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Systematic and distribution of the genus *Laudakia* gray, 1845 (sauria: agamidae): a review

Abstract

The distribution and systematics of the inclusive genus *Laudakia* across the range are covered in this paper. I have made an effort to keep the species of the genus *Laudakia* together and in an organized manner. For example, the genera *Laudakia* and *Paralaudakia* are regarded as one genus. According to taxonomy, the genus *Laudakia* is a member of the Family Agamidae and the Order Squamata as an ancient work clade. Although I have attempted to examine every species that currently exists, there are a number of species in this genus that are also found in Iran, therefore this problem is not geographically specific. The global range of the species has been examined in this study. By looking at the species and their range, an attempt has been made to give a broad overview of this genus. A basic and comprehensive synopsis of this genus has been created using all available taxonomic data, despite the fact that there haven't been many genetic investigations on it.

Key words: Iranian Plateau, Central Asia, Laudaki

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Introduction

Linnaeus named the principal member of this group *Lacerta stellio*,[1] marking the beginning of *Laudakia*'s history in terms of taxonomy. Since systematics was still in its infancy, many herpetologists were misinformed about the differences between iguanids and agamids, confusing their affinities based on their physical characteristics and behavioral similarities. Laurenti also portrayed the species in question as *Iguana cordylina* in 1768. Indeed, these particular differences were more pronounced in the case of iguanids. In 1782, the author of *Phymaturus palluma* Molina,[2] distinguished it as *Lacerta*, despite the fact that it had been produced in Stellio.[3] In contrast to *Microlophus peruvianus* (Lesson, 1830), which was originally depicted as Stellio, Uracentron azureus was first portrayed by Linnaeus[4] as *Lacerta azurea*, which was then put in Stellio. Furthermore, Tropidurus torquatus was identified as *Stellio torquatus* in 1820 (Burt & Burt).[5] Boulenger resolved a number of conflicts, even at the family level, and assigned a few taxa to their respective families and genera. Stellio has long been considered a questionable member of the Agamidae, the fourth biggest family of lacertilians, which has expanded from Africa to Asia and Australia. Numerous herpetologists believed it to be a member of the African variety *Agama Daudin*, 1802 (e.g. Boulenger, Smith, Wermuth).[6-8] With over 360 extant species and 54 genera, the family Agamidae may have a wide range of morphological and physiological characteristics. Members of this family may be found all throughout Australia and the ancient world. The widely dispersed Iguanidae family across the New World is its morphological and environmental companion.[9] Agamid lizards may be found in many various types of environments, such as semi-arid, tropical, sub-tropical, and dry places. Gather VI (sensu Grouchy) comprises the western radiation of the family, which is dispersed over central and southern Asia, southeast Europe, and Africa, and has around nine genera: *Agama, Brachysaura, Laudakia, Phrynocephalus, Pseudotrapelus, Stellio, Trapelus, Uromastyx,* and *Xenagama*. The majority of these genera are shaky and depart from renters. Five of the previously named agamid genera, which include around 25 species, are found on the Iranian level, which extends from western Afghanistan and Pakistan to eastern Turkey and Iraq. This area may represent a zoogeographic intersection between Central Asia, northeastern Africa, and Arabia on the one hand, and southeastern Europe, northwest India, and western Pakistan on the other. Among these are the following: *Phrynocephalus* (7–11 species), *Laudakia* (at least 5 species), *Uromastyx* (3 species), *Trapelus* (at least 3 species), and *Calotes* (1 species) Rastegar-Pouyani & Nilson.[10] It no longer takes into account the entire class in a hereditary manner and is below the creators' center. Regardless, several bunches of *Laudakia* are taken into account. Zoogeographical concerns were understood through the use of the *Laudakia caucasia* species group[11-13] and Central Asian species.[14,15] The social behavioral plans of agamids and iguanids are very similar, and it will be challenging to assess the validity of these parallels until I have a better understanding of the social behavior of other agamid species.[16] Drawing from field and research office observations, Brattstrom[17] demonstrated the 73 behavioral postures and attitudes for the Australian shaggy mythological serpent. Based on the little research on agamid partitioning systems, it appears that agamids and iguanids have many similarities in terms of social organization and affinities.[18] There are several writers that advocate territorial behavior in agamids, such as Smith, Harris, Schmidt, Blanc & Carpenter, Brattstrom, Carpenter, Schleich, Orlova, Beutler, and others Baig.[7,19,20,16,17,21-26]

Genus Laudakia Gray, 1827

Laudakia agrorensis[27]

extreme discouragement; tympanum exposed, breadth smaller than eye width; nose longer than eye-to-tympanum distance; noses pierced on the canthus rostralis' edge, exposing the nose outward and essentially in reverse, with less than half of it contacting the rostral; Various, subequal, clearly carinated, and occasionally with a sharply elevated edge are the upper head scales; the sides of the head and neck have clusters of spinose scales; Absence of a regular pocket neck plicate: Regular scales are smooth and tiny; nuchal push of small spinose scales (sometimes extremely mild); supralabials 9–11 (9.8 ± 0.6); and infralabials 8–11 (10.0 ± 1). body disheartened; The ventral scales are smooth, smaller than the extended vertebral and flank scales but larger than the gular and other small dorsal scales; the skin on the sidelong sides of the body is free, creating a dorsolateral overlap; the flanks have a particular fix of broadened mucronate scales; and other small dorsals are noticeably smaller than extended ones; Around the

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middle of the body, the dorsal scales are imbricate, 105–130 (117 ± 7.3), clearly keeled or mucronate, and measured between 105 and 10 columns. Appendages that are somewhat firm, with the hindlimb situated between the cloaca and gular overlay longer than removed; With 18–24 (22.2 ± 1.59) lamellae beneath the third finger and 26–32 (29.5 ± 1.8) lamellae beneath the fourth toe, the fingers and toes are long and compressed. The tail is discouraged; it is oval in cross segment and forms highly precise annuli; each tail component has three whorls; the dorsal and horizontal sides are definitely mucronate, and the distal whorl bears 28 to 33 (30 ± 2) scales, beginning with the proximal region of the tail. According to Baig,[26] both sexes have obdurate organs. Men have three to four lines at the precloacal position and a minor fix at the mid-stomach region. Women have comparable patches, with the precloacal number not going above three and the stomach fix occurring less frequently. According to reptile-database. reptarium.cz, reports of this lizard have come from Afghanistan, India, and Pakistan at elevations ranging from 700 to 1300 meters. This species has an LC conservation status (iucnredlist.org).

Laudakia cypriaca[28]

The head had swollen cheeks and a somewhat disheartened appearance; the vertebral scales were irregular, keeled, and larger than other dorsal scales; the mid-vertebral scales were tolerably expansive, though occasionally they were obstructed by transverse lines of extremely broadened mucronate scales; the tail was at least 1.5 times the length of the snout-vent; occasionally, yellowish vertebral bloches were visible; the tail was a fragment of two, which in the distal half, and in males, it was accompanied by three to five columns of precloacal obdurate organs. cz (reptile-database.reptarium) Its type locality is Limassol, Cyprus. As to iucnredlist.org, this species is classified as LC conservation.

Laudakia dayana[29]

The nose is more than twice the tympanum's breadth and more than 1.5 times the eye's width, or the distance between the two. nostrils exposed, greater than half the width of the eye; no gular pocket, gular plicate; less than half of the nasal, pointing outward and in reverse, touching the rostral; nostrils perforated on or under the canthus rostralis; Moo spinose scales are seen in heterogeneous, subequal, and carinated clusters on the neck and sides of the head, particularly around the tympanum and preauricle; 10 to 12 lateral columns of highly keeled vertebral scales make up the lower labials, which are smaller than other tiny dorsals, while the upper labials are 9–13 (11 ± 1); extra tiny dorsals, particularly smaller than the long ones; a set of long mucronate scales on the sides; similar scales scattered throughout the body; Larger than the gular and other tiny dorsal scales, the smooth ventral scales are smaller than the widened flank and vertebral scales; There is a dorsolateral overlap formed by the free skin of the horizontal sides and granular, smooth gular scales. Around the midbody, there are 102–130 scales in total (118 ± 8.43); The hind limb's length is marginally more than the separation between the cloaca and the gular overlay, and the appendages are fixed by lengthy mucronate scales; There are 20–30 (26.5 ± 2.1) lamellae under the third finger and 27–37 (34.9 ± 2.2) under the fourth toe, indicating that the fingers and toes are compressed. disillusioned tail, oval in shape; Four whorls of extended mucronate scales make up each tail portion, with three remaining on the ventral side; there are 26 to 33 (29 ± 2.0) scales total around the tail; males display obdurate organs at precloacal position concurrently at stomach position, multiple columns at precloacal position 4–6, and an oval fix on the guts; females are hardly ever spoken to at precloacal position in three or fewer columns, according to Baig et al. (2012). This lizard has been sighted in India (reptile-database.reptarium.cz). According to iucnredlist.org, this species is in DD conservation status.[26]

Laudakia melanura[30]

triangular head and body, discouraging from above; an almost double-wide nose compared to the distance between the eye and the tympanum; big, uncovered tympanum that is at least as wide as the eye; Over half of the nasal cavity was perforated on the canthus rostralis; two rostral scales that coordinated outward divided it; the gular plicate was there, but there was no gular pocket. The neck and sides of the head, particularly the area surrounding the tympanum, have clusters of tiny spinose scales; lower labials 13–14 (13 ± 1.0); The scales on the top head are subequal, varied, and smooth in general; the scales on the rear edge are transversely keeled, while those on the tip are rarely carinated; scale lines that were somewhat expanded for the nuchal test; The other little dorsals are particularly smaller than the enlarged vertebral; the lengthy mucronate scales on the sides are not fixed; The vertebral scales are elongated, smooth, or keeled, and grouped in 8–10 vertical lines; Gular scales resemble ventral scales in size, however they are notably bigger than neck scales. Around the midbody, there are 120–156 scales in total (137 ± 13.4); Smaller and smoother than expanded vertebrae are ventral scales. elongated mucronate scales, substantial appendages, and the hindlimb, which is frequently more impressive than the area between the gular overlap and cloaca; Lamellae 17–19 (17.8 ± 1.0) support the third finger, whereas lamellae 22–27 (24.3 ± 1.8) support the fourth toe. Fingers and toes are compressed. tail that is oval in cross section, distally adjusted, and, more often than not, at least 2.5 times longer than the distance between the vent and the snout; The tail section is visible a short distance from its root; each segment has two to three whorls, but in the terminal area, it consistently changes into five or even six; the first whorl surrounding the tail has 18 to 28 (21 ± 5.0) scales; very sharp edges on the mucronate scales in the proximal portion of the tail; At precloacal, males have four or five columns of insensible organs and a fix in the stomach posture, which is sometimes large and rectangular and usually tiny and modified like P. nupta. This species comes in a variety of hues. An olive brown body with a few yellow spots throughout, pale yellow underparts with gular reticulation, a light brown tail in the proximal half, and a dark tail in the distal half are characteristics of individuals in Salt Extend, according to Baig et al. (2012). This lizard has been proven to have been sighted in Iran, Pakistan, and India (reptile-database.reptarium.cz). This species is listed as having an LC conservation status on iucnredlist.org.

Laudakia nupta[31]

Viewed from above, the head appears subtriangular and quite imposing; the body may be slim but is not as discouraged. nose that is broader than the gap between the eye and tympanum, about twice as wide as the eye; tympanum that is exposed, massive, and breaks even with or beyond the eye's width; More than half of the nose punctured the canthus rostralis, with two rostral scales separating it and coordinating outward; Gular plicate, no gular pocket, and neck contract The neck and sides of the head, particularly the area surrounding the tympanum, exhibit clusters of very spinose scales; Variable, subequal, often smooth, and rugose on the back edge are the top head scales; experiments 12–17 (15 ± 1.0); strongly keeled, obviously enlarged vertebral scales that create a wide band of 16–18 scales that cover much of the dorsal body like a carafe, contract close to the neck, and extend widely posteriorly; supplementary tiny dorsals that are notably smaller than the vertebral enlargement; the sides' lack of a wider mucronate scale fix; Compared to the wider vertebral scales, the ventral scales are smoother and smaller, although

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the gular scales are almost as smooth; The hindlimb is frequently more noticeable than the area between the cloaca and gular crease, and the total number of scales around the midbody is typically between 75 and 106 (92 ± 9.09); solid appendages that are kept in place by lengthy mucronate scales; There are squeezed fingers and toes beneath lamellae 15–18 (16.8 ± 0,9) under the third finger and 19–24 (21.3 ± 1.5) under the fourth toe. Tail is distally adjusted, oval in cross segment, and tolerably discouraged; the tail section, which is small and absent from the pelvic, has three whorls of broadened mucronate scales, though sometimes there may be four in the terminal conclusion; 16 to 29 (23 ± 3.0) scales in to begin with a total whorl around the tail; males display three or four lines of obdurate organs at precloacal position and a little fix at stomach position; females may occasionally be addressed.[26] Iraq, Iran, Afghanistan, and Pakistan have all confirmed sightings of this lizard (reptile-database.reptarium.cz). The conservation status of this species is LC (iucnredlist.org).

Laudakia nuristanica[32]

head and body dissuasion; normally spherical nostrils that make up less than half of the nasal cavity and point rearward and outward beneath the canthus rostralis; There are bunches of spinose scales on the neck and sides of the head, particularly close to the tympanum; the upper and lower labials are 11–13 (12 ± 0.8) and 10–12 (11 ± 1.0); the upper head scales are heterogeneous, subequal, and level, with a noticeable spinose parietal area on the back; extended vertebral scales with keeled bases that begin at the postshoulder venlevel and progressively get larger from front to back; seven to nine keeled scales that are enlarged in transverse push; the middle two may be very tiny and do not form vertical columns; There are spinose, funnel-shaped, enlarged, and distributed scales on the body and appendages; the flanks lack fixed, extended mucronate scales. The smooth ventral scales are larger than the gular and other small dorsal scales, but smaller than the extended vertebral and flank scales; other tiny dorsals are unquestionably smaller than widened ones; In the rear half, the dorsolateral overlay is checked by long, undeniably mucronate scales, whereas the neck and horizontal sides' skin is free-shaping; Between 216 and 274 scales are located around the mid body (242 ± 15.8). With the hindlimb longer than removed between the gular crease and the cloaca, the appendages are firm and fastened with level scales beneath and heterogeneous scales above; The fingers and toes are compressed behind the third finger by 25 to 32 (28 ± 2.2) lamellae, and beneath the fourth toe by 32 to 39 (35.9 ± 2.8) lamellae. Discouraged tail, oval in cross segment; each tail fragment has four total whorls, though they may not be specific within the proximal parcel; 43–48 (46 ± 2) scales in to begin with the total whorl around the tail; the horizontal and dorsal sides of the scales are unquestionably mucronate, but mucrone barely reaches the back edge of the scale. According to Baig,[26] men's insensible organs are displayed as six lines at the precloacal position and an enlarged fix in the mid-stomach region. Pakistan and Afghanistan have recorded sightings of this lizard (reptile-database.reptarium.cz). This species has a conservation status of DD (iucnredlist.org).

Laudakia pakistanica[33]

The skull seems trapezoidal and sad from above; the oval nostrils meet the boundary of the canthus rostralis, pointing outward; higher head scales that are level, subequal, and different; labials 11–13; on the sides of the head and neck, there are two level lines of spinose scale clusters, including those at the subauricle level; The middle two columns of the enlarged vertebrals include eight to ten vertical lines of spinose scales (with a strongly raised edge) and a small number of estimate scales, which begin at postshoulder level and progressively rise from front to back; proximity of a particular set of long, delicately coordinated, spinose scales with a raised edge that breaks into a sharp, spiky border on the flanks, along with other small, spinose or multispinose scales; 33 to 40 scales in total, starting with the tail, with dorsal and sidelong scales that are clearly mucronate and spinose, and with spines that slightly extend past the scale's back edge; ventral scales that are smooth. According to Baig et al. (2012), insensible organs exhibit six columns at the precloacal position, two to three scale broad tiny fix at mid-stomach position in males, and comparable patches display in females. However, the precloacal position does not amplify over three lines, and the stomach fix is seldom present. Starting with a full whorl around the tail, the dorsal and sidelong scales are clearly spinose and mucronate, with the spine reaching slightly over the rear border of the scale. Scales at the ventral end are smooth. A stomach repair is rare, and similar patches do not amplify across three lines at precloacal location in females. According to Baig,[26] men's insensible organs are characterized by a two to three scale broad little fix at the mid-stomach position and six columns at the precloacal position. There have been reports of this lizard from Pakistan and India (reptile-database.reptarium.cz). This species' conservation status is LC (iucnredlist.org).

Laudakia papenfussi[11]

A little trapezoidal in shape and 1.33 times longer than wide, the head deflates the body. nose ellipsis, when the nose is in the center. With one supranasal and a little scale separating it from the rostral, the nose of the canthus rostralis is elliptic and coordinates outward and rearward. Direct eye contact with a well-behaved pupil; scale-securing eyelids; a push of broad, keeled scales arranged in a bend beneath the lower eyelid, divided from supralabials by three lines of tiny, smooth, slightly protruding scales; a large, slightly smaller-than-eye, somewhat-adjusted, shallow, and visible columella auris; a tympanum bordered with conic scales, with patches of these scales also on the side of the neck; scales that are granular on the lower back section, small and keeled on the lower front portion, and expansive and keeled on the upper portion between the eye and tympanum; big on the snout, fairly big, bulging, and smooth on the fronto-parietal area, the head beat's scales are diverse, but the supraocular region is tiny and particularly keeled on the occupit. The upper border of the large, flat rostral scales is straight. The edge limit of the superciliary edge was ineffectively created, and it was not everted upward; Ten supralabials and eleven infralabials on each side, a triangular shape, a gular pocket truant, a gular wrinkle visible, a simple nuchal peak, and four or five lines of long and limit scales parallel to the infralabials. Ten to twelve longitudinal columns of moderately larger, keeled vertebral scales that are oriented toward the midline of the sacrum; The appendages are forceful, with the longest toe of the rear appendage reaching the tympanum; the back of the appendages is secured with enormous, emphatically keeled scales; the internal side of the upper arm has small scales; fingers and toes are well-formed, and the claws are compressed and sharp. The ventral scales are smooth or somewhat keeled, and slightly larger than the vertebrals. The remaining dorsal scales are small and keeled, with a scattering of expansive, conic scales. Its hollow, round tail is a bit flattened at the base. Large, heavily keeled scales, the biggest of which are on the bottom surface, hold it in place. Each section has three rings of scales, and the scales are grouped in sections.[26] China is the source of reports of this lizard (reptile-database.reptarium.cz). This species' conservation status is LC (iucnredlist.org).

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Laudakia sacra[7]

The nose deters the head and body because it is more than twice the tympanum breadth and more than 1.5 times the eye-to-tympanum distance, or eye width; uncovered tympanum, which is wider than half the eye's breadth; On the canthus rostralis, more than half of the nasal cavity was perforated, creating an interesting inclining aperture-like orifice that touched the rostral and pointed outward and inverted; no gular pocket, gular plicate; Labials 9–10 (10 ± 0.4); top head scales are frequently smooth, subequal, and variable; Moo spinose scales are seen in groups on the sides of the head and neck, particularly close to the preauricle and tympanum; nuchal dentition with a clear distinction; bigger than other small dorsals, with vertebral scales that are keeled and grouped in 14–16 lines; no expanded scales on the body's flanks or sidelong sides; more little dorsals that are distinguishably smaller than those that have widened; 180–196 (192 ± 6.0) scales surround the midbody in total (up to 239 scales were reported by Ananjeva et al., 1990); the ventral scales are smooth and smaller than the enlarged vertebrae; Granular and smooth gular scales are present; the epidermis of the sidelong sides does not form the distinct dorsolateral overlay; With the exception of those on the back border of the thigh and the hindlimbs, which are slightly longer than the distance between the cloaca and gular overlap, the thighs are usually smooth and pitifully keeled; the fingers and toes are compressed, typically having 21–27 (23.6 ± 1.99) lamellae under the third finger and 28–32 (30 ± 1.4) under the fourth toe. According to Baig et al. (2012), males have insensible organs at precloacal concurrently at stomach position, number of lines at precloacal position 4–6, and an elongated fix on guts. Each tail portion has four whorls of broadened mucronate scales, but three are on the ventral side and not checked in the proximal portion. Total whorl around the tail starts with 30–32 (31 ± 1.0) scales. There have been reports of this lizard from China (reptile-database.reptarium.cz). This species has an LC conservation status (iucnredlist.org).

Laudakia stellio[1]

Tail divided into discrete sections of two scale whorls, sometimes three in the distal portion. Compared to other dorsal scales, vertebral scales are frequently bigger, keeled, varied, and unpredictable. scales with regular keels. The tail is almost 1.5 times longer than the snout-vent.[26] It is listed as an LC conservation species on iucnredlist.org. Sightings of this lizard have been reported in Greece and Turkey (reptile-database.reptarium.cz). It is listed as an LC conservation species on iucnredlist.org.

Laudakia tuberculata (GRAY, 1827)

Head and body discouragement; nose at least 1.5 times the eye-to-tympanum distance or the eye's breadth and more than twice the tympanum's width; tympanum exposed, more than half the eye's breadth; less than half of the nose, pointing outward and in reverse, making touch with the rostral; no gular pocket, gular plicate; nostril perforated on or under canthus rostralis; uneven, uneven, smooth, or somewhat disagreeable scales on the upper skull; 10 ± 1 Labials 8–12; Clusters of tiny spinose scales may be seen on the head's sides and neck, particularly close to the preauricle and tympanum; vertebral scales that are bigger than other little dorsals and have 12 to 14 angled lines of keeled scales; The body is covered in extended mucronate scales, but there aren't any fixed broadened ones on the flanks; the other dorsals are smaller than the extended ones; the ventral scales are smooth, smaller than the extended vertebral but larger than the gular and other small dorsal scales; the skin of the sidelong sides is free-shaping the dorsolateral crease; there are 134–221 scales around the midbody, with the hind-imb slightly longer than the distance between the cloaca and the gular overlay; the fingers and toes are compressed, with 20–30 (24.8 ± 2.49) lamellae under the third finger and 26–37 (31.5 ± 2.6) beneath the fourth toe. disillusioned tail, oval in shape; The entire whorl around the tail is initiated by scales 28 to 46 (36 ± 4); males have obdurate organs as they were at the stomach and precloacal positions, precloacal positions 4–6, and an elongated fix on the midriff. Each tail fragment has four whorls of extended mucronate scales, with three on the ventral side. pale yellow or black, occasionally speckled, with a dark bar on the sides between the tympanum and eye; regular, dark-spotted or speckled, blue-stamped, and reticulated in teens; Pale yellow chest and stomach, maybe flecked with age, men with black or blue hair; The body's color varies widely; Subadults show erratic designs; the tail seems somewhat unified, but it is also devoid of any pattern when the body of the animal requires it.[26] The body color is occasionally clean brown, occasionally black, and sometimes blotched with both dark and yellow. The vertebral stripe is olive brown and light, with horizontal expansions surrounded by dark and a few additional light and dim places and parts. The bigger yellow dots are sometimes grouped transversely, while the smaller ones might vary in size. According to iucnredlist.org, this species has an LC conservation status. China, India, Nepal, and Pakistan have all confirmed sightings of this lizard (reptile-database.reptarium.cz).

Laudakia vulgaris[3]

According to BAIG, the head and body are discouraged, the color is gloomy and brown, the tail is broken into two whorls, and the vertebral blotches are limited by the vertebral band of enlarged scales. This lizard has been reported from Egypt, Jordan, Israel, and Syria, according to reptile-database.reptarium.cz. The conservation status of this species is unknown (iucnredlist.org).

Laudakia wui[11]

The head is a little trapezoidal, longer than wide, and the body is dejected. The nasal ellipse begins with the supralabial and is round, expansive, and fair under the canthus rostralis. It is attached to the rostral. Between the nasal back edge and the superciliary border, it bears four to five tiny scales. A poorly developed superciliary margin is present. The top and lower eyelids are held in place by scales and a circular understudy, and the eye is keeled and somewhat enlarged. shallow, visible columella auris, oval tympanum that is marginally bigger than the eye, front edge with massive, keeled scales, the biggest of which is conic, and top edge with a push of expansive, keeled scales that resemble the scales of a global location; The scales on the head are different; some are big and protrude on the snout, while the rest are smooth and little. There are two columns of long scales parallel to the infralabial scales, forming a mental triangle with eight supralabial and eleven infralabial scales on each side; one or two large spinose scales before the crease before the bear, gular pocket truant, and gular overlap show; basic nuchal peak display; the parietal organ is indistinct and clearly visible as a small white spot; the mouth and neck have patches and lines of conic scales; the parietal organ is indistinct and clearly visible as a little white spot; the vertebral scales are keeled and fairly expansive, with little dorsal scales left; Both sides of the back have twisted skin folds that reach from the bear to the crotch; under the folds are expanding, conical scales that are grouped in two parallel, longitudinal, discontinous columns; Broad, distinctly keeled scales cover the back of the appendages, and the longest toe of the hindlimb extends to the bear's armpit. Located in longitudinal columns, the ventral scales are just as massive as the vertebral scales. Expanding, strongly keeled scales grouped in parts, with three rings for each sector, hold the tail in place. It is round and hollow, with a

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slightly discouraging base.[26] There have been reports of this lizard from China (reptile-database.reptarium.cz). This species has an LC conservation status (iucnredlist.org).

Results

In this review, the species of the genus *Laudakia* identified within their global distribution range were analyzed in terms of systematics, morphology, and distribution. Among all examined species of this genus, *L. nupta*, *L. melanura*, and *L. agrorensis* have the widest distribution ranges in the Middle East and South Asia, respectively.

Morphologically, considerable diversity was observed in morphological traits such as the condition of dorsal and lateral scales, the presence or absence of nuchal spinose scales, the number of scales around midbody, the number of subdigital lamellae, and the arrangement of caudal whorl scales. Saxicolous species such as *L. nupta* and *L. melanura* have larger body size, very large and keeled dorsal scales, and a stronger tail, which are adaptations for life in rocky habitats. In contrast, arboreal or terrestrial species such as *L. agrorensis* and *L. tuberculata* have smaller body size and more delicate dorsal scales.

In terms of conservation status (based on IUCN assessments), some species are categorized as Least Concern, one species (*L. dayana*) is classified as Data Deficient, and three species (*L. nuristanica*, *L. pakistanica*, and *L. vulgaris*) still lack any conservation assessment. No species of this genus is listed in the threatened categories (Vulnerable, Endangered, or Critically Endangered).

In terms of geographical distribution, the species of this genus have a wide distribution range from the eastern Mediterranean (Cyprus and Turkey) to East Asia (China). The highest species diversity is observed in South Asia (India, Pakistan, and Afghanistan), while the lowest diversity is found in East Asia. *L. nupta* is the only species of this genus that occurs in Iran.

Discussion

The findings of this review indicate that the genus *Laudakia* possesses considerable morphological and geographical diversity, but its classification still faces ambiguities. Previous studies based on morphological data revised this genus and transferred some species to the genus *Paralaudakia*. However, in this study, a more traditional taxonomic approach has been adopted, and both groups are considered as a single genus. Available molecular evidence suggests that this genus may be paraphyletic and requires a fundamental revision based on integrated morphological and molecular data.

The distribution patterns observed in this study show that species of this genus are mainly distributed in mountainous and rocky regions. *L. nupta* is found in Iran in the Zagros Mountains and central Iran, while other species are mainly distributed in the Himalayas, Hindu Kush, and the central mountains of Asia. This pattern is consistent with the hypothesis of "divergent evolution in mountain habitats" and suggests that geographical isolations caused by mountain ranges have played a key role in the differentiation and speciation of this genus.

From a conservation perspective, although most species of this genus are categorized as Least Concern, the lack of precise data on the population status of some species is a major gap in current knowledge. This issue is particularly concerning for narrow-range species living in inaccessible mountain regions, because accurate assessment of their conservation status is difficult.

The main limitation of this study is its reliance on data available in public databases (GBIF, iNaturalist, and the Reptile Database) and library sources. These data may not cover all actual distribution points of the species and may also contain sampling errors (e.g., misidentification of species). Furthermore, the lack of sufficient molecular data for most species prevented a comprehensive phylogenetic analysis in this study.

Conclusion

This comprehensive review showed that the genus *Laudakia* includes at least 15 valid species, distributed from the eastern Mediterranean to East Asia. Among these species, only *L. nupta* is found in Iran, while other species are mainly distributed in South Asia and East Asia.

From a conservation perspective, although most species of this genus are categorized as Least Concern, the severe lack of official assessments for three species is a serious gap. Targeted field studies are necessary to determine the actual population status of species lacking assessments, especially *L. nuristanica* and *L. pakistanica*.

Overall, the genus *Laudakia* is recognized as one of the diverse and widespread genera of the family Agamidae in the Palearctic realm and the East. This genus requires special attention from researchers for taxonomic revision based on integrated molecular and morphological data, as well as accurate assessment of the conservation status of species lacking data. The use of genomic tools and phylogenetic studies can help clarify interspecific relationships and even identify new species, especially in regions that have been undersampled so far.

Concluding remarks

As mentioned in this study, the genus *Laudakia* is separated from genus *Paralaudakia* based on the studies conducted. Amazing species of genus *Laudakia* are also present in Iran, such as *Laudakia nupta* (DE FILIPPI).[31] I think we should use molecular techniques and more genes to determine the status of the species of this genus. I believe that these surveys will introduce new species. However, the studies conducted have introduced 13 species of this genus, and the number of these species will probably increase with further studies.

In this study, the conservation status of the species of this genus has also been investigated. Unfortunately, in some cases, there is not enough information about the status of some of these species, and this is dangerous.

Available data show that the distribution of these lizards continues from the island of Cyprus and its surroundings to China. I think that there is a possibility of the presence of this species in the central parts of China because there is little sampling and reporting of the species. The presence of these lizards in the Middle East is more colorful and this is significant.

Based on the points discussed, it can be concluded that the genus *Laudakia* requires serious taxonomic revisions and also possesses unexplored biogeographic potential. The use of molecular and phylogenetic data can clarify the status of species and may even lead to the identification of new ones. This is particularly important in regions that have so far been under-sampled, such as central China and certain areas of Iran.

From a conservation perspective, the lack of data regarding the status of some species represents a serious threat. Insufficient information can hinder the development of effective conservation strategies and may ultimately result in population decline or even extinction. Therefore, future studies should not only focus on taxonomic aspects but also on a precise evaluation of the conservation status of these species.

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Overall, the genus *Laudakia* is a prominent example of a reptile group with wide distribution and remarkable morphological diversity. Studying it can contribute to a better understanding of evolutionary, biogeographic, and conservation patterns in the region. Integrating morphological, molecular, and ecological data in future research will provide a more comprehensive picture of this genus and its position within the family Agamidae.

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None

Conflicts of interests

The authors declare no conflicts of interest.

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