the Arabian Peninsula to the Iranian Plateau (Sindaco *et al.*, 2008; Simó-Riudalbas *et al.*, 2019) towards India. Several molecular and morphological studies have contributed to our knowledge of the relationships among *Mesalina* species (Arnold 1986a, 1986b; Joger & Mayer, 2002; Kapli *et al.*, 2008; Kapli *et al.*, 2015; Šmíd *et al.*, 2017; Sindaco *et al.*, 2018; Simó-Riudalbas *et al.*, 2019; Pizzigalli *et al.*, 2021).

Mesalina watsonana has a wide distribution range in Iran, some parts of Turkmenistan, Afghanistan, Pakistan and north-west India (Anderson, 1999; Khan, 2006; Hosseinian Yousefkhani *et al.*, 2013; Kapli *et al.*, 2015; Ahmadzadeh *et al.*, 2017). Šmíd & Frynta, (2012) identified four different clades within species that are geographically isolated

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from each other, with 9.8 to 13.1% genetic distances using the cytochrome *b* gene. Hosseinian Yousefkhani *et al.*, (2013) explored various morphological and meristic characters of three population groups of *M. watsonana* in Iran. According to the study, *M. watsonana* can be divided into two large morphological groups. Kapli *et al.*, (2015) studied the phylogenetic relationships of *Mesalina* species using one nuclear (beta-fibrinogen intron 7) and two mitochondrial (cyt *b* and 16S) loci. They showed that the *M. watsonana* lineage had high statistical support, and the data suggested that the origin of *Mesalina* dates back as early as the Miocene (c. 22 Ma). According to their findings, *M. watsonana* also separated from the other *Mesalina* clades during the Miocene period. They also mentioned that *M. watsonana* is a species complex, occurring in the lowlands and mountain hills of the area in arid and semi-arid habitats. Boroumand *et al.*, (2024), conducted a new molecular study with comprehensive sampling from the entire distribution range of the complex in Iran using the mitochondrial (cyt *b* and 16S) and nuclear (C-mos) markers. They identified seven highly supported distinct deep lineages presumably referring to seven species. Herein, we describe six new species of the complex with a more detailed sampling of localities.

Materials and methods

Morphological samples and characters

The molecular study by Boroumand *et al.* (2024) on Iranian populations of *M. watsonana* showed the presence of a species complex consisting of seven deep lineages, so following this study, the morphology of the lineages of this species complex was carried out. For morphological studies on *M. watsonana* complex, 37 specimens containing 22 males and 15 females across the species range in the central Iranian Plateau and Mesopotamian Plains of Iran were collected during extensive field studies from October 2019 to April 2021. The morphological datasets included: two specimens from the west Dasht-e Kavir, six specimens from the east Dasht-e Kavir, four specimens from the east-northeast, three specimens from the west of Zagros Mountains, two specimens from the Baft County, Kerman Province (Halil area), 10 specimens from the east-southeast and 10 specimens from central Iran (Kerman area) (Fig. 1; Appendix). All specimens were anesthetized with chloroform for morphological examination and were then injected with 96% ethanol into their body and fixation in 70% alcohol. All specimens are stored in the herpetological collection of the Zoologisches Forschungsmuseum Alexander Koenig (ZFMK), Leibniz Institute for the Analysis of Biodiversity Change (LIB), Bonn, Germany.

Morphological characters including 11 metrics and 15 meristics were used in this study based on previous studies (Stoliczka, 1872; Szczerbak, 1989; Anderson, 1999; Arnold *et al.*, 2007 Ahmadzadeh *et al.*, 2013; HosseinianYousefkhani *et al.*, 2015; Nasrabadi *et al.*, 2017; Galoyan *et al.*, 2020) and personal observations. The following measurements were used: width of the head, immediately before the ear opening (hw); head length, measured ventrally from the tip of the snout to the posterior margin of the collar (hl); total forelimb length, from the base to the tip of the longest toe (ffl); trunk length (from the groin to the armpit) (trl); snout-vent length, length of the body from the tip of snout to the cloaca (svl); total hind limb length, from the base to the tip of the fourth toe (hfl); pileus length, dorsally from the tip of the snout to posterior margin of parietal and occipital scales (pl); length of the posterior half of the pileus (esd); head height near the occipital plate (hh); mouth opening, laterally from the tip of the snout to corner of the mouth (mo); and tail length, from the cloaca to the tip of the tail (tl). Meristic characters were counted as follows: The number of ventral scales in transverse rows (vstn); the number of ventral scales along the middle line (vsn); collar scales number (csn); gular scales number (gsn) (from the angle between the maxillar scales to the collar); submaxillary scales number (smsn); femoral pores number (fpn) (fpnr-fpn on the right side, fpnl-fpn on the left side); upper labial scales number (ulsn); lower labial scales number (llsn); supraocular scales number (sosn); supraciliary scales number (scsn); The number of dorsal granular scales across middle of back (dgsn) The number of transparent shields on the lower eyelid (tslen); lamellae under 4th toe (lft); scales number between femoral pores on each side (sbfp) and the number of semicircular rows of scales surrounding the preanal scale (rspn). Measurements were taken using a Mitutoyo 0.02 mm caliper (model SHOCK PROOF) on the right side of the specimens. If the measurement on the right side was not available, the measurements from the corresponding left side were used instead. A stereomicroscope (model ZSM1001) was used to count the scale, and photos were taken using a Dino Capture 2 device. All measurements and photography were carried out by the same person.

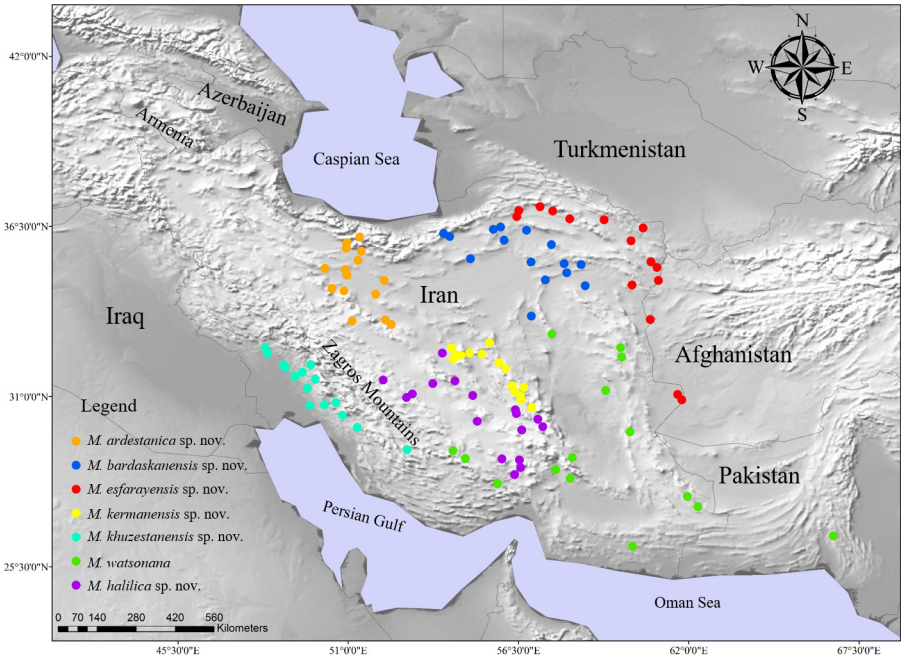

FIGURE 1. Geographical distribution range of the seven species within the *M. watsonana* complex in Iran. The distribution points of species were collected from reliable sources such as Anderson, 1999; Šmíd & Frynta, 2012; Hosseinian Yousefkhani *et al.*, 2013; Šmíd *et al.*, 2014; Kapli *et al.*, 2015; Sindaco *et al.*, 2018; Simó-Riudalbas *et al.*, 2019 and this study.

Results

Based on genetic evidence (Boroumand *et al.*, 2024) seven distinct lineages were recognized within the *Mesalina watsonana* complex. We described six lineages, as new species using morphological features and measurements (see Appendix).

Mesalina watsonana (Stoliczka, 1872)

Fig. 2

Comment on the original type material. *Eremias* (*Mesalina*) *watsonana* has been described based on five specimens (Stoliczka 1872) from "Sind", belonging to the "desert fauna the Panjáb Province, India". According to the International Code of Zoological Nomenclature (ICZN 1999) only these five specimens are to be regarded as syntypes. Obviously, these five specimens, deposited in the collection of the Zoological Survey of India, are listed in the type catalog of this institution (Das *et al.* 1998) as **Syntypes: ZIS 5224-25, 4929, 5050, and 5223**. However, Šmíd *et al.* (2014), citing these five ZSI specimens, added some additional specimens that they claimed to be syntypes, too, from the collections of the Natural History Museums in London (BMNH) and Vienna (NMW), thus bringing the number of syntypes up to 9. This is in clear contradiction to Stoliczka's (1872) original description of this taxon. The new type catalog of the Vienna Natural History Museum (NMW) (Gemel *et al.* 2019) lists three *M. watsonana* from "Sind", stating that they had already been donated by Stoliczka to the NMW in 1874. Also, the type locality given by Šmíd *et al.* (2014) for this taxon ("between Karachi and Sukkur"), i.e. in the Sindh Province, Pakistan, cannot be found in Stoliczka's paper. It refers to the BMNH specimen likewise regarded as a syntype. Obviously, the BMNH specimen has also been donated by Stoliczka, so only one syntype should still be present in Kolkata (which cannot be verified at the moment). However, because all specimens mentioned by Stoliczka (1872) came from the same area and were said to be very similar to each other, a lectotype designation is not warranted before these contradictions will be resolved.

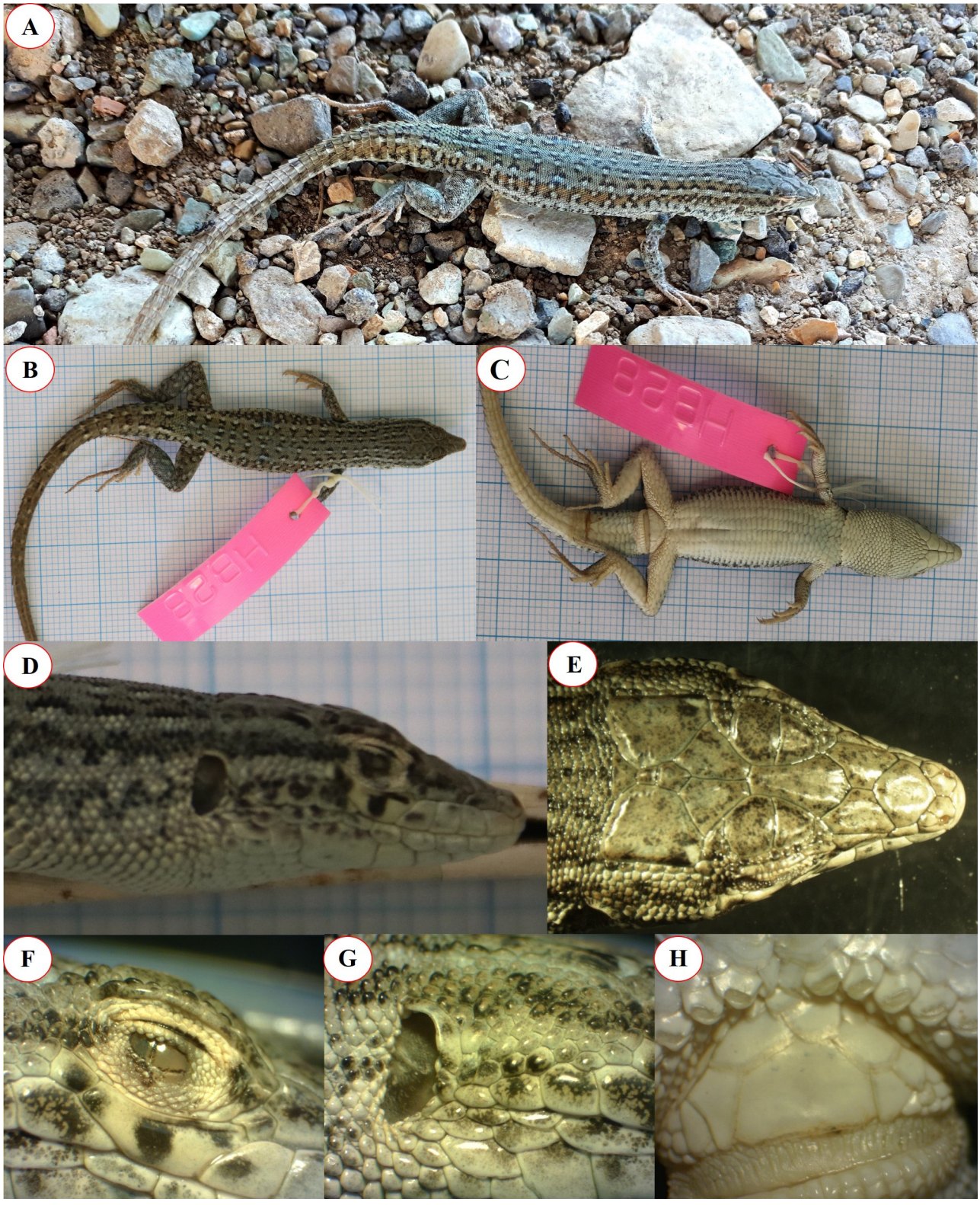

FIGURE 2. Pictures of the examined specimen (ZFMK 104005 (♂)) of *M. watsonana* from Iran. A) specimen in life (Photo by H. Boroumand); B) dorsal view of the body; C) ventral view; D) right side of the head; E) dorsal view of the head; F) window of black-edged scales in lower eyelid; G) tympanic hole; H) preanal scale and semicircular rows of scales surrounding it.

Other specimens examined. Adult male, Iran, Kerman Province, Jiroft, (Latitude: 28.634357N, Longitude: 57.698953 E, 714 m asl), 17 March 2021, Hamid Boroumand (ZFMK 104005). 2 females: same data as abovementioned (ZFMK 104006, ZFMK 104007); 2 females: Iran, Sistan and Baluchistan province, Saravan, Hoshak, (Latitude:

27.44083 N, Longitude: 62.29555 E, 1219 m asl), 3 June 2020, Hamid Boroumand (ZFMK 104008, ZFMK 104009); 2 males: Iran, South Khorasan province, Birjand, Sarbisheh, (Latitude: 32.28 N, Longitude: 59.83138 E, 1514 m asl), 4 June 2020, Hamid Boroumand (ZFMK 104010, ZFMK 104011); 1 male: Iran, South Khorasan province, Deyhuk, Esfandiar village, (Latitude: 33.02527 N, Longitude: 57.58 E, 1252 m asl), 5 June 2020, Hamid Boroumand (ZFMK 104012); 2 males: Iran, Fars province, Neyriz, Hasanabad village, (Latitude: 29.246667 N, Longitude: 54.385833 E, 1789 m asl), 17 September 2020, Hamid Boroumand (ZFMK 104013, ZFMK 104014).

Etymology. *M. watsonana* was named after H. E. Watson, a civil officer at a "station" in Sakkar, India (now in Pakistan). According to Stoliczka, H. E. Watson had helped Dr. Francis while collecting reptiles in Sind (Beolens *et al.*, 2011).

Diagnosis. Three nasals, lower in contact with rostral and first (rarely the second) upper labial; the fifth (rarely fourth or sixth) upper labial being largest and under the orbit; 8–10 upper labials; 6–8 lower labials; shields of head smooth, or very slighly rugose; occipital present in contact with interparietal; a long, narrow shield at the upper anterior edge of the tympanic hole (the first scale after that is often larger than the others); two large transparent shields of lower eyelid edged with black; scales on tibia smooth or very slightly keeled; ventral plates in 10 straight longitudinal series, ventral plates in 26–32 transverse rows; 36–47 dorsal granular scales across middle of back; collar complete, curved and serrated, 11–15 collars; 5 submaxillaries; 21–27 gulars; three (rarely Four) supraoculars, the first and fourth supraoculars smaller than the others; 6–7 supraciliaries; row of granules separating supraoculars and supraciliaries incomplete; one very large preanal shield surrounded above and at the sides by a row of smaller scales; 10–12 femoral pores on each side of the thigh, narrowly separated by 2–3 scales; 22–31 lamellae under 4th toe. Width of the head before the tympanic hole (hw) 6–8.8 mm; head length, from the tip of the snout to the posterior margin of the collar (hl) 15–20.6 mm; head height near the occipital plate (hh) 4.4–6.7 mm; pileus length, dorsally from the tip of the snout to posterior margin of parietal and occipital scales (pl) 10.1–12.3 mm; length of the posterior half of the pileus (esd) 5.4–7 mm; mouth opening, from the tip of the snout to the end of the mouth (mo) 8.7–11.5 mm; total forelimb length, from the base to the tip of the 4th toe (ffl) 13.6–16.4 mm; total hind limb length, from the base to the tip of the 4th toe (hfl) 27.9–34.7 mm; trunk length, from the groin to the armpit (trl) 19.2–25.8 mm; length of the body from the tip of snout to the cloaca (svl) 41.1–50.4 mm; and tail length (tl)77.3–102 mm (the maximum snout-vent length is 50.4 mm in males and 47.4 mm in females).

Dorsal coloration of adult, olivaceous above; dorsum with longitudinal series of small white spots, edged by small black spots often on both sides; often light dorsolateral stripe running to the eye; limbs marbled with many small white spots edged by black spots.

Distribution. It occurs in the south Khorasan, Sistan and Baluchistan, Hormozgan, Kerman and Fars provinces.

Habitat. The foothills, sand dunes, and sandy plains with poor vegetation.

***Mesalina khuzestanensis* sp. nov.**

urn:lsid:zoobank.org:act: HB14

Fig. 3

Holotype. Adult male, Iran, Khuzestan Province, Masjed Soleyman, Hajiabad village, (Latitude: 31.783645 N, Longitude: 49.514287 E, 445 m asl), 18 September 2020, Hamid Boroumand (ZFMK 104015).

Paratypes. 2 females: same data as holotype (ZFMK 104016, ZFMK 104017).

Etymology. It is named after its occurrence area in Khuzestan Province, Iran.

Diagnosis. A member of the *M. watsonana* complex with three nasals, lower in contact with rostral and first upper labial; 8 upper labials (the fifth upper labial being largest and under the orbit); 7 lower labials; shields of head often smooth; occipital present; a long, narrow shield at the upper anterior edge of the tympanic hole (the first scale after that is often larger than the others); two large transparent shields of lower eyelid edged with black ; scales on tibia smooth; ventral plates in 10 straight longitudinal series, ventral plates in 27–32 transverse rows; 46–47 dorsal granular scales across middle of back; collar complete, curved and serrated, 12 collars; 5 submaxillaries; 22 gulars; three supraoculars; 5 supraciliaries; row of granules separating supraoculars and supraciliaries incomplete; one very large preanal shield surrounded above and at the sides by several rows of smaller scales; 10–12 femoral pores on each side of the thigh, narrowly separated by 2–3 scales; 22 lamellae under 4th toe. Width of the head before the tympanic hole (hw) 6.9–7.6 mm; head length, from the tip of the snout to the posterior margin of the collar (hl)

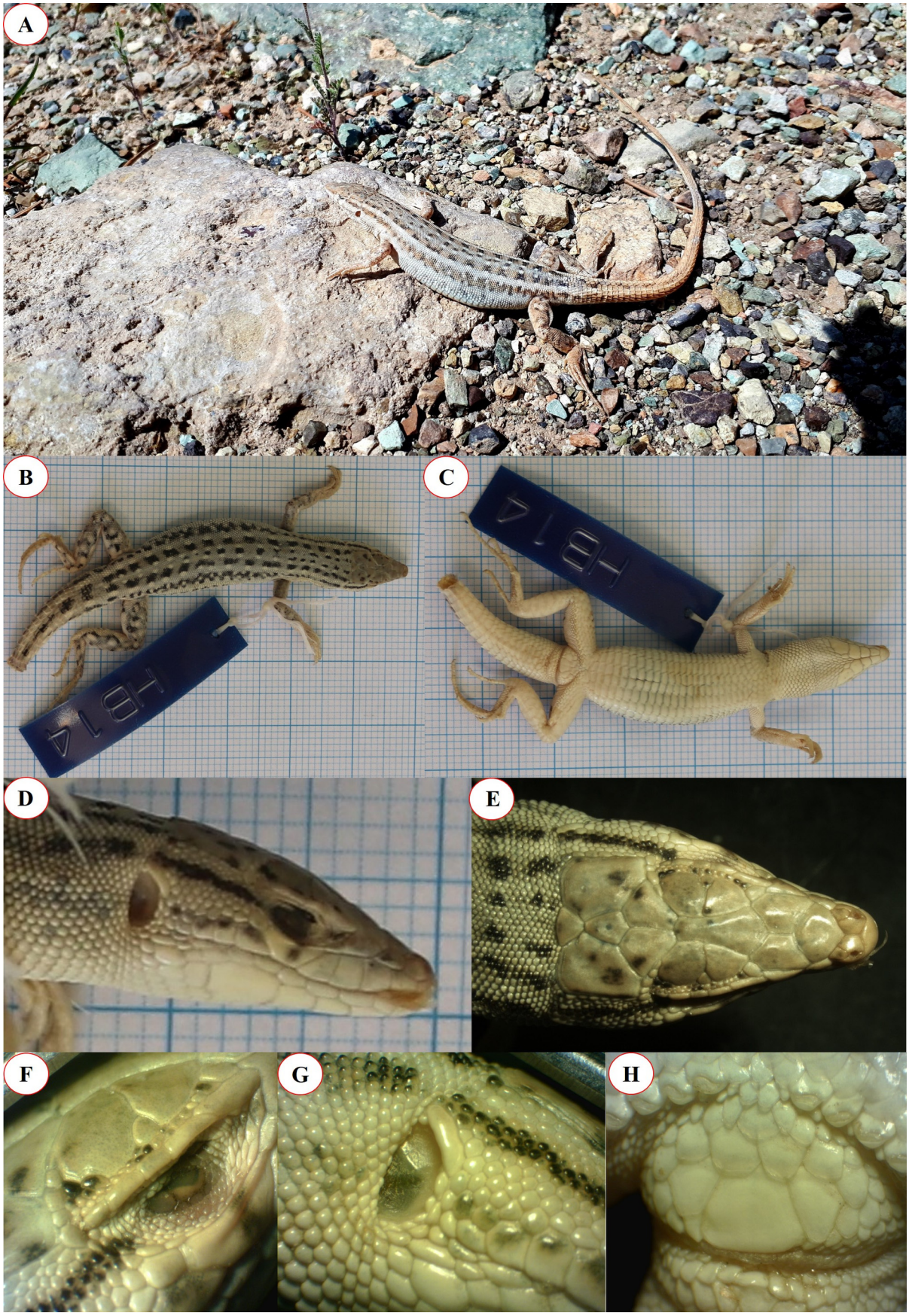

FIGURE 3. Pictures of the holotype (ZFMK 104015 (♂)) of *M. khuzestanensis* **sp. nov.** A) specimen in life (Photo by H. Boroumand); B) dorsal view of the body; C) ventral view; D) right side of the head; E) dorsal view of the head; F) window of black-edged scales in lower eyelid; G) tympanic hole; H) preanal scale and semicircular rows of scales surrounding it.

17.4–18.2 mm; head height near the occipital plate (hh) 5.2–5.9 mm; pileus length, dorsally from the tip of the snout to posterior margin of parietal and occipital scales (pl) 10.8–11.7 mm; length of the posterior half of the pileus (esd) 5.8–6.4 mm; mouth opening, from the tip of the snout to the end of the mouth (mo) 9.5–10.9 mm; total forelimb length, from the base to the tip of the 4th toe (ffl) 13.8–16.7 mm; total hind limb length, from the base to the tip of the 4th toe (hfl) 29–31.6 mm; trunk length, from the groin to the armpit (trl) 20.6–23.7 mm; length of the body from the tip of snout to the cloaca (svl) 46.5–48 mm and tail length (tl)77 mm (the maximum snout-vent length is 47.5 mm in males and 48 mm in females).

Description of holotype. An adult male; width of the head before the tympanic hole (hw) 7.6 mm; head length, from the tip of the snout to the posterior margin of the collar (hl) 18.2 mm; total forelimb length, from the base to the tip of the 4th toe (ffl) 16.7 mm; trunk length, from the groin to the armpit (trl) 20.6 mm; length of the body from the tip of snout to the cloaca (svl) 46.5 mm; total hind limb length, from the base to the tip of the 4th toe (hfl) 31.6 mm; pileus length, dorsally from the tip of the snout to posterior margin of parietal and occipital scales (pl) 11.7 mm; length of the posterior half of the pileus (esd) 6.4 mm; head height near the occipital plate (hh) 5.9 mm; mouth opening, from the tip of the snout to the end of the mouth (mo) 10 mm; ventral plates in 10 straight longitudinal series; 27 ventral scales in transverse rows; 12 collars; 22 gulars; 5 submaxillaries; 12 femoral pores (fpnr-fpn on the right side); the upper labial has 8 scales; the lower labial has 7 scales; the supraocular has 3 scales; 5 supraciliaries; 46 dorsal scales, approximately at half trunk; 2 large scales on the lower eyelid and there are 22 lamellae under 4th toe.

Dorsal coloration of the adult, grayish above; dorsum with the longitudinal series of white spots, edged by black spots on one side, some of the dark margins especially dorsolateral longitudinal series confluent and merged, forming dark crossbars; light dorsolateral stripe running to the eye; limbs marbled with few large white spots edged by black spots.

Variation in paratypes. See Appendix.

Distribution. Southwest of Iran in the provinces of Khuzestan, Kohgiluyeh and Boyer-Ahmad and Fars.

Habitat. Hills, foothills covered with thorny plants.

***Mesalina halilica* sp. nov.**

urn:lsid:zoobank.org:act: HB16

Fig. 4

Holotype. Adult male, Iran, Kerman Province, Baft, Khabr, Vakilabad village, (Latitude: 28.948908 N, Longitude: 56.529936 E, 2068 m asl), 27 October 2019, Hamid Boroumand (ZFMK 104018).

Paratype. 1 male: same data as holotype (ZFMK 104019).

Etymology. It is named after the area in the branches of Halil river catchment, Iran in which it occurred.

Diagnosis. A member of the *M. watsonana* complex with three nasals, lower in contact with rostral and first upper labial; 9 upper labials (the fifth upper labial being largest and under the orbit); 8 lower labials; shields of head smooth, or very slighly rugose; occipital present; a long, narrow shield at the upper anterior edge of the tympanic hole (scales in front of the tympanic hole mostly are serrated); two large transparent shields of lower eyelid edged with black; scales on tibia smooth; ventral plates in 10 straight longitudinal series, ventral plates in 30 transverse rows; 45 dorsal granular scales across middle of back; collar complete, curved and serrated, 12–13 collars; 5 submaxillaries; 24–25 gulars; four supraoculars (the first and fourth supraoculars are small); 6 supraciliaries; row of granules separating supraoculars and supraciliaries incomplete; one very large preanal shield surrounded above and at the sides by two rows of smaller scales; 12–13 femoral pores on each side of the thigh, narrowly separated by 2 scales; 24–26 lamellae under 4th toe; width of the head before the tympanic hole (hw) 8.5–8.8 mm; head length, from the tip of the snout to the posterior margin of the collar (hl) 19.1–19.7 mm; head height near the occipital plate (hh) 5.6–6.1 mm; pileus length, dorsally from the tip of the snout to posterior margin of parietal and occipital scales (pl) 12.3 mm; length of the posterior half of the pileus (esd) 6.5–6.8 mm; mouth opening, from the tip of the snout to the end of the mouth (mo) 10.7–11.2 mm; total forelimb length, from the base to the tip of the 4th toe (ffl) 16.2–17.3 mm; total hind limb length, from the base to the tip of the 4th toe (hfl) 34.5–35.5 mm; trunk length, from the groin to the armpit (trl) 23–23.7 mm; length of the body from the tip of snout to the cloaca (svl) 49.7–50.3 mm and tail length (tl) 94.8–100 mm (the maximum snout-vent length is 50.3 mm in males).

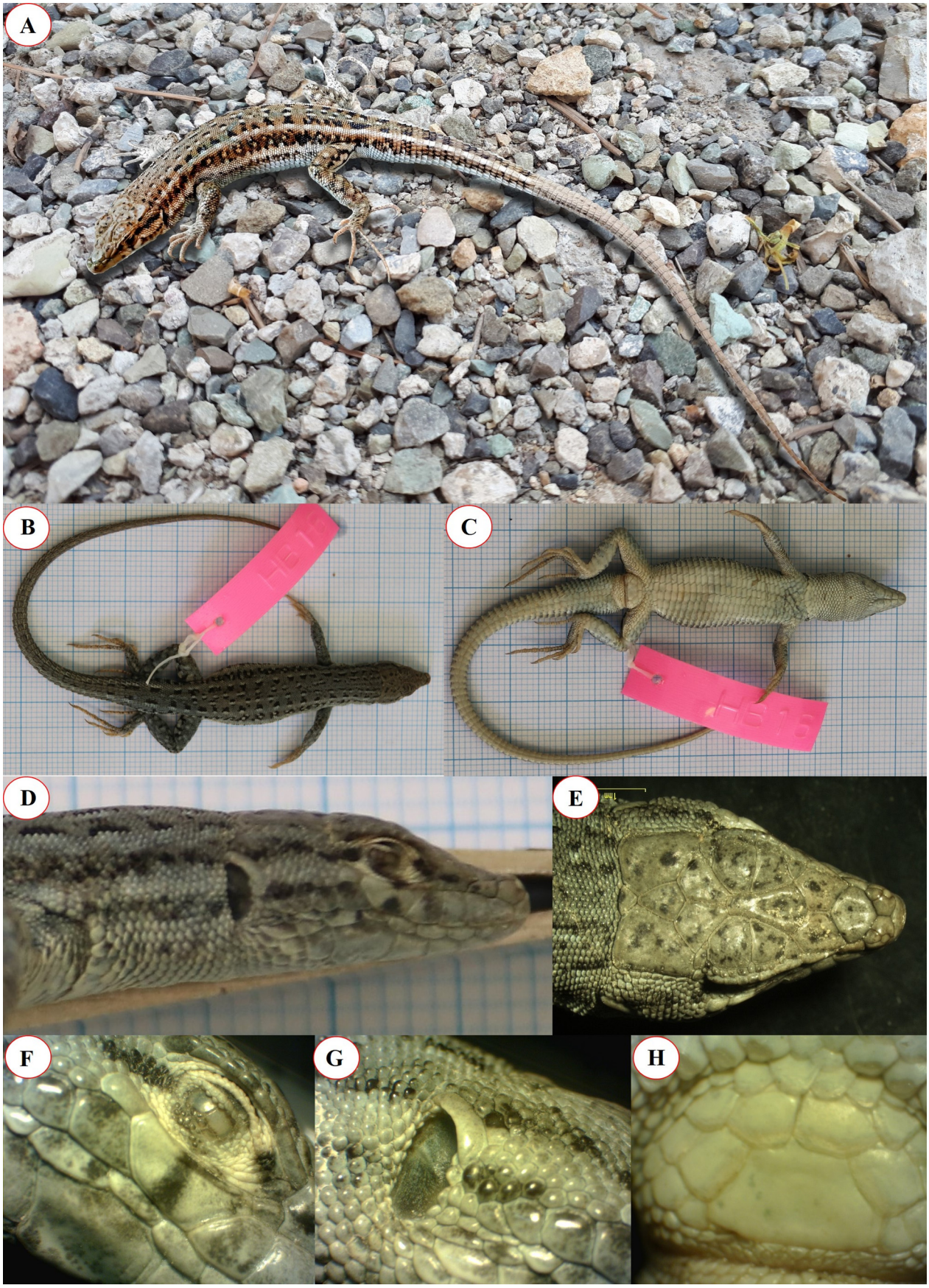

FIGURE 4. Pictures of the holotype (ZFMK 104018 (♂)) of *M. halilica* **sp. nov.** A) specimen in life (Photo by H. Boroumand); B) dorsal view of the body; C) ventral view; D) right side of the head; E) dorsal view of the head; F) window of black-edged scales in lower eyelid; G) tympanic hole; H) preanal scale and semicircular rows of scales surrounding it.

Description of holotype. An adult male; width of the head before the tympanic hole (hw) 8.8 mm; head length, from the tip of the snout to the posterior margin of the collar (hl) 19.1 mm; total forelimb length, from the base to the tip of the 4th toe (ffl) 16.2 mm; trunk length, from the groin to the armpit (trl) 23.7 mm; length of the body from the tip of the snout to the cloaca (svl) 50.3 mm; total hind limb length, from the base to the tip of the 4th toe (hfl) 35.5 mm; pileus length, dorsally from the tip of the snout to posterior margin of parietal and occipital scales (pl) 12.3 mm; length of the posterior half of the pileus (esd) 6.8 mm; head height near the occipital plate (hh) 6.1 mm; mouth opening, from the tip of the snout to the end of the mouth (mo) 11.2 mm and tail length (tl) 100 mm; ventral plates in 10 straight longitudinal series; 30 ventral scales in transverse rows; 13 collars; 24 gulars; 5 submaxillaries; 13 femoral pores (fpnr-fpn on the right side); the upper labial has 9 scales; the lower labial has 8 scales; the supraocular has 4 scales; 6 supraciliaries; 45 dorsal scales, approximately at half trunk; 2 large transparent scales on the lower eyelid and there are 24 lamellae under 4th toe.

Dorsal coloration of adult, brownish above; dorsolateral longitudinal series of whitish spots edged by big black spots on one side, dorsomedian longitudinal series of white spots edged by small black spots on both sides; limbs marbled with many white spots edged by black spots.

Variation in paratype. See Appendix.

Distribution. Southeast to central Iran in provinces of Kerman, Yazd, and Fars.

Habitat. Sandy plains leading to the foothills with scattered plants.

***Mesalina kermanensis* sp. nov.**

urn:lsid:zoobank.org:act: HB34

Fig. 5.

Holotype. Adult male, Iran, Kerman Province, Zarand, Dasht-e-khak, (Latitude: 31.024946 N, Longitude: 56.557987 E, 2279 m asl), 25 March 2021, Hamid Boroumand (ZFMK 104020).

Paratypes. 1 male, 4 females: same data as holotype (ZFMK 104021, ZFMK 104022, ZFMK 104023 ZFMK 104024, ZFMK 104025); 1 female: Iran, Kerman Province, Zarand, Babtangal, (Latitude: 30.88618 N, Longitude: 56.581336 E, 1826 m asl), 25 March 2021, Hamid Boroumand (ZFMK 104026); 3 males: Iran, Yazd Province, Ardakan, Tout, (Latitude: 32.578333 N, Longitude: 54.341667 E, 1154 m asl), 5 April 2021, Hamid Boroumand (ZFMK 104027, ZFMK 104028, ZFMK 104029).

Etymology. It is named after its occurrence area in Kerman Province, Iran.

Diagnosis. A member of the *M. watsonana* complex with three nasals, lower in contact with rostral and first upper labial; 8–10 upper labials (the fifth upper labial being largest and under the orbit); 7–8 lower labials; shields of head smooth, or very slighly rugose; occipital present; a long, narrow shield at the upper anterior edge of the tympanic hole (there are several very small scales after the long narrow shield); two large transparent shields of lower eyelid edged with black; scales on tibia smooth; ventral plates in 10 straight longitudinal series, ventral plates in 28–31 transverse rows; 40–45 dorsal granular scales across middle of back; collar, not complete, curved and serrated, 9–12 collars; 5 submaxillaries; 22–28 gulars; 3–4 supraoculars (the first and fourth supraocular scales are small); 5–7 supraciliaries; row of granules separating supraoculars and supraciliaries incomplete; one very large preanal shield surrounded above and at the sides by two rows of smaller scales; 10–13 femoral pores on each side of the thigh, narrowly separated by 2–3 scales; 22–24 lamellae under 4th toe. Width of the head before the tympanic hole (hw) 6.4–8.2 mm; head length, from the tip of the snout to the posterior margin of the collar (hl) 13.8–19.1 mm; head height near the occipital plate (hh) 4.5–6.3 mm; pileus length, dorsally from the tip of the snout to posterior margin of parietal and occipital scales (pl) 9.6–12 mm; length of the posterior half of the pileus (esd) 5.4–7 mm; mouth opening, from the tip of the snout to the end of the mouth (mo) 8.3–10.7 mm; total forelimb length, from the base to the tip of the 4th toe (ffl) 13.5–17.8 mm; total hind limb length, from the base to the tip of the 4th toe (hfl) 26.2–35.5 mm; trunk length, from the groin to the armpit (trl) 18.4–23.9 mm; length of the body from the tip of snout to the cloaca (svl) 39.8–47.6 mm and tail length (tl) 65–93.6 mm (the maximum snout-vent length is 47.6 mm in males and 47 mm in females).

Description of holotype. An adult male; width of the head before the tympanic hole (hw) 7.5 mm; head length, from the tip of the snout to the posterior margin of the collar (hl) 17.7 mm; the total forelimb length, from the base to the tip of the 4th toe (ffl) 13.8 mm; trunk length, from the groin to the armpit (trl) 20.4 mm; length of the body

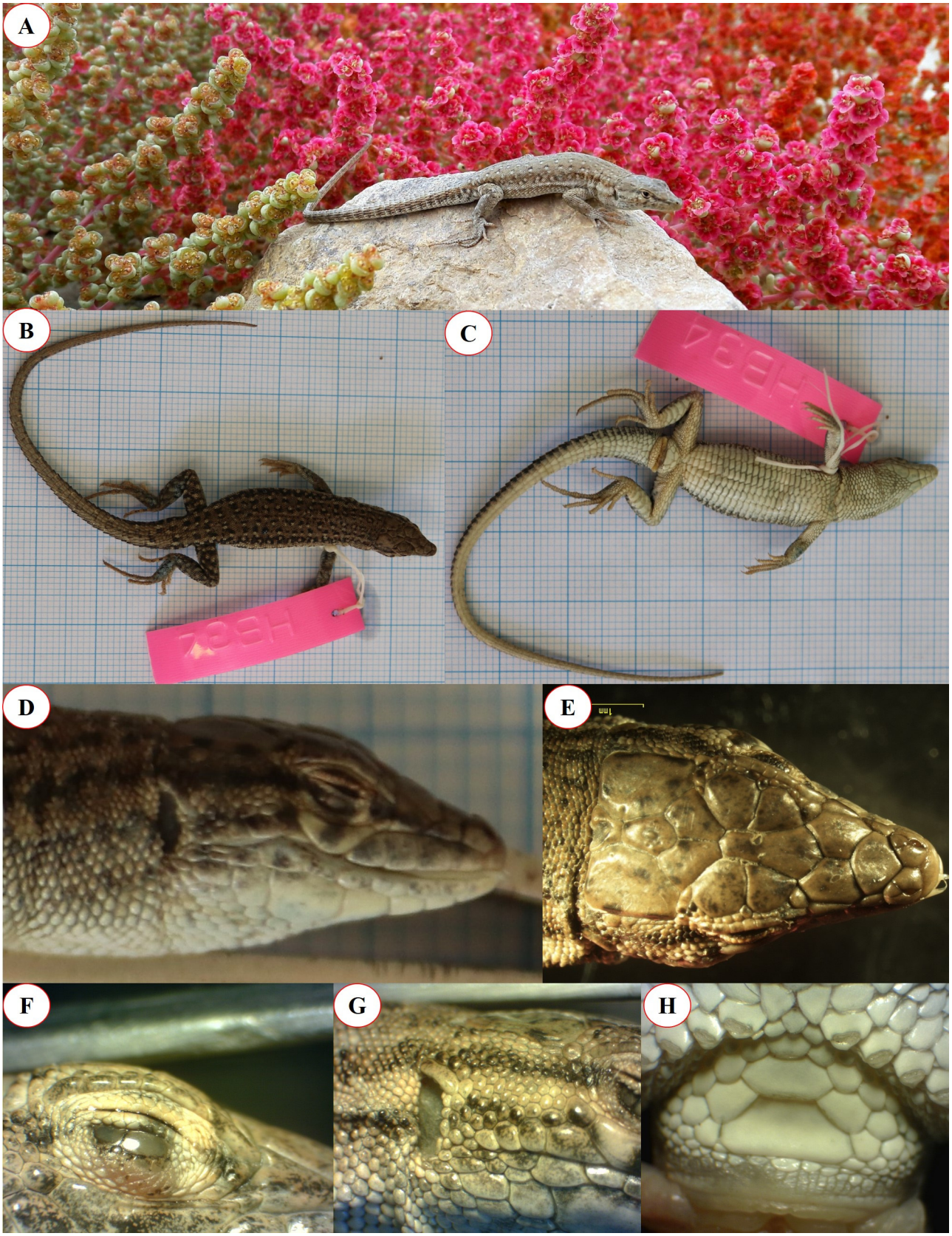

FIGURE 5. Pictures of the holotype (ZFMK 104020 (♂) and paratypes ZFMK 104022 (♀), ZFMK 104029 (♂)) of *M. kermanensis* **sp. nov.** A) specimen in life (Photo by Mehdi Sheikhi); B) dorsal view of the body; C) ventral view; D) right side of the head; E) dorsal view of the head; F) window of black-edged scales in lower eyelid (Paratype); G) tympanic hole (Paratype); H) preanal scale and semicircular rows of scales surrounding it (Paratype).

from the tip of snout to the cloaca (svl) 41.8 mm; total hind limb length, from the base to the tip of the 4th toe (hfl) 29.9 mm; pileus length, dorsally from the tip of the snout to posterior margin of parietal and occipital scales (pl) 10.9 mm length of the posterior half of the pileus (esd) 6 mm; head height near the occipital plate (hh) 6.3 mm; mouth opening, from the tip of the snout to the end of the mouth (mo) 9.4 mm and tail length (tl) 84 mm; ventral plates in 10 straight longitudinal series; 28 ventral scales in transverse rows; 11 collars; 22 gulars; 5 submaxillaries; 12 femoral pores (fpnr-fpn on the right side); the upper labial has 8 scales; the lower labial has 7 scales; the supraocular has 4 scales; 6 supraciliaries; 42 dorsal scales, approximately at half trunk; 2 large transparent scales on the lower eyelid and 23 lamellae under 4th toe.

Brownish above; dorsum with several longitudinal series of many small white or whitish spots, edged by small black spots on one side; unclear light dorsolateral stripe; limbs with many small white spots edged by black spots.

Variation in paratypes. See Appendix.

Distribution. In the northeast of Kerman province, located in Zarand city and the eastern half of Yazd province to Ardakan city, Iran.

Habitat. A foothill, with a rubble bed.

***Mesalina ardestanica* sp. nov.**

urn:lsid:zoobank.org:act: HB01

Fig. 6.

Holotype. Adult male, Iran, Isfahan Province, Ardestan, Hendooabad village, (Latitude: 33.323702 N, Longitude: 52.392139 E, 1363 m asl), 1 October 2020, Hamid Boroumand (ZFMK 104030).

Paratype. 1 male: same data as holotype (ZFMK 104031).

Etymology. It was named after its occurrence area in Ardestan, Isfahan Province, Iran.

Diagnosis. A member of the *M. watsonana* complex with three nasals, lower in contact with rostral and first upper labial; 8 upper labials (the fifth upper labial being largest and under the orbit); 8 lower labials; shields of head smooth, or very slighly rugose; occipital present; a long, narrow shield at the upper anterior edge of the tympanic hole (there are many small scales after the long narrow shield); two large transparent shields of lower eyelid edged with black; scales on tibia smooth; ventral plates in 10 straight longitudinal series, ventral plates in 27–31 transverse rows; 48–52 dorsal granular scales across middle of back; collar complete, curved and serrated, 12–13 collars; 6 submaxillaries; 24–28 gulars; 4 supraoculars (the first and fourth supraocular scales are small); 6–7 supraciliaries; row of granules separating supraoculars and supraciliaries incomplete; one very large preanal shield surrounded above and at the sides by two rows of smaller scales; 12–14 femoral pores on each side of the thigh, narrowly separated by 3 scales; 25 lamellae under 4th toe. Width of the head before the tympanic hole (hw) 9.3–10.5 mm; head length, from the tip of the snout to the posterior margin of the collar (hl) 20–20.6 mm; head height near the occipital plate (hh) 8.2–8.3 mm; pileus length, dorsally from the tip of the snout to posterior margin of parietal and occipital scales (pl) 12.8–12.9 mm; length of the posterior half of the pileus (esd) 6.9–7.5 mm; mouth opening, from the tip of the snout to the end of the mouth (mo) 11.2–11.5 mm; total forelimb length, from the base to the tip of the 4th toe (ffl) 17.4–18.2 mm; total hind limb length, from the base to the tip of the 4th toe (hfl) 36–36.6 mm; trunk length, from the groin to the armpit (trl) 25.3–27mm; length of the body from the tip of snout to the cloaca (svl) 51.8–53.7 mm and tail length (tl) 104–107.2mm (the maximum snout-vent length is 53.7 mm in males).

Description of holotype. An adult male; width of the head before the tympanic hole (hw) 10.5 mm; head length, from the tip of the snout to the posterior margin of the collar (hl) 20 mm; total forelimb length, from the base to the tip of the 4th toe (ffl) 17.4 mm; trunk length, from the groin to the armpit (trl) 27 mm; length of the body from the tip of snout to the cloaca (svl) 53.7 mm; total hind limb length, from the base to the tip of the 4th toe (hfl) 36.6 mm; pileus length, dorsally from the tip of the snout to posterior margin of parietal and occipital scales (pl) 12.9 mm; length of the posterior half of the pileus (esd) 6.9 mm; head height near the occipital plate (hh) 8.2 mm; mouth opening, from the tip of the snout to the end of the mouth (mo) 11.2 mm and tail length (tl) 104 mm; ventral plates in 10 straight longitudinal series; 31 ventral scales in transverse rows; 13 collars; 28 gulars from the angle between the maxillar scales to the collar; 6 submaxillaries; 14 femoral pores (fpnr-fpn on the right side); the upper labial has 8 scales; the lower labial has 8 scales; the supraocular has 4 scales; 6 supraciliaries; 52 dorsal scales, approximately at half trunk; 2 large transparent scales on the lower eyelid and 25 lamellae under 4th toe.

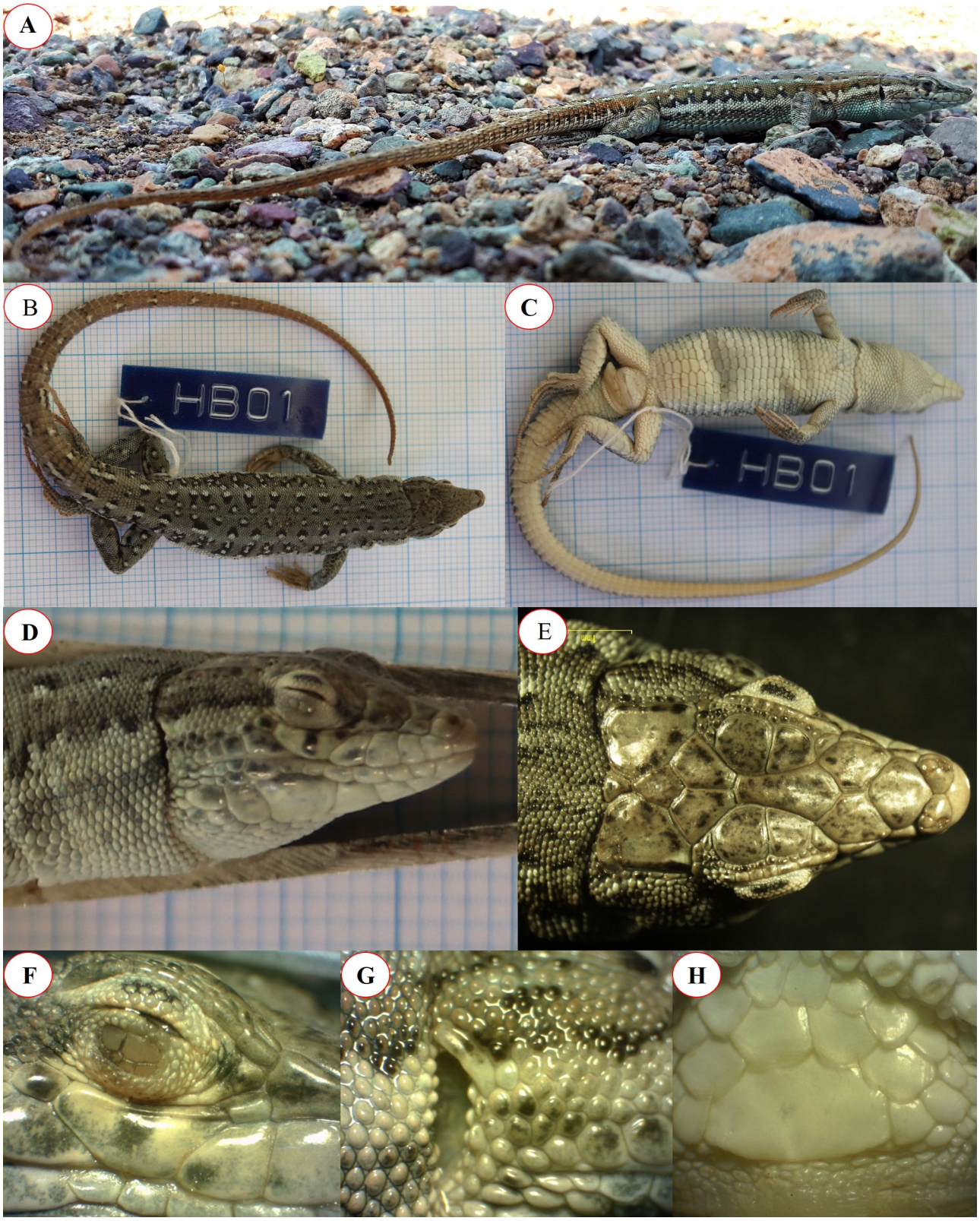

FIGURE 6. Pictures of the holotype (ZFMK 104030 (♂) and paratype ZFMK 104031 (♂)) of *M. ardestanica* **sp. nov.** A) specimen in life (Photo by H. Boroumand); B) dorsal view of the body; C) ventral view; D) right side of the head; E) dorsal view of the head; F) window of black-edged scales in lower eyelid (paratype); G) tympanic hole; H) preanal scale and semicircular rows of scales surrounding it.

Dorsal coloration of adult, olivaceous above; dorsolateral longitudinal series of big whitish spots edged by big black spots on one side, dorsomedian longitudinal series of small white spots edged by small black spots on both sides; limbs marbled with few white spots edged by black spots.

Variation in paratype. See Appendix.

Distribution. From the center to the north of Iran in the provinces of Isfahan, Qom, and Tehran.

Habitat. In the sandy plains with sparse vegetation.

***Mesalina bardaskanensis* sp. nov.**

urn:lsid:zoobank.org:act: HB03

Fig. 7

Holotype. Adult male, Iran, Khorasan Razavi Province, Bardaskan, Kaboudan, (Latitude: 35.293453 N, Longitude: 57.974873 E, 1123 m asl), 5 October 2020, Hamid Boroumand (ZFMK 104032).

Paratypes. 1 male: same data as holotype (ZFMK 104033); 2 males, 2 females: Iran, Semnan Province, Damghan, (Latitude: 36.171876 N, Longitude: 54.276441 E, 1234 m asl), 6 October 2020, Hamid Boroumand (ZFMK 104034, ZFMK 104035, ZFMK 104036, ZFMK 104037).

Etymology. It is named after its occurrence area in Bardaskan, Khorasan Razavi province, Iran.

Diagnosis. A member of the *M. watsonana* complex with three nasals, lower in contact with rostral and first upper labial; 8–9 upper labials, (the fifth rarely sixth upper labial being largest and under the orbit); 7–8 lower labials; shields of head smooth, or very slighly rugose; occipital present; a long, narrow shield at the upper anterior edge of the tympanic hole (mostly the three (rarely two) scales after the long narrow shield well developed); two large transparent shields of lower eyelid edged with black; scales on tibia smooth; ventral plates in 10 straight longitudinal series, ventral plates in 28–31 transverse rows; 42–46 dorsal granular scales across middle of back; collar complete, curved and serrated, 11–14 collars; 5–6 submaxillaries; 22–27 gulars; 4 supraoculars (the first and fourth supraocular scales are small); 6–8 supraciliaries; row of granules separating supraoculars and supraciliaries incomplete; one very large preanal shield surrounded above and at the sides by two rows of smaller scales; 11–14 femoral pores on each side of the thigh, narrowly separated by 1–3 scales; 20–25 lamellae under 4th toe; width of the head before the tympanic hole (hw) 7.9– 9.5 mm; head length, from the tip of the snout to the posterior margin of the collar (hl) 15.6– 20 mm; head height near the occipital plate (hh) 6.3–7.5 mm; pileus length, dorsally from the tip of the snout to posterior margin of parietal and occipital scales (pl) 11.3–12.9 mm; length of the posterior half of the pileus (esd) 6–7.2 mm; mouth opening, from the tip of the snout to the end of the mouth (mo) 9.6–11.6 mm; total forelimb length, from the base to the tip of the 4th toe (ffl) 14.5–17.2 mm; total hind limb length, from the base to the tip of the 4th toe (hfl) 29.5–36.1 mm; trunk length, from the groin to the armpit (trl) 22.3–24.8mm; length of the body from the tip of snout to the cloaca (svl) 44.2–50.6 mm and tail length (tl) 99.7–110mm (the maximum snout-vent length is 51.1 mm in males and 49.8 mm in females).

Description of holotype. An adult male; width of the head before the tympanic hole (hw) 9.2 mm; head length, from the tip of the snout to the posterior margin of the collar (hl) 19.9 mm; total forelimb length, from the base to the tip of the 4th toe (ffl) 17.2 mm; trunk length, from the groin to the armpit (trl) 24.2 mm; length of the body from the tip of snout to the cloaca (svl) 50.6 mm; total hind limb length, from the base to the tip of the 4th toe (hfl) 36.1 mm; pileus length, dorsally from the tip of the snout to posterior margin of parietal and occipital scales (pl) 12.9 mm; length of the posterior half of the pileus (esd) 6.9 mm; head height near the occipital plate (hh) 7.4 mm; mouth opening, from the tip of the snout to the end of the mouth (mo) 11.1 mm and tail length (tl) 110 mm; ventral plates in 10 straight longitudinal series; 31 ventral scales in transverse rows; 14 collars; 27 gulars; 5 submaxillaries; 13 femoral pores (fpnr-fpn on the right side); the upper labial has 8 scales; the lower labial has 7 scales; the supraocular has 4 scales; 6 supraciliaries; 46 dorsal scales, approximately at half trunk; 2 large transparent scales on the lower eyelid and 25 lamellae under 4th toe.

Olivaceous above; dorsum with longitudinal series of small white spots, edged by small black spots often on one side; limbs with big white spots edged by small black spots.

Variation in paratypes. See Appendix.

Distribution. Northeast to the north in Khorasan Razavi and Semnan provinces, Iran.

Habitat. In the sandy plains with sparse vegetation.

FIGURE 7. Pictures of the holotype (ZFMK 104032 (♂)) of *M. bardaskanensis* **sp. nov.** A) specimen in life (Photo by H. Boroumand); B) dorsal view of the body; C) ventral view; D) right side of the head; E) dorsal view of the head; F) window of black-edged scales in lower eyelid; G) tympanic hole; H) preanal scale and semicircular rows of scales surrounding it.

***Mesalina esfarayensis* sp. nov.**
urn:lsid:zoobank.org:act: HB07
Fig. 8

Holotype. Adult male, Iran, North Khorasan Province, Esfarayen, Eyzi village, (Latitude: 36.995959 N, Longitude: 57.60645 E, 1290 m asl), 5 October 2020, Hamid Boroumand (ZFMK 104038)

Paratypes. 2 females: same data as holotype (ZFMK 104039, ZFMK 104040); 1 male: Iran, Sistan and Balochistan Province, Zabol, Nader Alam Khan village, (Latitude: 30.89388 N, Longitude: 61.77611 E, 492 m asl), 5 June 2014, Alireza Riki (ZFMK 104041).

Etymology. It is named after its occurrence area in Esfarayen, in the North Khorasan Province, Iran.

Diagnosis. A member of the *M. watsonana* complex with three nasals, lower in contact with rostral and first upper labial; 8–9 upper labials, (the fifth upper labial being largest and under the orbit); 6–8 lower labials; shields of head smooth, or very slighly rugose; occipital present; a long, narrow shield at the upper anterior edge of the tympanic hole (very tiny scales after the long narrow shield); two large transparent shields of lower eyelid edged with black; scales on tibia smooth; ventral plates in 10 straight longitudinal series, ventral plates in 28–33 transverse rows; 43 dorsal granular scales across middle of back; collar complete, curved and serrated, 9–11 collars; 4–5 submaxillaries; 20–23 gulars; 4 supraoculars (the first and fourth supraocular scales are small); 6–7 supraciliaries; row of granules separating supraoculars and supraciliaries incomplete; one very large preanal shield surrounded above and at the sides by one row of smaller scales; 10–13 femoral pores on each side of the thigh, narrowly separated by 1–3 scales; 20–24 lamellae under 4th toe; width of the head before the tympanic hole (hw) 5.7–7.7 mm; head length, from the tip of the snout to the posterior margin of the collar (hl) 13.3–17 mm; head height near the occipital plate (hh) 3.9– 6.2 mm; pileus length, dorsally from the tip of the snout to posterior margin of parietal and occipital scales (pl) 8.5–12.1 mm; length of the posterior half of the pileus (esd) 4.7–6.7 mm; mouth opening, from the tip of the snout to the end of the mouth (mo) 7.3–10 mm; total forelimb length, from the base to the tip of the 4th toe (ffl) 11.3–15.4 mm; total hind limb length, from the base to the tip of the 4th toe (hfl) 24.6–28.7 mm; trunk length, from the groin to the armpit (trl) 16.8–24.8mm; length of the body from the tip of snout to the cloaca (svl) 35–46 mm and tail length (tl) 49.5–64 mm (the maximum snout-vent length is 46 mm in males and 43.6 mm in females).

Description of holotype. An adult male; width of the head before the tympanic hole (hw) 7.7 mm; head length, from the tip of the snout to the posterior margin of the collar (hl) 17 mm; total forelimb length, from the base to the tip of the 4th toe (ffl) 15.4 mm; trunk length, from the groin to the armpit (trl) 24.8 mm; length of the body from the tip of snout to the cloaca (svl) 46 mm; total hind limb length, from the base to the tip of the 4th toe (hfl) 28.7 mm; pileus length, dorsally from the tip of the snout to posterior margin of parietal and occipital scales (pl) 12.1 mm; length of the posterior half of the pileus (esd) 6.7 mm; head height near the occipital plate (hh) 6.2 mm and mouth opening, from the tip of the snout to the end of the mouth (mo) 10 mm; ventral plates in 10 straight longitudinal series; 31 ventral scales in transverse rows; 11 collars; 23 gulars; 5 submaxillaries; 11 femoral pores (fpnr-fpn on the right side); the upper labial has 8 scales; the lower labial has 7 scales; the supraocular has 4 scales; 6 supraciliaries; 43 dorsal scales, approximately at half trunk; 2 large transparent scales on the lower eyelid and there are 21 lamellae under 4th toe.

Dorsal coloration of adult, brownish above; dorsolateral longitudinal series of white spots edged by big black spots on one side, dorsomedian longitudinal series of white spots edged by very small black spots on one side; limbs with big white spots edged by small black spots.

Variation in paratypes. See Appendix.

Distribution. From the east to northeast, north of Sistan and Baluchistan to North Khorasan provinces, Iran.

Habitat. Foothills covered with *Artemisia* sp. and *Astragalus* sp., floodplains with poor vegetation, and *Tamarix* sp. trees.

Discussion

In this study, to assess the species diversity of *M. watsonana* complex, we conducted an extensive investigation by collecting samples from the whole distribution range in Iran. The results showed that there is a high degree of morphological variability within the species complex.

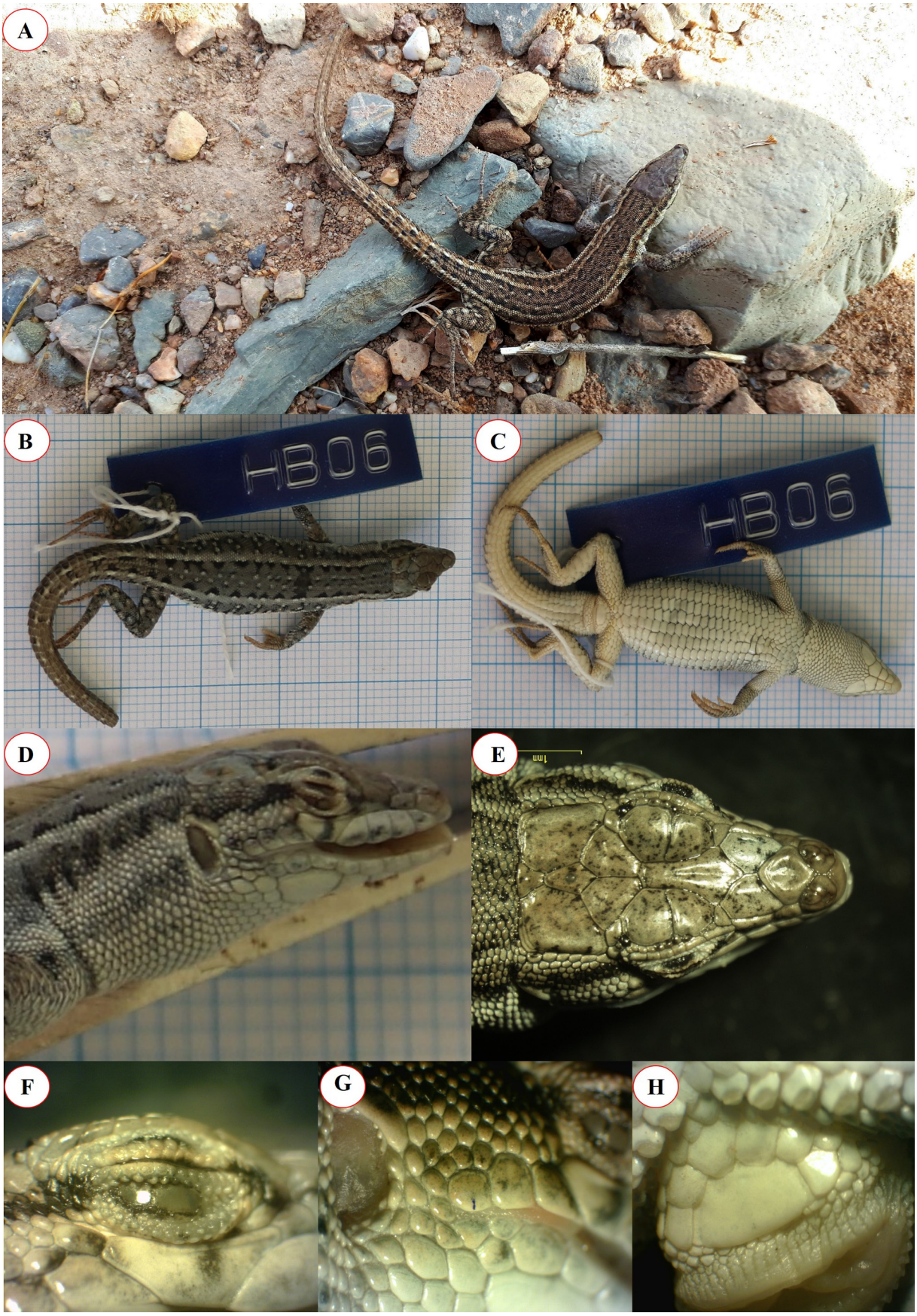

FIGURE 8. Pictures of the paratypes (ZFMK 104039 (♀), ZFMK 104040 (♀)) of *M. esfarayensis* **sp. nov.** A) specimen in life (Photo by H. Boroumand); B) dorsal view of the body; C) ventral view; D) right side of the head; E) dorsal view of the head; F) window of black-edged scales in lower eyelid; G) tympanic hole; H) preanal scale and semicircular rows of scales surrounding it.

Based on morphological evidence, several populations within the species complex were validated. The morphological examination revealed seven distinct species with distinct diagnostic color patterns. Therefore, based on aggregated morphological findings, we describe six new distinctive lacertid lizards of the genus *Mesalina* within the currently recognized *M. watsonana* complex from the Iranian Plateau and the Khuzestan Plain. The new species include *Mesalina khuzestanensis* **sp. nov.**, *Mesalina halilica* **sp. nov.**, *Mesalina kermanensis* **sp. nov.**, *Mesalina ardestanica* **sp. nov.**, *Mesalina bardaskanensis* **sp. nov.**, *Mesalina esfarayensis* **sp. nov.**

Previously, some investigations were conducted on this species complex to reassess the relationships among the species within it, although these studies predominantly involved a limited number of samples. Šmíd and Frynta (2012), and Kapli *et al.* (2015) based on genetic evidence showed that *M. watsonana* is a species complex. Hosseinian Yousefkhani *et al.* (2013) recognized three morphological groups from Iran. They classified their samples with multivariate analysis into three groups, the Zagros group (Qom, Kerman, Fars, Kashan), the Southern group (Qeshm, Bandare Abbas), and the Eastern and Northeastern group (Khorasan, Semnan, Tabas, Zabol). The results of the current study are consistent with the study by Boroumand *et al.* (2024). They conducted a new molecular study with comprehensive sampling from the entire distribution range of the *M. watsonana* complex in Iran using the mitochondrial (cyt *b* and 16S) and nuclear (C-mos) markers. They identified seven highly supported distinct deep lineages presumably referring to seven species.

Overall, the description of new lizard species is increasing in the Iranian plateau and neighboring regions due to the rich reptile diversity (Uetz *et al.*, 2023). On the other hand, the area provides wide and diverse habitats for different lizard species in particularly lacertid and geckos (Ghane-Ameleh *et al.*, 2021; Ghaedi *et al.*, 2021; Saberi *et al.*, 2021; Kafimola *et al.*, 2023). In the last years, many new species have been described morphologically from the country (e.g. Ahmadzadeh *et al.*, 2011; Mozaffari *et al.*, 2011; Torki *et al.*, 2011). Applying these combined taxonomic methods is expected to lead to the description of more new species from this less known region in terms of reptile fauna investigations.

Below, we provide a new identification key for the species of the *Mesalina watsonana* complex in Iran.

Key to the species of the *Mesalina watsonana* complex in Iran

1a. Grayish above; dorsum with the longitudinal series of white spots, edged by black spots on one side, some of the dark margins especially dorsolateral longitudinal series confluent and merged, forming dark crossbars; light dorsolateral stripe running to eye; limbs marbled with few large white spots edged by black spots . . . . . ***Mesalina khuzestanensis* sp. nov.**

1b. Olivaceous or brownish above; dorsum with the longitudinal series of white spots, edged by black spots, are not confluent and not merged; often light dorsolateral stripe running to the eye; limbs marbled with few large white spots or many small white spots edged by black spots 2

2a. Dorsum with longitudinal series of small white spots, edged by black spots on one side or both sides 3

2b. Dorsolateral longitudinal series of white spots edged by black spots on one side, dorsomedian longitudinal series of white spots edged by small black spots on one side or both sides 5

3a. Olivaceous above; dorsum with longitudinal series of small white spots, edged by small black spots often on both sides; limbs marbled with many small white spots edged by black spots . . . . . ***M. watsonana***

3b. Dorsum with longitudinal series of small white spots, edged by black spots on one side. 4

4a. Brownish above; dorsum with several longitudinal series of many small white or whitish spots, edged by small black spots on one side; unclear light dorsolateral stripe; limbs with many small white spots edged by black spots . ***M. kermanensis* sp. nov.**

4b. Olivaceous above; dorsum with longitudinal series of small white spots, edged by small black spots often on one side; limbs with big white spots edged by small black spots . . . . . ***M. bardaskanensis* sp. nov.**

5a. Brownish above; dorsolateral longitudinal series of white spots edged by big black spots in one side, dorsomedian longitudinal series of white spots edged by very small black spots on one side; limbs with big white spots edged by small black spots . . . . . ***M. esfarayenensis* sp. nov.**

5b. Dorsolateral longitudinal series of white spots edged by big black spots on one side, dorsomedian series of small white spots edged by small black spots on both sides 6

6a. Brownish above; dorsolateral longitudinal series of whitish spots edged by big black spots on one side, dorsomedian longitudinal series of white spots edged by small black spots on both sides; limbs marbled with many white spots edged by black spots . . . . . ***M. halilica* sp. nov.**

6b. Olivaceous above; dorsolateral longitudinal series of big whitish spots edged by big black spots on one side, dorsomedian longitudinal series of small white spots edged by small black spots on both sides; limbs marbled with few white spots edged by black spots . . . . . ***M. ardestanica* sp. nov.**

Acknowledgments

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Appendix. Metric and meristic characters were used in this study.

CatNo	FieldNo	Type	Collector	Coll_Year	Coll_Month	Coll_Day	Genus	Complex	Species	Country
ZFMK 104030	HB01	Holotype	Hamid Boroumand	2020	October	1	*Mesalina*	*watsonana*	*Mesalina ardestanica* **sp. nov.**	Iran
ZFMK 104031	HB02	Paratypes	Hamid Boroumand	2020	October	1	*Mesalina*	*watsonana*	*Mesalina ardestanica* **sp. nov.**	Iran
ZFMK 104032	HB03	Holotype	Hamid Boroumand	2020	October	5	*Mesalina*	*watsonana*	*Mesalina bardaskanensis* **sp. nov.**	Iran
ZFMK 104033	HB04	Paratypes	Hamid Boroumand	2020	October	5	*Mesalina*	*watsonana*	*Mesalina bardaskanensis* **sp. nov.**	Iran
ZFMK 104034	HB08	Paratypes	Hamid Boroumand	2020	October	6	*Mesalina*	*watsonana*	*Mesalina bardaskanensis* **sp. nov.**	Iran
ZFMK 104035	HB09	Paratypes	Hamid Boroumand	2020	October	6	*Mesalina*	*watsonana*	*Mesalina bardaskanensis* **sp. nov.**	Iran
ZFMK 104036	HB10	Paratypes	Hamid Boroumand	2020	October	6	*Mesalina*	*watsonana*	*Mesalina bardaskanensis* **sp. nov.**	Iran
ZFMK 104037	HB11	Paratypes	Hamid Boroumand	2020	October	6	*Mesalina*	*watsonana*	*Mesalina bardaskanensis* **sp. nov.**	Iran
ZFMK 104039	HB05	Paratypes	Hamid Boroumand	2020	October	5	*Mesalina*	*watsonana*	*Mesalina esfarayensis* **sp. nov.**	Iran
ZFMK 104040	HB06	Paratypes	Hamid Boroumand	2020	October	5	*Mesalina*	*watsonana*	*Mesalina esfarayensis* **sp. nov.**	Iran
ZFMK 104038	HB07	Holotype	Hamid Boroumand	2020	October	5	*Mesalina*	*watsonana*	*Mesalina esfarayensis* **sp. nov.**	Iran
ZFMK 104041	HB12	Paratypes	Alireza Riki	2014	June	5	*Mesalina*	*watsonana*	*Mesalina esfarayensis* **sp. nov.**	Iran
ZFMK 104016	HB13	Paratypes	Hamid Boroumand	2020	September	18	*Mesalina*	*watsonana*	*Mesalina khuzestanensis* **sp. nov.**	Iran
ZFMK 104015	HB14	Holotype	Hamid Boroumand	2020	September	18	*Mesalina*	*watsonana*	*Mesalina khuzestanensis* **sp. nov.**	Iran
ZFMK 104017	HB15	Paratypes	Hamid Boroumand	2020	September	18	*Mesalina*	*watsonana*	*Mesalina khuzestanensis* **sp. nov.**	Iran
ZFMK 104018	HB16	Holotype	Hamid Boroumand	2019	October	27	*Mesalina*	*watsonana*	*Mesalina halilica* **sp. nov.**	Iran
ZFMK 104019	HB17	Paratypes	Hamid Boroumand	2019	October	27	*Mesalina*	*watsonana*	*Mesalina halilica* **sp. nov.**	Iran
ZFMK 104008	HB18	Examined specimens from Iran	Hamid Boroumand	2020	June	3	*Mesalina*	*watsonana*	*Mesalina watsonana*	Iran
ZFMK 104009	HB19	Examined specimens from Iran	Hamid Boroumand	2020	June	3	*Mesalina*	*watsonana*	*Mesalina watsonana*	Iran
ZFMK 104013	HB20	Examined specimens from Iran	Hamid Boroumand	2020	September	17	*Mesalina*	*watsonana*	*Mesalina watsonana*	Iran
ZFMK 104014	HB21	Examined specimens from Iran	Hamid Boroumand	2020	September	17	*Mesalina*	*watsonana*	*Mesalina watsonana*	Iran
ZFMK 104010	HB22	Examined specimens from Iran	Hamid Boroumand	2020	June	4	*Mesalina*	*watsonana*	*Mesalina watsonana*	Iran
ZFMK 104011	HB23	Examined specimens from Iran	Hamid Boroumand	2020	June	4	*Mesalina*	*watsonana*	*Mesalina watsonana*	Iran
ZFMK 104012	HB24	Examined specimens from Iran	Hamid Boroumand	2020	June	5	*Mesalina*	*watsonana*	*Mesalina watsonana*	Iran
ZFMK 104006	HB26	Examined specimens from Iran	Hamid Boroumand	2021	March	17	*Mesalina*	*watsonana*	*Mesalina watsonana*	Iran
ZFMK 104007	HB27	Examined specimens from Iran	Hamid Boroumand	2021	March	17	*Mesalina*	*watsonana*	*Mesalina watsonana*	Iran
ZFMK 104005	HB28	Examined specimens from Iran	Hamid Boroumand	2021	March	17	*Mesalina*	*watsonana*	*Mesalina watsonana*	Iran
ZFMK 104020	HB34	Holotype	Hamid Boroumand	2021	March	25	*Mesalina*	*watsonana*	*Mesalina kermanensis* **sp. nov.**	Iran
ZFMK 104021	HB30	Paratypes	Hamid Boroumand	2021	March	25	*Mesalina*	*watsonana*	*Mesalina kermanensis* **sp. nov.**	Iran

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Appendix. (Continued)

CatNo	FieldNo	Type	Collector	Coll_Year	Coll_Month	Coll_Day	Genus	Complex	Species	Country
ZFMK 104022	HB32	Paratypes	Hamid Boroumand	2021	March	25	*Mesalina*	*watsonana*	*Mesalina kermanensis* **sp. nov.**	Iran
ZFMK 104023	HB33	Paratypes	Hamid Boroumand	2021	March	25	*Mesalina*	*watsonana*	*Mesalina kermanensis* **sp. nov.**	Iran
ZFMK 104024	HB29	Paratypes	Hamid Boroumand	2021	March	25	*Mesalina*	*watsonana*	*Mesalina kermanensis* **sp. nov.**	Iran
ZFMK 104025	HB31	Paratypes	Hamid Boroumand	2021	March	25	*Mesalina*	*watsonana*	*Mesalina kermanensis* **sp. nov.**	Iran
ZFMK 104026	HB25	Paratypes	Hamid Boroumand	2021	March	25	*Mesalina*	*watsonana*	*Mesalina kermanensis* **sp. nov.**	Iran
ZFMK 104027	HB35	Paratypes	Hamid Boroumand	2021	April	5	*Mesalina*	*watsonana*	*Mesalina kermanensis* **sp. nov.**	Iran
ZFMK 104028	HB36	Paratypes	Hamid Boroumand	2021	April	5	*Mesalina*	*watsonana*	*Mesalina kermanensis* **sp. nov.**	Iran
ZFMK 104029	HB37	Paratypes	Hamid Boroumand	2021	April	5	*Mesalina*	*watsonana*	*Mesalina kermanensis* **sp. nov.**	Iran

Appendix. (Continued)

CatNo	Province	Locality	Latitude	Longitude	Sex	hw	hl	ffl	trl	svl	hfl	pl	esd	hh
ZFMK 104030	Isfahan	Ardestan, Hendoo Abad	33.323702	52.392139	M	10.5	20	17.4	27	53.7	36.6	12.9	6.9	8.2
ZFMK 104031	Isfahan	Ardestan, Hendoo Abad	33.323702	52.392139	M	9.3	20.6	18.2	25.3	51.8	36	12.8	7.5	8.3
ZFMK 104032	Khorasan Razavi	Bardaskan, Kaboudan	35.293453	57.974873	M	9.2	19.9	17.2	24.2	50.6	36.1	12.9	6.9	7.4
ZFMK 104033	Khorasan Razavi	Bardaskan, Kaboudan	35.293453	57.974873	M	8.4	17	17	22.6	46	33	11.3	7	6.4
ZFMK 104034	Semnan	Damghan	36.171876	54.276441	M	9.5	20	16.7	25.7	51.1	33.8	12.5	7.2	7.5
ZFMK 104035	Semnan	Damghan	36.171876	54.276441	F	8	17.1	14.5	22.3	44.3	31.6	11.3	6	6.4
ZFMK 104036	Semnan	Damghan	36.171876	54.276441	M	8.6	15.6	14.8	23.6	44.2	30.3	11.6	6	6.4
ZFMK 104037	Semnan	Damghan	36.171876	54.276441	F	7.9	19.1	15.7	24.8	49.8	29.5	11.3	6.3	6.3
ZFMK 104039	Khorasan Shomali	Esfarayen, Eyzi	36.995959	57.60645	F	7.3	16.1	13.4	21.2	43.6	26.1	10.3	5.7	6.1
ZFMK 104040	Khorasan Shomali	Esfarayen, Eyzi	36.995959	57.60645	F	6.6	14	13	19	38.5	26.2	9.6	5.7	6
ZFMK 104038	Khorasan Shomali	Esfarayen, Eyzi	36.995959	57.60645	M	7.7	17	15.4	24.8	46	28.7	12.1	6.7	6.2
ZFMK 104041	Sistan and Baluchistan	Zabol, Nader Alam Khan village	30.89388	61.77611	M	5.7	13.3	11.3	16.8	35	24.6	8.5	4.7	3.9
ZFMK 104016	Khuzestan	Masjed Soleyman, haji Abad Village	31.783645	49.514287	F	6.9	17.4	13.8	22.1	47.5	29	11.3	6	5.3
ZFMK 104015	Khuzestan	Masjed Soleyman, haji Abad Village	31.783645	49.514287	M	7.6	18.2	16.7	20.6	46.5	31.6	11.7	6.4	5.9
ZFMK 104017	Khuzestan	Masjed Soleyman, haji Abad Village	31.783645	49.514287	F	7.3	17.9	16.2	23.7	48	30.5	10.8	5.8	5.2
ZFMK 104018	Kerman	Baft, Khabr, Vakil Abad	28.948908	56.529936	M	8.8	19.1	16.2	23.7	50.3	35.5	12.3	6.8	6.1
ZFMK 104019	Kerman	Baft, Khabr, Vakil Abad	28.948908	56.529936	M	8.5	19.7	17.3	23	49.7	34.5	12.3	6.5	5.6
ZFMK 104008	Sistan and Baluchistan	Saravan, Hoshak	27.44083	62.29555	F	6	15	14.4	21	43.1	27.9	10.1	5.6	4.4

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Appendix. (Continued)

CatNo	Province	Locality	Latitude	Longitude	Sex	hw	hl	ffl	trl	svl	hfl	pl	esd	hh
ZFMK 104009	Sistan and Baluchistan	Saravan, Hoshak	27.44083	62.29555	F	6.6	16	15	24.5	45.5	28.5	10.6	5.4	5.3
ZFMK 104013	Fars	Neyriz, Hasan Abad Village	29.246667	54.385833	M	7.7	18.6	16	23	46.6	33.8	11.6	6.5	6
ZFMK 104014	Fars	Neyriz, Hasan Abad Village	29.246667	54.385833	M	6	18	16	20	44.6	34.3	11.2	6.3	6
ZFMK 104010	Khorasan Jonobi	Birjand, Sarbisheh	32.28	59.83138	M	7.3	17.6	16.4	22	46.2	28.4	11.5	6.4	5.4
ZFMK 104011	Khorasan Jonobi	Birjand, Sarbisheh	32.28	59.83138	M	7.4	17.9	16.1	21.4	41.1	31.5	11.7	6.4	5.7
ZFMK 104012	Khorasan Jonobi	Deyhuk, Esfandiar village	33.02527	57.58	M	7.3	17	15.2	19.2	42.7	30.8	11	6	4.6
ZFMK 104006	Kerman	Jiroft	28.634357	57.698953	F	7.4	15.6	13.6	25.8	47.5	29.6	10.4	5.9	5.5
ZFMK 104007	Kerman	Jiroft	28.634357	57.698953	F	8.1	18.2	15.8	23.2	47	33.3	11.7	6.7	6.5
ZFMK 104005	Kerman	Jiroft	28.634357	57.698953	M	8.8	20.6	16.3	23.7	50.4	34.7	12.3	7	6.7
ZFMK 104020	Kerman	Zarand, Dashtkhak	31.024946	56.557987	M	7.5	17.7	13.8	20.4	41.8	29.9	10.9	6	6.3
ZFMK 104021	Kerman	Zarand, Dashtkhak	31.024946	56.557987	M	7.3	16	14.5	19.5	40.4	28.5	10.7	5.7	5.7
ZFMK 104022	Kerman	Zarand, Dashtkhak	31.024946	56.557987	F	6.5	13.8	13.5	21.2	39.8	26.2	9.6	5.5	4.9
ZFMK 104023	Kerman	Zarand, Dashtkhak	31.024946	56.557987	F	6.6	16.4	14.3	23.9	42.2	27.8	9.9	5.6	5.3
ZFMK 104024	Kerman	Zarand, Dashtkhak	31.024946	56.557987	F	6.4	14.7	13.7	21	41	27	9.6	5.4	4.5
ZFMK 104025	Kerman	Zarand, Dashtkhak	31.024946	56.557987	F	6.7	15.2	14.2	18.4	40	31.5	10.1	5.8	5.3
ZFMK 104026	Kerman	Zarand, Babtangal	30.88618	56.581336	F	7	16.5	15.5	23.2	47	30.1	10.9	5.6	5
ZFMK 104027	Yazd	Ardekan, Tout	32.578333	54.341667	M	7.3	16.7	14.3	20	42	30.8	10.6	6.1	5.7
ZFMK 104028	Yazd	Ardekan, Tout	32.578333	54.341667	M	8.2	19.1	16.6	22.8	47.6	33.4	12	7	6
ZFMK 104029	Yazd	Ardekan, Tout	32.578333	54.341667	M	8.1	18.6	17.8	23.2	47.4	35.5	12	6.8	6.1

Appendix. (Continued)

CatNo	mo	tl	vsn	vstn	csn	gsn	smsn	fpn- r	fpn- l	ulsn	llsn	sosn	scsn	dgsn	tslen	lft	sbfp	rspn
ZFMK 104030	11.2	104	10	31	13	28	6	14	14	8	8	4	6	52	2	25	3	2
ZFMK 104031	11.5	107.2	10	27	12	24	6	12	12	8	8	4	7	48	2	25	3	2
ZFMK 104032	11.1	110	10	31	14	27	5	13	14	8	7	4	6	46	2	25	3	2
ZFMK 104033	9.6	100	10	30	14	24	6	12	13	9	7	4	6	42	2	25	1	2
ZFMK 104034	11.6	0	10	28	11	23	5	12	11	9	7	4	6	42	2	20	2	2
ZFMK 104035	10.2	99.7	10	28	13	23	5	13	14	9	7	4	7	42	2	22	3	2
ZFMK 104036	10.2	0	10	28	11	22	5	12	13	9	8	4	8	46	2	21	2	2

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Appendix. (Continued)

CatNo	mo	tl	vsn	vstn	csn	gsn	smsn	fpn- r	fpn- l	ulsn	llsn	sosn	scsn	dgsn	tslen	lft	sbfp	rspn
ZFMK 104037	9.9	0	10	30	12	23	5	12	12	8	8	4	6	42	2	21	2	2
ZFMK 104039	9.1	64	10	31	11	22	5	13	12	8	6	4	6	43	2	21	2	1
ZFMK 104040	8.8	0	10	28	9	20	4	10	10	8	6	4	6	43	2	20	1	1
ZFMK 104038	10	0	10	31	11	23	5	11	11	8	7	4	6	43	2	21	3	1
ZFMK 104041	7.3	49.5	10	33	10	23	5	12	12	9	8	4	7	43	2	24	3	1
ZFMK 104016	10.9	77	10	32	12	22	5	11	10	8	7	3	5	46	2	22	2	>2
ZFMK 104015	10	0	10	27	12	22	5	12	12	8	7	3	5	46	2	22	3	>2
ZFMK 104017	9.5	0	10	32	12	22	5	11	11	8	7	3	5	47	2	22	3	>2
ZFMK 104018	11.2	100	10	30	13	24	5	13	13	9	8	4	6	45	2	24	2	2
ZFMK 104019	10.7	94.8	10	30	12	25	5	13	12	9	8	4	6	45	2	26	2	2
ZFMK 104008	8.7	85.7	10	32	12	22	5	12	12	8	7	3	6	39	2	27	2	1
ZFMK 104009	9	0	10	31	12	23	5	10	12	8	7	3	6	40	2	26	3	1
ZFMK 104013	10.2	100.8	10	30	14	27	5	10	13	10	6	3	6	44	2	25	3	1
ZFMK 104014	10	77.3	10	30	14	25	5	12	13	8	6	3	6	45	2	31	3	1
ZFMK 104010	10.4	93.8	10	28	12	24	5	11	11	8	8	3	6	43	2	23	2	1
ZFMK 104011	10.1	89.6	10	26	12	21	5	11	11	9	8	3	6	36	2	22	3	1
ZFMK 104012	9.6	85	10	30	11	24	5	11	11	9	8	4	6	40	2	26	3	1
ZFMK 104006	9.2	102	10	32	14	23	5	11	10	9	7	3	7	46	2	22	3	1
ZFMK 104007	10.3	78.5	10	29	13	24	5	12	13	8	6	3	6	47	2	23	3	1
ZFMK 104005	11.5	97.4	10	32	15	25	5	12	12	8	7	4	6	45	2	24	2	1
ZFMK 104020	9.4	84	10	28	11	22	5	12	13	8	7	4	6	42	2	23	2	2
ZFMK 104021	9.2	90	10	29	12	25	5	12	12	8	8	4	6	43	2	22	3	2
ZFMK 104022	8.6	73	10	31	11	23	5	10	11	10	8	3	7	45	2	23	2	2
ZFMK 104023	8.3	65	10	29	10	23	5	10	10	9	7	4	6	40	2	23	2	2
ZFMK 104024	8.6	0	10	30	11	23	5	12	11	9	7	3	5	40	2	23	3	2
ZFMK 104025	8.6	0	10	29	10	24	5	12	11	9	8	3	6	45	2	24	3	2
ZFMK 104026	9.3	92	10	31	9	24	5	10	10	9	7	3	6	43	2	22	2	2
ZFMK 104027	9.2	90.5	10	29	10	28	5	12	13	9	8	4	6	43	2	23	2	2
ZFMK 104028	10.2	72.6	10	29	10	24	5	12	12	8	8	3	6	45	2	23	2	2
ZFMK 104029	10.7	93.6	10	28	9	24	5	12	11	10	7	3	6	44	2	23	3	2